United States
Department of
Agriculture

Forest
Service

December
2013

Lava Restoration

Preliminary Assessment

Hood River Ranger District
Mt. Hood National Forest

Hood River County, Oregon

Legal Description: T1S R8.5-9E; Willamette Meridian

Parkdale Lava Flow (Sam Beebe, 2008)

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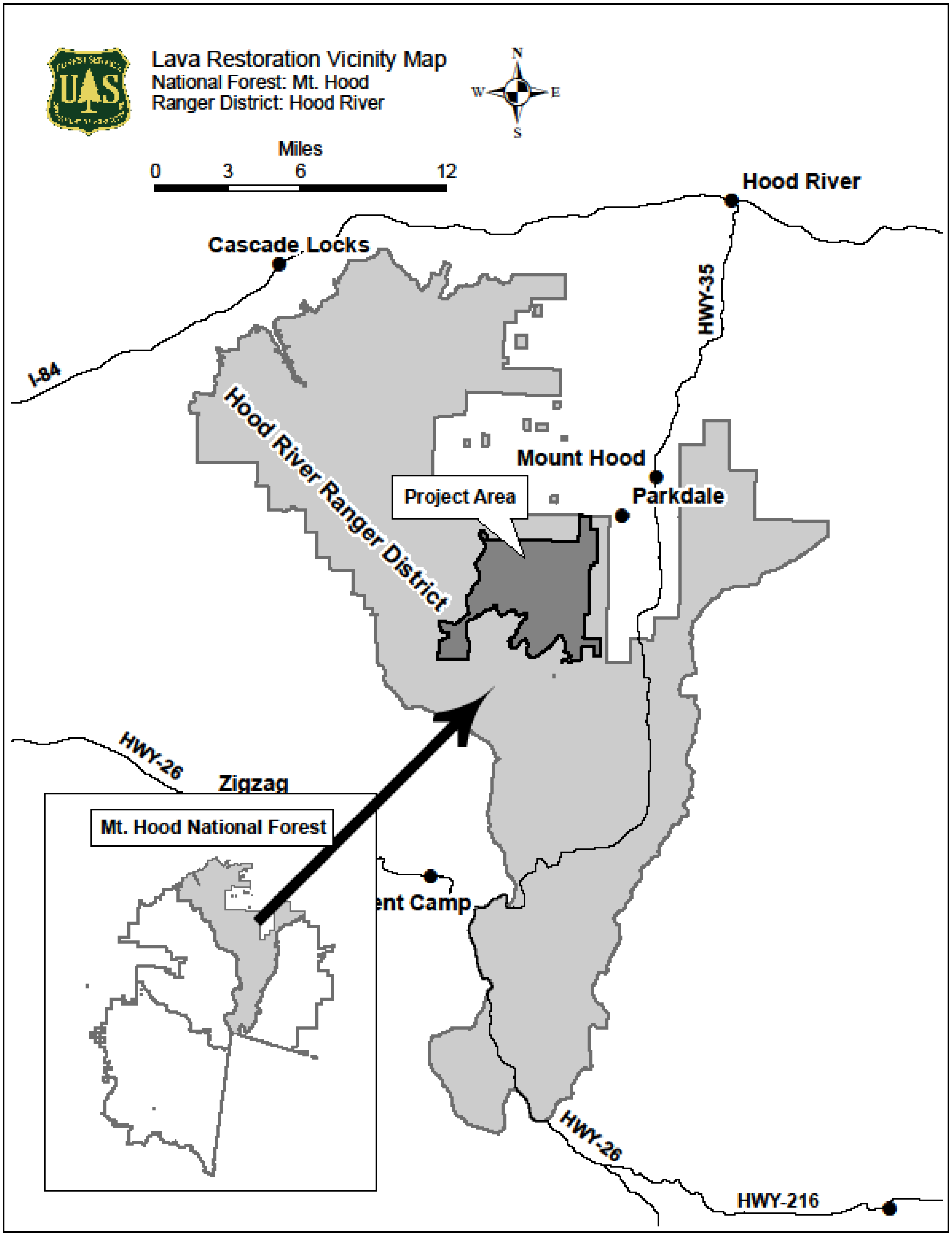
SUMMARY

The Lava Restoration area is located on the Hood River Ranger District of the Mt. Hood National Forest. The large majority of the roughly 13,800 acre project area falls within the Middle Fork Hood River Watershed with smaller portions within the East Fork and West Fork Hood River Watersheds. About 64% of the project area is within C1 (Timber Emphasis) land allocation as designated under the Mt. Hood Forest Plan and Matrix land (68%) as designated under the Northwest Forest Plan.

The stand composition, structure and densities in the project area have been altered by previous vegetation management, fire suppression, favorable climatic conditions for vegetation growth, and an increased presence and scale of native / non-native insects and diseases. This has led to high density stand conditions, which contributes to mortality of trees due to competition for nutrients, water and sunlight. Insects and diseases are also more likely to kill trees that grow in dense, crowded conditions. Current stand structure has been altered though the absence of small and large-scale disturbance events, such as fire, resulting in higher stocking levels of fire-intolerant species, an increase of shade-tolerant species in the intermediate layer, an increased density of the shrub and young tree component, and fewer openings normally associated with natural stands.

The Lava Restoration proposal seeks to improve these conditions within the West, Middle and East Fork Hood River Watersheds through a variety of vegetative and road treatments. The Proposed Action includes vegetative treatments of approximately 1,908 acres including plantation thinning, sapling thinning, planting, firewood removal and huckleberry enhancement. All thinning activities proposed in this project would apply variable density thinning (VDT), which allows flexibility to achieve overall treatment objectives. This allows emphasis to be placed on leaving vigorous trees of all sizes without concern for spacing. Leave tree spacing associated with VDT would vary within and between units. Tree density would be measured by basal area, canopy closure, trees per acre or relative density depending on the ecological needs for each unit. Where the objective is to delay the time at which the stand reaches the stem exclusion stage, a heavy VDT would be prescribed (wide leave tree spacing). In other areas, the objective would be to have stands reach the stem exclusion stage sooner and they would have moderate or light VDT. Leave trees would include minor species and would include trees with the elements of wood decay.

In addition to the vegetative treatments, all of the National Forest System Roads within the project area were analyzed to determine if decommissioning or road closures were appropriate following the completion of the vegetation treatments. This project would decommission approximately 2.1 miles of unneeded roads over several years, as implementation funding becomes available. The roads would not be decommissioned until the vegetation treatments have been fully completed. Road decommissioning includes active and/or passive methods. The decommissioning method ultimately selected would be based on hydrologic and ecological needs. A decommissioned road would be removed from the Forest’s transportation system and would no longer receive any maintenance. In addition to the proposed roads to be decommissioned, a year-round closure would be implemented on 15.4 miles of road and a seasonal closure would be implemented on 7.0 miles of road.



Vicinity Map of Lava Restoration Project Area

CHAPTER 1 – INTRODUCTION

The Lava Restoration area is located on the Hood River Ranger District of the Mt. Hood National Forest. The large majority of the roughly 13,800 acre project area falls within the Middle Fork Hood River Watershed with smaller portions within the East Fork and West Fork Hood River Watersheds. The project area consists of entirely National Forest System (NFS) Lands. The stand composition, structure, and densities in the Lava project area have been altered by:

- Previous vegetation management;
- Fire suppression;
- Favorable climatic conditions for vegetation growth; and
- Increased presence and scale of native and non-native insects and diseases.

The stand composition, structure and densities in the project area have been altered by previous vegetation management, fire suppression, favorable climatic conditions for vegetation growth, and an increased presence and scale of native and non-native insects and diseases. This has led to high density stand conditions, which contributes to mortality of trees due to competition for nutrients, water and sunlight. Insects and diseases are also more likely to kill trees that grow in dense, crowded conditions. Current stand structure has been altered though the absence of small and large-scale disturbance events, such as fire, resulting in higher stocking levels of fire-intolerant species, an increase of shade-tolerant species in the intermediate layer, an increased density of the shrub and young tree component, and fewer openings normally associated with natural stands.

1.1 Document Structure

This Preliminary Assessment discloses the direct, indirect, and cumulative environmental effects that would result from the No Action (baseline) and Proposed Action alternatives. The document is organized into four parts:

- *Introduction:* The section includes information on the history of the project proposal, the purpose and need for action, and the agency's proposal for achieving that purpose and need. This section also details the collaboration process among state, local and tribal governments, non-governmental organizations, and interested parties for this project, as well as how the Forest Service informed the public of the proposal and how the public responded.

- *Alternatives, including the Proposed Action:* This section provides a more detailed description of the No Action and Proposed Action Alternatives. This discussion also includes project design criteria and mitigation measures that were added as a result of environmental analysis.

- *Environmental Consequences:* This section describes the environmental effects of no action as well as the trade-offs and effects of implementing the Proposed Action alternative. This analysis is organized by resource area. Within each section, the existing environment is described first, followed by the estimated effects of no action that provides a baseline for evaluation, and finally the estimated effects of the Proposed Action alternatives.

Consultation and Coordination: This section provides agencies consulted during the development of the Preliminary Assessment and a list of preparers.

Additional documentation, including more detailed analyses of project area resources, may be found in the project record located at the Hood River Ranger District Office in Mount Hood/Parkdale, Oregon.

1.2 Background

A substantial portion of the project area contains immature stands less than 80 years old (see Table 1-1) dominated by trees from ten to twenty inches in diameter measured at breast height (DBH). Most of these stands exist at high densities and are exhibiting signs of poor forest health such as insect and disease infestations. The absence of fire, partial cutting in the early 1900s, and stand regeneration practices in the past 60 to 80 years have all contributed to Douglas-fir dominated, dense and often single-story stand conditions within plantations. These conditions have made a substantial number of stands within the project area susceptible to root disease and root decay. In addition, at higher elevations stand conditions are susceptive to insect and diseases, such as the balsam wooly adelgid. Stands outside of plantations are also exhibiting some of these same high density conditions, lacking small openings in the canopy necessary for a well-developed shrub layer. As a result, the shrub layer in these stands is poorly developed leading to a deficiency in the shrub component including the culturally and ecologically important huckleberry plant. As a result of the current situation within the East Fork, Middle Fork and West Fork Hood River Watersheds, this project was undertaken to improve the forest conditions mentioned above within these watersheds. The table below shows the current project area stand conditions.

Table 1-1: Current Project Area Stand Conditions

Age Class	% of Project Area
< 20 Years	8%
21-40 Years	16%
41-60 Years	10%
61-80 Years	8%
81-100 Years	7%
101-120 Years	9%
121-140 Years	2%
141-160 Years	1%
161-180 Years	2%
181-200 Years	10%
200 + Years	6%

Age Class	% of Project Area
Unknown	6%

The project area for the Lava Restoration project was determined using the following criteria.

- National Forest System lands within two 6th field subwatersheds (Lower and Upper Middle Fork Hood River). These two subwatersheds totaled over 27,000 acres occupying multiple ownerships.
- Remove land use designations inconsistent with active vegetation / roads management (i.e. designated wilderness areas and inventoried roadless areas).
- Incorporate a broad look at huckleberry enhancement treatments, including a small portion of the Upper West Fork Hood River subwatershed that was previously analyzed in Red Hill Restoration. The treatments on these lands were deferred in order to provide a more complete analysis of all huckleberry enhancements opportunities.
- Design proposed treatment to address the forest ecosystem conditions based on the relevant land use allocations (LUA), the existing conditions on the ground and the overall purpose for this project as discussed in the following sections.
- Utilize the Hood River Collaborative Stewardship Crew recommendations and discussions during the field visits and multiple group meetings (See Appendix 1 for full collaborative group recommendations).

In addition to these criteria, small portions of the Lower and Middle East Fork Hood River subwatersheds were added to the project area. This was done in order to prevent creating a “management sliver” in which a small piece of land is never considered for potential treatments.

1.3 Purpose and Need for Action

The overarching purpose of the project is to improve the forest conditions within the West, Middle and East Fork Hood River Watersheds. In order to meet this overall goal, the underlying needs based on management direction and the LUAs of the project would be to:

1. Improve forest health conditions by reducing competition, promoting increased growth and vigor, and increasing structural and species diversity within selected stands;

2. Improve growing conditions for huckleberry and other native understory vegetation by reducing shading and competition by overstory trees within selected stands;

3. Maintain a road system that meets transportation and/or access needs (including reducing the need for incurring ongoing maintenance costs) while reducing aquatic risk associated with specific roads; and,

4. Provide timber to meet local and/or regional demands for wood products.

Need 1 - Improve forest health conditions by reducing competition, promoting increased growth and vigor, and increasing structural and species diversity within selected stands.
The second-growth Douglas-fir dominated plantations within the Lava Restoration project area are dense and overcrowded. These crowded conditions have resulted in reduced growth and vigor due to competition for light, water and nutrients. These stands also lack both the structural and species diversity usually present within the area. To promote forest health and vigor, as well as increase structural and species diversity, these stands should be thinned to conditions that better meet the management goals and desired future conditions identified in the Forest Plan and East Fork, Middle Fork, and West Fork Watershed Analyses.

Need 2 - Improve growing conditions for huckleberry and other native understory vegetation by reducing shading and competition by overstory trees within selected stands.
The majority of the understory within the Lava Restoration project area is deficient in huckleberry as well as other native plants. In some cases, the huckleberry that is present is being shaded out by high density canopies. Big leaf huckleberry is not only an important component of the plant communities within the project area, but also has cultural significance for the Confederated Tribes of Warm Springs. To improve growing conditions for huckleberry and other native understory vegetation stands should be thinned to conditions that better meet the management goals and desired future conditions identified in the Forest Plan, East Fork, Middle Fork, and West Fork Watershed Analyses.

Need 3 - Maintain a road system that meets transportation and/or access needs (including reducing the need for incurring ongoing maintenance costs) while reducing aquatic risk associated with specific roads.
A desirable transportation system provides safe access, meets the needs of local communities and forest users; meets current and future resource management objectives; minimizes costs for ongoing maintenance, and has a minimal impact on natural resources. In order to improve the opportunities for huckleberry picking and reduce impacts on aquatic resources it is necessary to reduce/restrict the open road density within the project area. Opportunities also exist to improve and/or maintain the transportation system in the Lava Restoration project area that are reasonable to implement concurrently with the proposed treatment activities, that would help facilitate log haul, and/or contribute to the long-term access needs.

Need 4 - Provide timber to meet local and/or regional demands for wood products.
Forest Plan timber resource management goals include keeping forests healthy and productive in part to sustainably provide forest products now and into the future. There is a need to use commercial harvest in managing forest vegetation in the Lava Restoration area in order to offer wood products to contribute to satisfying local demands. Also, one of the dual goals of the Northwest Forest Plan is to provide a sustainable level of forest products for local and regional economies and to provide jobs. Thinning is needed to keep forests healthy and productive to provide wood products now and in the future.

1.3.1 Management Direction

The Lava Restoration project is proposed to respond to goals and objectives of the Mt. Hood Land and Resource Management Plan, as amended (US Forest Service, 1990a) and the recommendations in the West Fork (US Forest Service, 1996a), Middle Fork and East Fork of Hood River Watershed Analyses (US Forest Service, 1996b). This Preliminary Assessment has been completed in accordance with direction contained in the National Forest Management Act, the National Environmental Policy Act, the Council on Environmental Quality regulations, Clean Water Act, the Endangered Species Act and other applicable laws, policies and regulations.

This Preliminary Assessment is tiered to the Mt. Hood National Forest Land and Resource Management Plan Final Environmental Impact Statement (US Forest Service, 1990b) and Record of Decision (US 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. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management. Goals, objectives and desired future conditions of the management areas within the project area are discussed below in the description of land allocations. In addition, management direction for the area is provided in three major 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* (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* (2001); and,
- Invasive Plants– *Pacific Northwest Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision* (2005).

Additionally, this Preliminary Assessment is tiered to the East Fork, Middle Fork and West Fork Hood River Watershed Analyses. The NWFP Record of Decision requires a watershed analysis for all Key Watersheds prior to resource management (page C-3).Watershed analysis is a systematic procedure to characterize the aquatic, riparian, and terrestrial features within a watershed. The information is used to refine riparian reserves boundaries, prescribe land management activities, including watershed restoration and develop monitoring programs (NWFP ROD page 10). A portion of the West Fork Hood River watershed (Ladd Creek) is a Tier 1 Key watershed. Tier 1 Key Watersheds were selected for directly contributing to anadromous salmonid and bull trout conservation (see Section 3.5, Water Quality for more details).

1.3.2 Desired Future Conditions and Land Allocations

The desired future condition for the upland and riparian vegetation treatments areas is a multi-layer canopy with large diameter trees, well-developed understory, more than one age class, and snags and down woody debris. The desired future conditions for the road treatments are to have a road system that meets current and projected access needs, is maintainable and has a reduced risk to aquatic resources. Achieving this desired future condition would assist in meeting the overall goals of the LUAs within the project area and recommendations within the watershed analyses as described below. Figure 1-1 through Figure 1-6 illustrate the existing conditions and desired future conditions for the vegetation treatments.

Figure 1-1: Existing Conditions Plantation thinning. Dense, Overstocked Stands.

Figure 1-2: Existing Conditions Plantation Thinning. Dense, Closed Canopy.

Figure 1-5: Existing Conditions Huckleberry Enhancement. Deficient shrub component.

Figure 1-6: Existing Conditions Firewood Removal. High density of snags.

Figure 1-3: Desired Future Condition Huckleberry Enhancement.

Figure 1-4: Desired Future Condition Plantation Thinning.

Several LUAs as designated by the Forest Plan and NWFP are found within the project area. The primary Forest Plan LUAs within the project area are listed in the table below along with the management goal of the LUA.

Table 1-2: Forest Plan Land Use Allocations within the Project Area

Forest Plan Land Use Allocation	Management Goal For Land Use Allocation
A4- Special Interest Area*	Protect and, where appropriate, foster public recreational use and enjoyment of important historic, cultural, and natural aspects of our national heritage. Preserve and provide interpretation of unique geological, biological, and cultural areas for education, scientific, and public enjoyment purposes (Forest Plan page 4-153 to 4-156).
B1- Wild, Scenic and Recreational Rivers	Protect and enhance the resource values for which a river was designated into the Wild and Scenic Rivers System (Forest Plan page 4-208 to 4-217).
B2- Scenic Viewshed	Provide attractive, visually appealing forest scenery with a wide variety of natural appearing landscape features. Utilize vegetation management activities to create and maintain a long term desired landscape character (Forest Plan page 4-218 to 4-220).
B3- Roaded Recreation*	Provide a variety of year-round recreation opportunities in natural appearing roaded settings. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices (Forest Plan page 4-229 to 4-233).
B6- Special Emphasis Watershed	Maintain or improve watershed, riparian, and aquatic habitat conditions and water quality for municipal uses and/or long term fish production. A secondary goal is to maintain a healthy forest condition through a variety of timber management practice (Forest Plan page 4-246 to 4-249).
B10- Deer and Elk Winter Range*	Provide high quality deer and elk habitat for use during most winters. Provide for stable population of mule deer and Rocky Mountain elk on the eastside. Secondary goals are to maintain a healthy forest condition through a variety of timber management practices and to provide dispersed summer and developed recreation opportunities (Forest Plan page 4-272).
C1- Wood Product Emphasis	Provide lumber, wood, fiber, and other forest products on a fully regulated basis, based on the capability and sustainability of the land. A secondary goal is to enhance other resource uses and values that are compatible with timber production (Forest Plan page 4-289 to 4-290).

* While in the project area no treatments are proposed in this LUA

In addition to the above listed LUAs the Forest Plan also prescribes a secondary LUA within the project area of B5-Pileated Woodpecker and Pine Marten Habitat Area. The goal for B5-Pileated Woodpecker/Pine Marten Habitat Area is to provide forestwide 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 page 4-240 to 4-241). Where the B5 secondary LUA has more stringent standards and guidelines than the primary LUA, these standards and guidelines would be followed. See Figure 1-8 for a map of the Forest Plan LUAs within the project area.

Management guidance for the Lava Restoration project also comes from the NWFP. The Lava Restoration project area encompasses multiple LUAs assigned by the NWFP. The majority of the project area (68%) falls within the Matrix LUA. The Matrix LUA is where timber harvest and other silvicultural activities are emphasized. Other LUAs include Administratively Withdrawn, Riparian Reserves and Late-Successional Reserves. While falling within he project area no treatments are proposed within the Administratively Withdrawn or Late-Successional Reserves LUA. Treatment are proposed within the Riparian Reserves, which are areas along all streams, wetlands, ponds, lakes, and unstable or potentially unstable areas where the conservation of aquatic and riparian-dependent terrestrial resources receives primary emphasis. The main purpose of the reserves is to protect the health of the aquatic system and its dependent species; the reserves also provide incidental benefits to upland species. See Figure 1-7 for a map of the NWFP LUAs within the project area.

In addition to the guidance found within the Forest Plan and NWFP, project direction is also found within the East Fork, Middle Fork and West Fork Hood River Watershed Analysis documents. The large majority of the project area (80%) falls within the area considered in the Middle Fork Hood River Watershed Analysis. The principal direction within the Middle Fork Hood River Watershed Analysis includes the following:

- Vegetative treatments should be focused in the sapling/pole and small tree stages of stand development especially where these conditions overlap with riparian reserves;
- Silvicultural treatments should support the development of existing young forests into late seral like structure;
- Management proposals need to incorporate treatments that include the upland and riparian areas; and,
- Treatments should use both pre-commercial and commercial harvest techniques to enhance late seral stand development.

Additional guidance from the East Fork, Middle Fork and West Fork Watershed Analysis documents also recommends pursuing huckleberry enhancement opportunities where available.

Lastly, the Middle Fork Hood River Outstanding Remarkable Values provide management direction for the treatment units within the Wild & Scenic River Corridor. The 3.7-mile segment of the Middle Fork Hood River from the confluence of Clear and Coe Branches to the north section line of T1S, R9E, Section 11 was designated under the Omnibus Public Land Management Act of 2009 (H.R. 146, page 22) as a recreational river segment. This section is to be administered by the Secretary of Agriculture as a scenic river. The geologic/hydrologic values were found to be outstandingly remarkable. The scenic, fisheries, wildlife, and ecological/botanical values were found to be substantial. A full description of the Outstanding Remarkable Values is available in the project record.

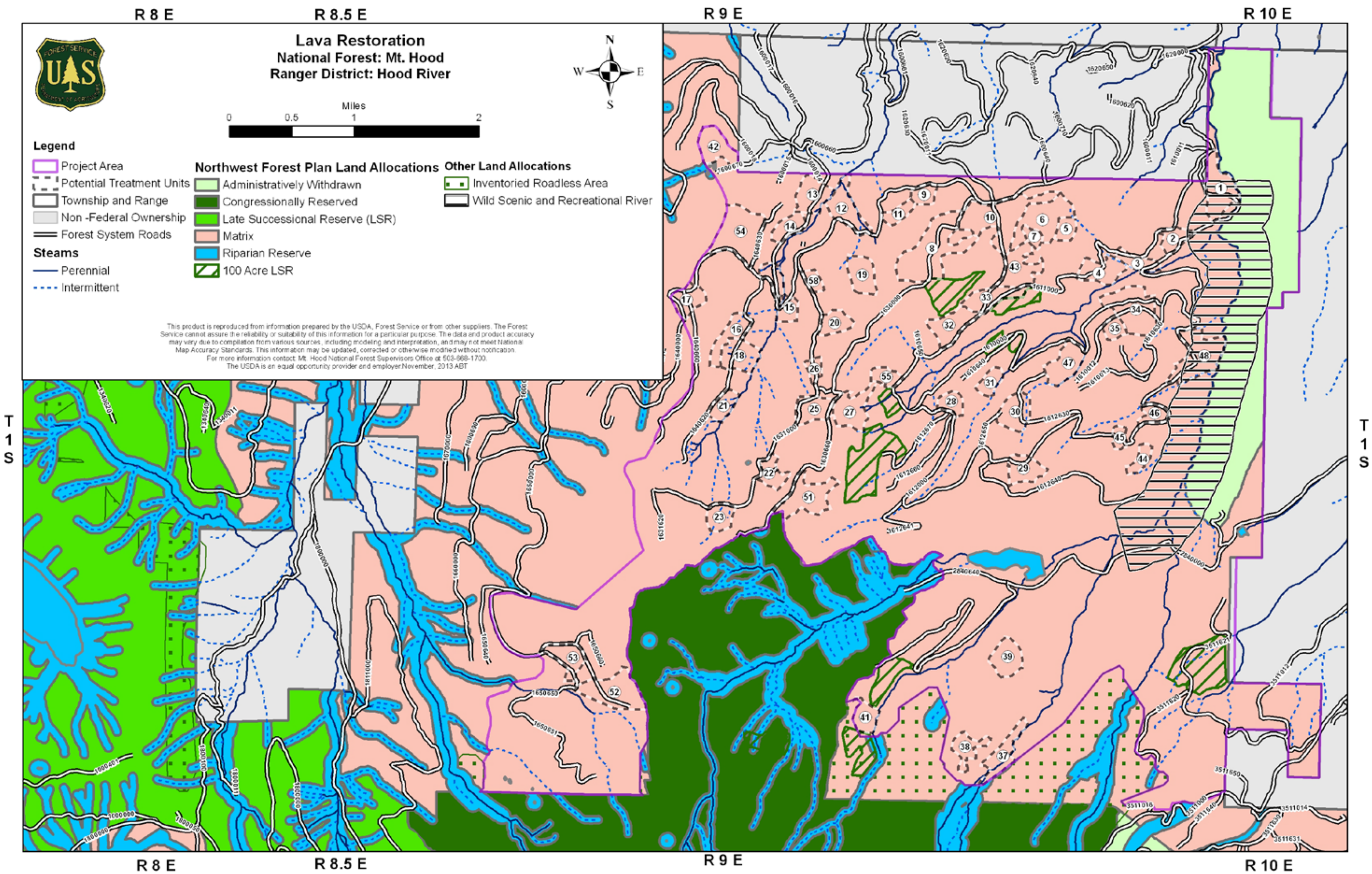


Figure 1-7: NWFP and Other Land Allocations within Lava Restoration Project Area

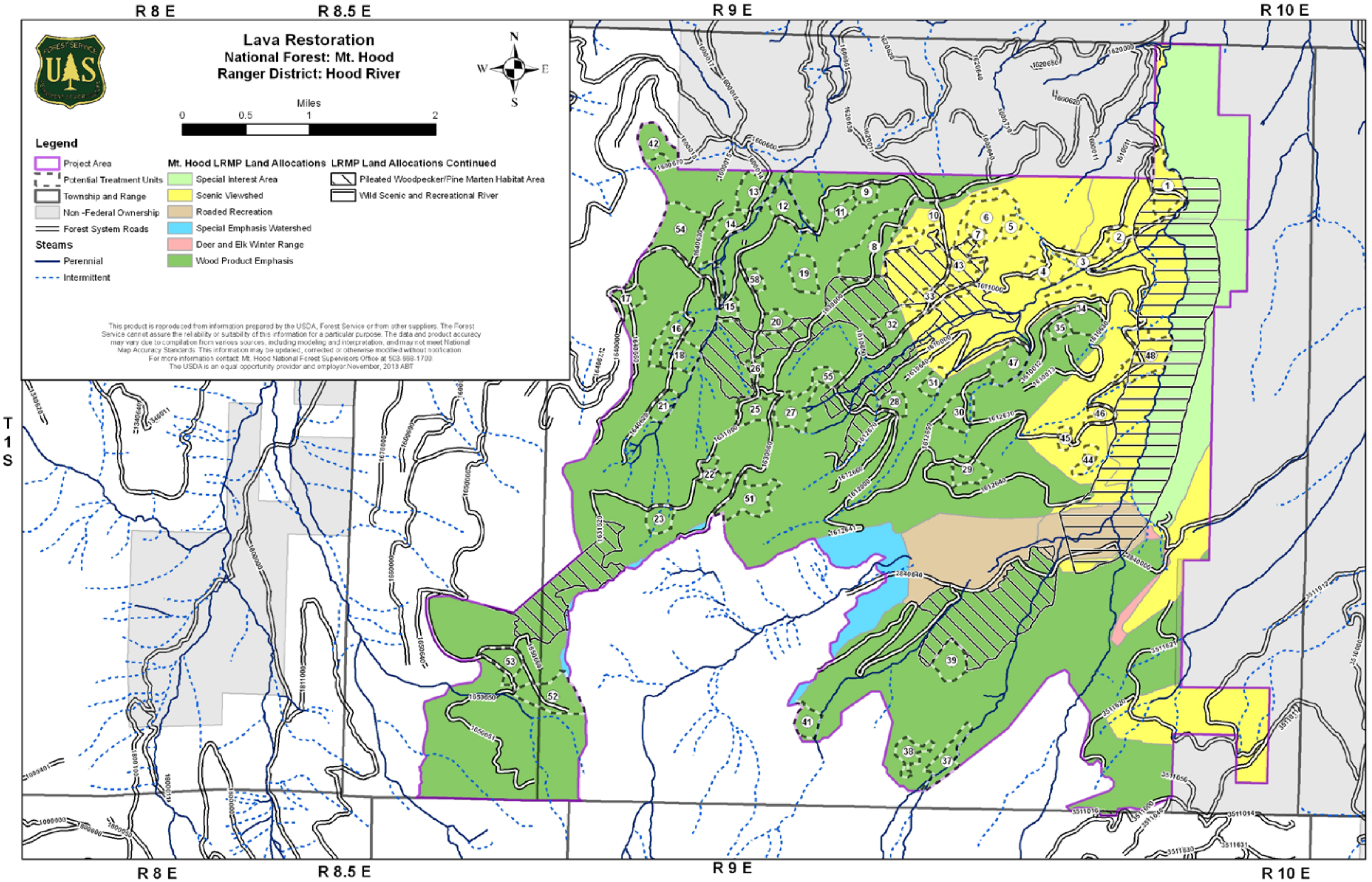


Figure 1-8: Forest Plan Land Use Allocations within Lava Restoration Project Area

1.4 Proposed Action

Overall, the Proposed Action includes treating approximately 1,908 acres within the West Fork and Middle Fork Hood River Watersheds (see Vicinity and Proposed Action maps). The Proposed Action includes planting, sapling thinning, plantation thinning, firewood removal, and huckleberry enhancement. In addition to these treatment units, the Proposed Action includes approximately 9 acres for logging system access. In addition to the vegetative treatments road treatments including decommissioning, closure, and seasonal closure are also proposed. The Proposed Action is summarized in Table 1-3 and in Figure 1-9 with each treatment type described in detail below.

Table 1-3: Proposed Action Treatments

Vegetative Treatment	Acres
Planting	127
Sapling Thinning	164
Plantation Thinning	1,447
Firewood Removal	58
Huckleberry Enhancement	103
Logging System Access	9
Total	**1,908**

Road Treatments	Miles
Decommission	2.1
Year Round Road Closure	15.4
Seasonal Road Closure	7.0
Total	**24.5**

Vegetative Treatments

Planting (127 acres) treatments are within existing plantations that were burned over in the 2011 Dollar Lake Fire. No vegetation manipulation would occur in this treatment other than felling hazard trees within the stands in order to facilitate safe tree planting operations. The goal of this treatment would be to establish slow growing shade intolerant species such as western white pine and western larch, which were lacking in the plant communities prior to the fire.

Sapling Thinning (164 acres) treatments would mechanically thin small trees leaving approximately 60 to 100 trees per acre in the dry forest type and 100 to 200 trees per acre in the wet forest type to promote and develop more resilient stand conditions. The material (slash) generated by this activity would be treated in a variety of methods including but not limited to piling and burning, lop and scattering, masticating, or biomass collection. Biomass collection would include machine piling and removal of materials to be used to generate electricity.

Plantation Thinning (1,447 acres) treatments would be a variable density thin from below treatment in existing even-aged managed units designed to address high density issues that are leading to forest health concerns. These concerns are stress-related mortality, limited species diversity, and limited structural diversity. Riparian areas within these plantations have the same forest health concerns. The overall desire for these treatments would be to move the riparian and upland portions of the selected plantations towards a more late seral like structure with a large tree component that is currently absent in the majority of these stands. The material (slash) generated by this activity would be treated in a variety of methods including but not limited to piling and burning, lop and scattering, masticating, or biomass collection. Biomass collection would include machine piling and removal of materials to be used to generate electricity.

Both thinning treatments described above would utilize variable density thinning (VDT) where appropriate, which allows for flexible local density levels to achieve overall treatment objectives. This allows emphasis to be placed on leaving vigorous trees of all sizes without concern for a fixed spacing.

Firewood Removal (58 acres) treatments are within stands with a large component of dead and/or dying trees. Average stand age within this treatment is over 80 years. Treatments would mechanically remove dead and/or dying trees both standing and down for use as fuel wood. Sufficient snags and downed wood would be retained to meet wildlife needs.

Huckleberry Enhancement (103 acres) treatments are within closed canopy stands and are designed to address the shading of a culturally important shrub that has limited regeneration and berry production. The treatment would create 2 to 5 acre openings (Gaps) centered around areas with insect and disease activity opening the canopy up to provide adequate sunlight for huckleberries to thrive.

Logging system access units (9 acres) are associated with proposed skyline logging systems. These areas would have skyline corridors in order to access roads or potential landing sites. The unit could include skyline corridors, skid trails, landings and/or temporary roads. It is estimated that no more than 10 percent of the trees would be removed to facilitate the logging activities in the adjacent units. No other activities are proposed within these units.

Road Treatments

Decommission (2.1 miles) treatments includes blocking vehicles from entering the decommissioned road though the use of rocks, earth berms, large logs, etc. If hydrologic and ecological processes are adversely impacted by the road, then the decommissioned road would be stabilized and restored to a more natural state utilizing a variety of treatments including ripping the road, removing drainage structures and restoring the natural couture of the slope. A decommissioned road is removed from the Forest's transportation system and no longer receives any maintenance.

Year Round Road Closure (15.4 miles) treatments would block vehicles from entering the closed road the entire year through the use of gates, rocks, earth berms, large logs etc. If hydrologic and ecological processes are adversely impacted by the road, a closed road would also be stabilized before it would be put into storage. A closed road remains on the Forest's transportation system and receives minimal maintenance as there is no public traffic allowed.

Seasonal Road Closure (7.0 miles) treatments would block vehicles from entering the closed road on a seasonal basis through the use of gates. Roads would remain closed through most of the year with access allowed during the traditional huckleberry harvesting season. Seasonally closed roads would remain on the Forest's transportation system and continue to receive the same level of maintenance that they currently do.

A more detailed description of the Proposed Action is found in Chapter 2, Section 2.2. The description includes information on variable density thinning, specific unit prescriptions and road treatments (decommissioning, closures, reconstruction and maintenance).

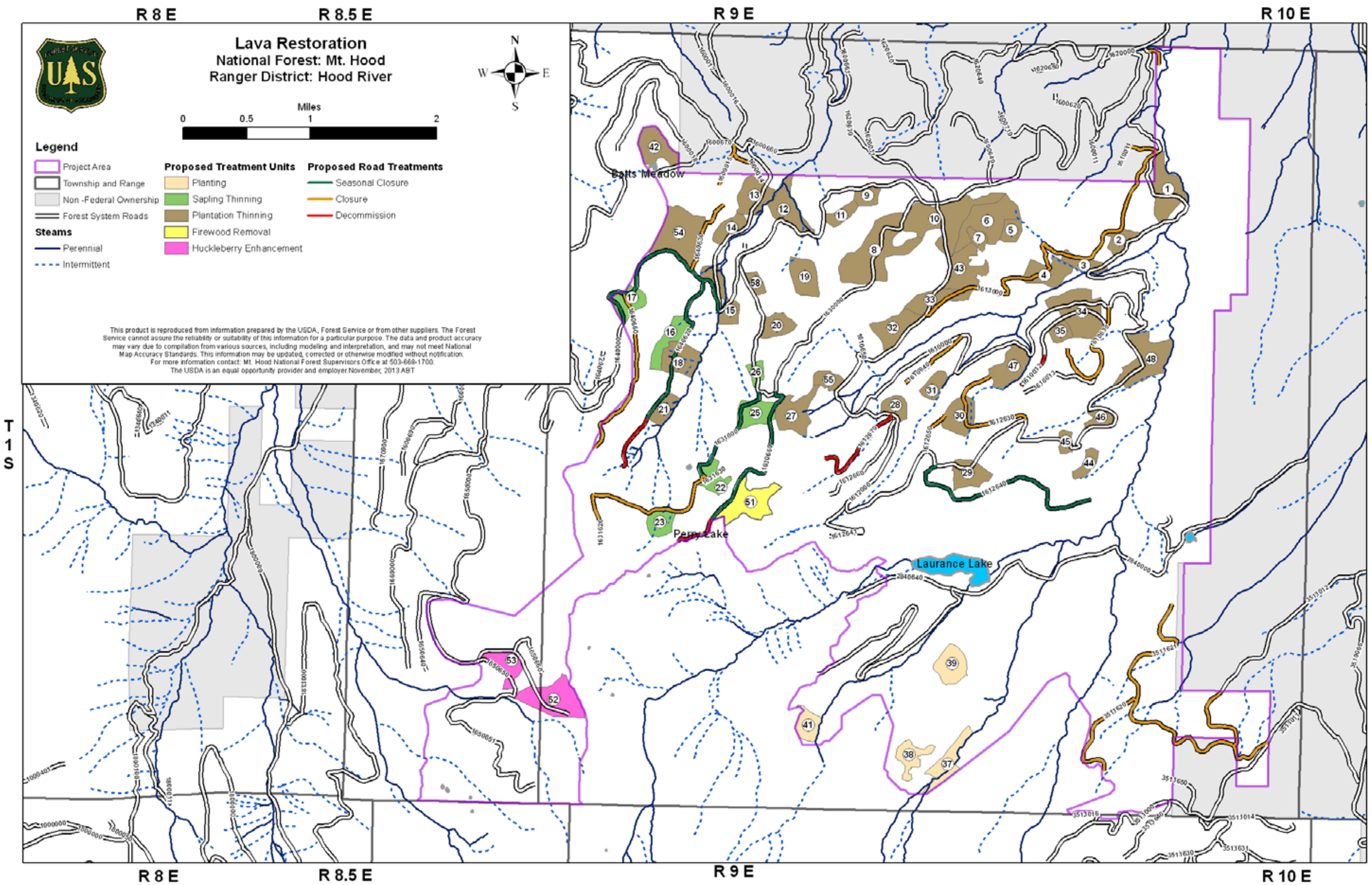


Figure 1-9: Proposed Action Map for Lava Restoration

1.5 Decision Framework

Based on the interdisciplinary analysis presented in the final Environmental Assessment and the project record, the District Ranger will decide whether or not to authorize the implementation of restoration activities within the West, Middle and East Fork Hood River Watersheds; and what, if any, project design criteria/mitigation measures are needed.

1.6 Public Involvement

1.6.1 Collaboration

In 2011, the Hood River Watershed Group and Hood River Soil & Water Conservation District (SWCD) formed the Hood River Collaborative Stewardship Crew made of representatives from Confederated Tribes of Warm Springs, US Forest Service, local and state governmental agencies (Oregon Department of Fish & Wildlife, Oregon Department of Forestry, Hood River County), watershed groups (Hood River Watershed Group), non-profit groups (Bark, Oregon Wild, Crag Law Center, Rocky Mountain Elk Foundation, Backcountry Horseman), timber industry (WKO/High Cascade), and individual residents/landowners. The group was formed “to learn about national forest health issues in the Hood River watershed and to develop recommendations on particular projects and/or project areas to the District Ranger for potential stewardship contracting.” The community members decided to launch the collaborative group and began with discussions on the Red Hill Restoration project as their first collaborative effort.

The Lava Restoration project represents the second collaborative effort undertaken by the Hood River Collaborative Stewardship Crew. Collaborative participants met from September 2012 to February 2013 to identify restoration opportunities within the Lava project area. The group discussed a range of topics including forest health, riparian thinning, huckleberry enhancement, and plantation thinning. The group participated in one field trip to visit potential treatment units and see the outcomes associated with a previous thinning project. In July of 2013, the Hood River Collaborative Stewardship Crew submitted recommendations for the Lava Restoration Project to District Ranger, Janeen Tervo (see Appendix 1).

1.6.2 Scoping/Public Involvement

Lava Restoration was listed in the Mt. Hood National Forest quarterly planning newsletter (Schedule of Proposed Action [SOPA]) beginning in January 2013. The project also listed on the Mt. Hood National Forest website beginning in March 2013 at: http://www.fs.usda.gov/projects/ mthood/ landmanagement/projects. No comments were received through this effort.

In March 2013, a scoping letter providing information and seeking public comment was mailed to approximately 135 individuals and groups. Fifty-three comments were received during the public scoping period. Forty-three comments were form letters received from Bark members. The remaining ten comments were received from Middle Fork Irrigation District (MFID), Oregon Wild, Bark, Hood River County Forestry, Hood River County Board of Commissioners, American Forest Resource Council (AFRC) and four individuals. All of the comment letters as well as a scoping summary is available in the project record, located at the Hood River Ranger District located in Mount Hood/Parkdale, Oregon.

In addition to the scoping effort, the Forest Service participated in government-to-government consultation with National Marine Fisheries Service on this project as detailed in Chapter 4.

New Objection Process (218 Objection Regulations)

Section 428 of The Consolidated Appropriations Act of 2012 included a provision establishing a pre-decisional objection process (36 CFR 218) for projects and activities implementing land management plans in lieu of the post-decisional appeal process (36 CFR 215) used by the agency since 1993. Since this project is a non-fuels reduction act project it is subject to the Project-Level Pre-decisional Administrative Review Process (Objection process) as identified in 36 CFR 218, Subparts A and B.

Rather than being able to seek higher-level review of unresolved concerns after a project decision has been made under 36 CFR 215 (Appeal process), those who are eligible will be able to seek that review before the project decision has been signed under 36 CFR 218 (Objection process). The Forest Service believes that considering public concerns before a decision is made aligns with our collaborative approach to public land management and increases the likelihood of resolving those concerns resulting in better, more informed decisions. The Forest Service also believes this will aid in our efforts to be more efficient with documenting environmental effects (NEPA).

Individuals and entities (non-governmental organizations, businesses, partnerships, state and local governments, Alaska Native Corporations, and Indian Tribes) who submit timely, specific written comments regarding a proposed project or activity during any designated opportunity for public comment may file an objection. Opportunity for public comment on this project includes scoping and this 45 day public review period.

Written comments are those submitted to the Responsible Official or designee during a designated opportunity for public participation provided for a proposed project. Specific written comments should be within the scope of the Proposed Action, have a direct relationship to the Proposed Action, and must include supporting reasons for the responsible official to consider.

1.7 Issues

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. Issues are best identified during scoping early in the process to help set the scope of the actions, alternatives, and effects to consider; but, due to the iterative nature of the NEPA process, additional issues may come to light at any time. Issues are statements of cause and effect, linking environmental effects to actions, including the Proposed Action (Forest Service Handbook 1909.15, 12.4). Issues are used to generate additional action alternatives to the Proposed Action.

During the collaborative process and the scoping comment period, no issues were brought forward that generated additional alternatives. Several concerns and specific recommendations were raised during the scoping and collaborative group processes which were specifically addressed in adjustments to the Proposed Action, changes to the project design criteria/mitigation measures (PDC) and environmental analysis. The issues and concerns related to this project include the following:

- **Decommissioning and Closing Roads**: Some scoping comments received stated a concern about closing and decommissioning additional roads on the District. One comment stated: "PLEASE STOP CLOSING OUR ROADS. There are other reasons to keep roads open besides huckleberry picking, closing them just keeps pushing people into smaller and tighter areas." Conversely, other scoping comments stated a concern about not decommissioning more roads within the project area. Specifically, a comment stated: "Roads targeted for "closure" and "seasonal closure" should be considered for decommissioning." Another scoping comment stated: "Many of the roads in the Lava planning area are in sad shape… This project needs to be much more ambitious with closing unused and unmaintained roads." Some commenters requested that the project decommission additional roads within the watershed in order to further aquatic restoration, while other commenters wanted to see few roads decommissioned in order to provide for future access for timber and recreational uses.

  All of the roads within the project area were analyzed to determine if decommissioning or road closures were appropriate following the completion of the proposed vegetation treatments. The criteria used to determine if the road would be decommissioned, closed, upgraded or remain open included: public and administrative access; likelihood and timing of future timber/fuels treatment; level of aquatic risk; current road conditions; and, future road maintenance needs. As defined by the 2003 Roads Analysis Report, an aquatic risk rating was assigned to each road segment based on combining the values of individual aquatic risk factors. The individual risk factors are: riparian areas/floodplains; fish passage; landslide hazard; surface erosion hazard; hydrologic hazard; high risk stream crossings; stream crossing density; and, wetlands. In addition, the social uses of the roads were considered, including recreation and hunting access. Lastly, road density Forest Plan standards and guidelines within the project area were considered. The decision on whether to actively or passively decommission is determined by on-the-ground surveys by roads and aquatic specialist. Each road to be decommissioned or closed is discussed in Section 2.2, Proposed Action. A full list of the roads considered is available in the project record. This concern is not considered a key issue because there are no substantive unresolved resource impacts.

- **Gap Size Openings**: Scoping comments raised concerns about the 5-acre gap openings to plant fire resistant/shade intolerant species such as western white pine. The commenters stated that planting western white pine was inconsistent with the historic mixed-conifer forest. Comments also felt that this species preferred smaller openings created by disease or windthrow. Specifically, a comment stated: "A five-acre gap is hugely unnecessary and is not in line with restoration efforts. WWP is a fire-dependent species and there was just a lot of fire near the planning area - Gnarl Ridge four years ago and Dollar Lake two years ago. It could be that the trees will move in on their own accord, when the soils have had the time to recover."

  Gaps are intended to create openings to support regeneration of shade intolerant species (e.g., western white pine and larch) that are native to these stands and more root-rot resistant than other species. The gaps for this project would vary in size based on the site *specific conditions within each unit. A gap would not be devoid of trees; gaps would maintain six to twelve trees per acre or roughly around 20% canopy cover. The intention of larger gaps is not to establish fire resistant species but to provide for more structural and species diversity currently lacking. This concern is not considered a key issue because there are no substantive unresolved resource impacts.*

- **Huckleberry Enhancement Units**: Scoping comments raised concerns regarding the proposed huckleberry enhancement units. Specific concerns included:

  - Concerns pertaining to blowdown risks stating that "…units are on the ridgeline where blowdown is a very real issue. Especially if this project is truly about huckleberries, than the canopy would have to be reduced to 30% which would increase windspeed..."

    While the canopy cover in the openings created for huckleberry enhancement would be reduced to approximately 20% the overall stand canopy cover would not be reduced below the target canopy cover of 65% identified in Table 2-2. This would provide adequate density to alleviate blowdown potential. This concern is not considered a key issue because there are no substantive unresolved resource impacts.

  - Concerns questioning the location of the treatments stating that "…Unit 52 is located in potential Wilderness, directly adjacent to the existing Mount Hood Wilderness. Both units are also located right near the trailhead for the very popular Vista Ridge trail…" and "…Are these remote units even accessible to the tribes?..."

    As unit 52 does border a wilderness area, the wilderness boundaries within approximately ¼ mile of the proposed treatments would be posted and/or refreshed by land surveyors prior to any implementation of the project. Potential impacts to the trailhead are addressed through PDCs/Mitigation Measures restricting the potential impact to the Vista Ridge Trail (see PDC RC-3). Accessibility of huckleberry enhancement areas was a consideration in the placement of the treatments. Originally two additional huckleberry enhancement units where proposed as part of this project, however, due to their inaccessibility were dropped from consideration. The remaining huckleberry enhancement units are readily accessible via NFS road 1650. These concerns are not considered key issues because there are no substantive unresolved resource impacts.

CHAPTER 2 – ALTERNATIVES

This chapter is intended to describe the alternatives and how they were formulated for the Lava Restoration project. This chapter provides readers and the Responsible Official with a description of the proposed action components, project design criteria/mitigation measures, monitoring requirements, and regulatory framework.

2.1 No Action Alternative

Under the No Action alternative, current management plans would continue to guide management of the area. No timber harvest or other associated actions would be implemented to accomplish project goals. Stands would continue to remain uniformly dense and the overstocked condition would result in stands with reduced vigor, small trees, increased mortality, and increased susceptibility to stressors such as insects, diseases and weather. In the long-term, the stand structure and composition would be dominated by Douglas-fir and in the overstory, and the understory would remain under-developed with low occurrences of ecologically important tree and shrub species including huckleberry. The stand structure would remain in a single story dominated stem exclusion type stand. Young stands would continue to grow in densely stocked conditions with little regeneration. Densely stocked stands would continue to have large amounts of small patches of increasing crown closure and little species and structural diversity. Additionally, no wood products would be provided. See Section 3.1, Vegetation Resources for more details.

Also, the riparian conditions would not be improved. Over the next 50 years there would be more trees dying and then falling in Riparian Reserves as the stands decay and fall apart. As such, there would be an increase in the amount of down wood, but this wood would generally be smaller in diameter and thus would decay faster both in and out of stream channels. Fewer trees would grow to a larger size that would last longer once on-the-ground and in larger stream provide more stable habitat creating characteristics. See Section 3.5, Water Quality and Section 3.6, Fisheries and Aquatic Fauna for more impacts on the riparian areas.

The No Action Alternative would not repair, decommission, or close any roads. The current use pattern of roads within the project area would not change. 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. No action would mean that current minimal road maintenance would occur, and no road reconstruction would occur. Lack of road maintenance exhibits a strong adverse effect with respect to both safety and the environment. Road surface, road subgrade, and road base failures present physical hazards to drivers, reduce a driver’s ability to maintain positive control of a vehicle, and increase the potential for the development of erosion hazards on road slopes including soil slumps and slides due to pooling of water and increased soil saturation in the road bed. See Section 3.2, Transportation System for more details.

2.2 Proposed Action Alternative

A substantial portion of the project area contains immature stands less than 80 years old dominated by trees from ten to twenty inches in diameter measured at breast height (DBH). Most of these stands exist at high densities and are exhibiting signs of poor forest health such as insect and disease infestations. The absence of fire, partial cutting in the early 1900s, and stand regeneration practices in the past 60 to 80 years have all contributed to Douglas-fir dominated, dense and often single-story stand conditions within plantations. These conditions have made a substantial number of stands within the project area susceptible to root disease and root decay. In addition, at higher elevations stand conditions are susceptive to insect and diseases, such as the balsam wooly adelgid. Stands outside of plantations are also exhibiting some of these same high density conditions, lacking small openings in the canopy necessary for a well-developed shrub layer. As a result, the shrub layer in these stands is poorly developed leading to a deficiency in the shrub component including the culturally and ecologically important huckleberry plant. As a result of the current situation within the East Fork, Middle Fork and West Fork Hood River Watersheds, this project was undertaken to improve overall forest conditions within these watersheds.

The Proposed Action is to treat approximately 1,908 acres of vegetation and 24.5 miles of NFS road within these watersheds utilizing a variety of vegetative and road treatments. Under the Proposed Action vegetative treatments would include plantation thinning, sapling thinning, planting, firewood removal and huckleberry enhancement. In addition to the vegetative treatments road treatments including decommissioning, closure, and seasonal closure are also proposed.

2.2.1 Vegetation and Road Treatments

Overall, the Proposed Action includes treating approximately 1,908 acres within the West Fork and Middle Fork Hood River Watersheds (see Figure 1-9). The Proposed Action includes planting, sapling thinning, plantation thinning, firewood removal, and huckleberry enhancement. In addition to these treatment units, the Proposed Action includes approximately 9 acres for logging system access. In addition to the vegetative treatments road treatments including decommissioning, closure, and seasonal closure are also proposed. The Proposed Action is summarized in Table 2-1 with each treatment type described in detail below.

Table 2-1: Proposed Action Treatment Acres

Vegetative Treatment	Acres	Road Treatments	Miles
Planting	127	Decommission	2.1
Sapling Thinning	164	Year Round Road Closure	15.4
Plantation Thinning	1,447	Seasonal Road Closure	7.0
Firewood Removal	58	Total	24.5
Huckleberry Enhancement	103		
Logging System Access	9		
Total	1,908		

Vegetative Treatments

Planting (127 acres) treatments are within existing plantations that were burned over in the 2011 Dollar Lake Fire. No vegetation manipulation would occur in this treatment other than felling hazard trees within the stands in order to facilitate safe tree planting operations. The goal of this treatment would be to establish slow growing shade intolerant species such as western white pine and western larch, which were lacking in the plant communities prior to the fire.

Sapling Thinning (164 acres) treatments would mechanically thin small trees leaving approximately 60 to 100 trees per acre in the dry forest type and 100 to 200 trees per acre in the wet forest type to promote and develop more resilient stand conditions. The material (slash) generated by this activity would be treated in a variety of methods including but not limited to piling and burning, lop and scattering, masticating, or biomass collection. Biomass collection would include machine piling and removal of materials to be used to generate electricity.

Plantation Thinning (1,447 acres) treatments would be a variable density thin from below treatment in existing even-aged managed units designed to address high density issues that are leading to forest health concerns. These concerns are stress-related mortality, limited species diversity, and limited structural diversity. Riparian areas within these plantations have the same forest health concerns. Figure 2-1 illustrates some of the forest health concerns within these units. The overall desire for these treatments would be to move the riparian and upland portions of the selected plantations towards a more late seral like structure with a large tree component that is currently absent in the majority of these stands. The material (slash) generated by this activity would be treated in a variety of methods including but not limited to piling and burning, lop and scattering, masticating, or biomass collection. Biomass collection would include machine piling and removal of materials to be used to generate electricity.

Both thinning treatments described above would utilize variable density thinning (VDT) where appropriate, which allows for flexible local density levels to achieve overall treatment objectives. This allows emphasis to be placed on leaving vigorous trees of all sizes without concern for a fixed spacing. VDT is described in more detailed in the following section.

Firewood Removal (58 acres) treatments are within stands with a large component of dead and/or dying trees. Average stand age within this treatment is over 80 years. Treatments would mechanically remove dead and/or dying trees both standing and down for use as fuel wood. Sufficient snags and downed wood would be retained to meet wildlife needs.

Huckleberry Enhancement (103 acres) treatments are within closed canopy stands and are designed to address the shading of a culturally important shrub that has limited regeneration and berry production. The treatment would create 2 to 5 acre openings centered around areas with insect and disease activity opening the canopy up to provide adequate sunlight for huckleberries to thrive. Figure 2-2 illustrates some of the forest health concerns within these units.

Logging system access units (9 acres) are associated with proposed skyline logging systems. These areas would have skyline corridors in order to access roads or potential landing sites. The unit could include skyline corridors, skid trails, landings and/or temporary roads. It is estimated that no more than 10 percent of the trees would be removed to facilitate the logging activities in the adjacent units. No other activities are proposed within these units.

Road Treatments

Decommission (2.1 miles) treatments includes blocking vehicles from entering the decommissioned road though the use of rocks, earth berms, large logs, etc. If hydrologic and ecological processes are adversely impacted by the road, then the decommissioned road would be stabilized and restored to a more natural state utilizing a variety of treatments including ripping the road, removing drainage structures and restoring the natural couture of the slope. A decommissioned road is removed from the Forest's transportation system and no longer receives any maintenance.

Year Round Road Closure (15.4 miles) treatments would block vehicles from entering the closed road the entire year through the use of gates, rocks, earth berms, large logs etc. If hydrologic and ecological processes are adversely impacted by the road, a closed road would also be stabilized before it would be put into storage. A closed road remains on the Forest's transportation system and receives minimal maintenance as there is no public traffic allowed.

Seasonal Road Closure (7.0 miles) treatments would block vehicles from entering the closed road on a seasonal basis through the use of gates. Roads would remain closed through most of the year with access allowed during the traditional huckleberry harvesting season. Seasonally closed roads would remain on the Forest's transportation system and continue to receive the same level of maintenance that they currently do.

A detailed treatment unit table including treatment type, unit acres, stand age, tree species, presence of skips and gaps, current canopy cover, target canopy cover, proposed logging systems and use of temporary roads is found in Table 2-2.

Figure 2-1: Forest Health Conditions in Plantation Thinnning Units. Photo 1 – Unit 1, Dense Stocking Levels; Photo 2 – Unit 1, Canopy Closure; Photo 3 – Unit 8, Dense Stocking Levels; and Photo 4 – Unit 8, Canopy Closure

Figure 2-2: Forest Health Conditions in Huckleberry Enhancement Units. Photo 1 and 2 – Unit 53, Deficient understory shrub component.

2.2.2 Variable Density Thinning

All thinning activities proposed in this project would apply variable density thinning (VDT), which allows flexible local densities levels to achieve overall treatment objectives. This allows emphasis to be placed on leaving vigorous trees of all sizes without concern for spacing. Leave tree spacing associated with VDT would vary within and between units. Tree density would be measured by basal area, canopy closure, trees per acre or relative density depending on the circumstances for each unit. Where the objective is to delay the time at which the stand reaches the stem exclusion stage, a heavy VDT would be prescribed (wide leave tree spacing). In other areas, the objective would be to have stands reach the stem exclusion stage sooner and they would have moderate or light VDT. Leave trees would include minor species and would include trees with the elements of wood decay. Minor tree species are those species which would be expected to be present within a stand but which make up a relatively small number of the total trees. The minor tree species vary within each unit based on plant associations. See Section 3.1, Vegetation Resources for more details.

Included in VDT are skips and gaps, which are intended to mimic more natural structural stand diversity. Skips are areas where no trees would be removed; gaps are areas where few trees would be retained. The gaps for this project would vary from one to five acres in size based on the conditions within each unit. The criteria used to determine the gap size would include percentage of shrub cover present; existing big leaf huckleberry plants; existing frost and root rot pockets; existing shade intolerant species; and plant association. Gaps are intended to create openings to support regeneration of shade intolerant species and more rot resistant species while also providing structural diversity. Gaps would be placed in units with plantation thinning and huckleberry enhancement prescriptions. Gap locations would be focused where openings already exist, in frost, wind throw, and root rot pockets. Gap areas would be incorporated into the average target canopy cover identified in Table 2-2.

- Skips and gaps would be created in a variety of sizes. The sizes and total quantity would vary within and between units.
- Skips would be placed where there are special features such as clumps of minor species, clumps of down logs, key snags or potential snag concentrations; or around areas of concern or protection such as wet areas, rare or uncommon plant or animal species, or archaeological sites.
- Where possible gaps would build upon natural openings within Riparian Reserves. These gaps would only extend outward away from the nearest water body.
- Gaps would range from 1 to 5 acres in size and would retain one to six trees. In gaps, minor tree species would be retained if present.
- Areas of heavy thinning (25 to 50 trees per acre retained) would be created in a variety of sizes quarter acre or greater. Heavy thinning is proposed to benefit species such as deer and elk, as well to enhance diversity.
- All non-hazardous snags would be retained. Future snags and down logs would be recruited through the use of skips.
- Existing down logs would be retained as practical and key concentrations of woody debris in the older decay classes would be protected as long as doing so would meet the intent of the project.

The Forest Plan allows for gap creation much larger than the 5 acre limit proposed for this project (FW-349 and FW-350). The larger gaps up to 5 acres are needed to promote the regeneration of shade intolerant tree and shrub species (e.g., western white pine, western larch and huckleberry) that are native to these stands.

Table 2-2: Unit Information (Abbreviations used in the table are: DF = Douglas-fir; NF = noble fir; WH = western hemlock; MH = mountain hemlock; SF = silver fir)

Unit	Treatment	Acres	Age (yr)	Tree Species	Skips and Gaps	Current Canopy Cover	Target Canopy Cover	Logging System	Temporary Roads
1	Plantation Thinning	57	45	DF,WH,SF	Yes	70%	40%	Ground, Skyline, Helicopter	Yes
2	Plantation Thinning	23	50	DF,WH,SF	Yes	70%	40%	Skyline	No
3	Plantation Thinning	22	50	DF,WH,SF	Yes	70%	40%	Skyline	No
4	Plantation Thinning	38	50	DF,WH,SF	Yes	70%	40%	Skyline	Yes
5	Plantation Thinning	16	50	DF,WH,SF	Yes	70%	40%	Helicopter	No
6	Plantation Thinning	68	50	DF,WH,SF	Yes	70%	40%	Ground, Helicopter	Yes
7	Plantation Thinning	11	50	DF,WH,SF	Yes	70%	40%	Ground	Yes
8	Plantation Thinning	112	50	DF,WH,SF	Yes	70%	40%	Ground	Yes
9	Plantation Thinning	18	50	DF,WH,SF	Yes	70%	40%	Ground	Yes
10	Plantation Thinning	98	50	DF,WH,SF	Yes	70%	40%	Ground	Yes
11	Plantation Thinning	17	50	DF,WH,SF	Yes	70%	40%	Ground	Yes
12	Plantation Thinning	47	60	WH,SF,DF	Yes	80%	40%	Ground, Skyline, Helicopter	Yes
13	Plantation Thinning	41	50	DF,WH,SF	Yes	70%	40%	Ground, Skyline	Yes
14	Plantation Thinning	25	60	WH,SF,DF		80%	40%	Ground, Skyline	Yes
15	Plantation Thinning	39	60	WH,SF,DF	Yes	80%	40%	Helicopter	No
16	Sapling Thinning	35	25	MH,DF,SF	Yes		40%	n/a	No
17	Sapling Thinning	31	30	MH,DF,SF	Yes		40%	n/a	No
18	Plantation Thinning	41	40	DF,WH,SF	Yes	60%	40%	Ground, Skyline	Yes
19	Plantation Thinning	36	40	DF,WH,SF	Yes	60%	40%	Ground	Yes
20	Plantation Thinning	25	40	DF,WH,SF	Yes	60%	40%	Ground	Yes
21	Plantation Thinning	23	40	DF,WH,SF	Yes	60%	40%	Ground, Skyline	Yes
22	Sapling Thinning	24	30	MH,DF,SF	Yes		40%	n/a	No
23	Sapling	26	30	MH,DF,SF	Yes		40%	n/a	No

Unit	Treatment	Acres	Age (yr)	Tree Species	Skips and Gaps	Current Canopy Cover	Target Canopy Cover	Logging System	Temporary Roads
	Thinning								
25	Sapling Thinning	36	30	MH,DF,SF	Yes		40%	n/a	No
26	Sapling Thinning	12	30	MH,DF,SF	Yes		40%	n/a	No
27	Plantation Thinning	46	40	DF,WH,SF	Yes	70%	40%	Ground, Skyline	Yes
28	Plantation Thinning	19	45	DF,WH,SF	Yes	70%	40%	Ground	Yes
29	Plantation Thinning	34	45	DF,WH,SF	Yes	70%	40%	Ground	Yes
30	Plantation Thinning	39	45	WH,DF	Yes	80%	40%	Ground	Yes
31	Plantation Thinning	19	50	GF,DF	No	80%	40%	Ground, Skyline	Yes
32	Plantation Thinning	43	50	GF,DF	No	80%	40%	Ground, Skyline	Yes
33	Plantation Thinning	39	45	WH,DF	Yes	80%	40%	Ground, Skyline	Yes
34	Plantation Thinning	75	50	GF,DF	No	80%	40%	Ground, Skyline	Yes
35	Plantation Thinning	15	50	GF,DF	No	80%	40%	Ground	No
37	Planting	38	0	MH,WH,DF, SF	No	30%	n/a	n/a	No
38	Planting	27	0	MH,WH,DF, SF	No	30%	n/a	n/a	No
39	Planting	37	0	MH,WH,DF, SF	No	30%	n/a	n/a	No
41	Planting	25	0	MH,WH,DF, SF	No	30%	n/a	n/a	No
42	Plantation Thinning	42	50	DF,WH,SF	Yes	70%	40%	Ground	Yes
43	Plantation Thinning	49	45	WH,DF	Yes	80%	40%	Ground, Helicopter	Yes
44	Plantation Thinning	15	45	WH,DF	Yes	80%	40%	Ground, Skyline	Yes
45	Plantation Thinning	11	45	WH,DF	Yes	80%	40%	Ground, Skyline	No
46	Plantation Thinning	18	50	DF,WH,SF	Yes	70%	40%	Ground, Helicopter	No
47	Plantation Thinning	43	50	GF,DF	No	80%	40%	Skyline, Helicopter	Yes
48	Plantation Thinning	71	50	DF,WH,SF	Yes	70%	40%	Ground, Skyline	Yes
51	Firewood Removal	58	100	LP,DF,NF,S F,WH	No	50%	50%	Ground	No
52	Huckleberry Enhancement	68	130	MH,WH,DF, SF	n/a	70%	65%	Ground, Skyline, Helicopter	No
53	Huckleberry Enhancement	35	130	MH,WH,DF, SF	n/a	70%	65%	Ground	Yes
54	Plantation Thinning	81	75	WH,SF,DF	Yes	80%	40%	Ground	Yes
55	Plantation Thinning	18	50	DF,WH,SF	Yes	80%	40%	Ground, Skyline	Yes

Unit	Treatment	Acres	Age (yr)	Tree Species	Skips and Gaps	Current Canopy Cover	Target Canopy Cover	Logging System	Temporary Roads
58	Plantation Thinning	13	50	DF,WH,SF	Yes	70%	40%	Ground	Yes

2.2.3 Economics

One of the aspects of the Purpose and Need (Section 1.3) and one of the dual goals of the Northwest Forest Plan is to provide a sustainable level of forest products for local and regional economies and to provide jobs. The Northwest Forest Plan Final Environmental Impact Statement has an in-depth analysis of the economic basis behind the goal of providing forest products for local and regional economies. It also contains an analysis of the social and economic benefits and impacts of preservation, recreation and other values. To benefit local and regional economies, timber is auctioned to bidders. For contracts to sell they must have products that prospective purchasers are interested in and they must have log values greater than the cost of harvesting and any additional requirements.

The proposed action would provide for jobs associated with logging and sawmill operations and would contribute to meeting society's forest product needs. The NWFP contains an analysis of employment in the timber industry. The annual incremental contribution of each million board feet of timber is approximately 8.3 jobs.

The Purpose and Need (Section 1.3) is not solely to create jobs but to provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies. Thinning is needed to keep forests healthy and productive to provide wood products now and in the future – people need and use wood products. Approximately 15.0 MMBF of wood products would be produced as a result of this project and stands would become healthier and more productive for future management.

Cost effectiveness is considered in the design of the thinning and in the road treatments proposed. Based on past experience with thinning comparable stands with similar prescriptions, it is likely that there would be sufficient value of timber removed to accomplish the thinning treatments proposed.

2.2.4 Temporary Roads

In addition, the project includes proposed temporary roads that were identified to facilitate conventional logging systems (ground-based and skyline yarding). Temporary roads are roads that are built or reconstructed to access landings and are rehabilitated upon completion of all harvest activities. After use, temporary roads are bermed at the entrance, water barred, culverts removed, decompacted, and roughened as needed with the jaws of a loader or excavator, and debris (such as rootwads, slash, logs or boulders) are placed near the entrance and along the first portion of the road.

To minimize impacts to the environment and natural resources, pre-existing temporary road alignments and alignments of previously decommissioned system roads are utilized wherever practical. There are cases where it is not feasible or undesirable to use the same alignments or landings. In some places, in order to protect residual trees, soil, and water, new temporary roads are proposed to access landings where existing system roads and old alignments are not adequate for accessing strategic locations on the ground. Stream crossings were minimized as much as possible when identifying the location of temporary roads. However, it is anticipated that three existing stream crossings over intermittent streams would need to be rebuilt and one existing stream crossing over a perennial spring would need to be reused. see Section 3.5, Water Quality for more information regarding these crossings.

The exact locations of temporary roads may change during the layout phase of this project, but the total mileage of the temporary roads would not exceed 14.7 miles[1]. Of the proposed temporary roads, 1.0 miles are new temporary roads, 11.2 miles are previous temporary roads that would be reconstructed for this project, and 2.5 miles are on previously decommissioned roads. No other previously decommissioned roads are proposed to be used as part of this project (see Figure 2-3).

The temporary roads located on previously decommissioned roads minimize environmental impacts by utilizing old road prisms and previously disturbed grounds. Proposed temporary roads were only located on decommissioned roads that had an aquatic risk rating of low to moderate. As defined by the 2003 Roads Analysis Report, an aquatic risk rating was assigned to each road segment based on combining the values of individual aquatic risk factors. The individual risk factors are: riparian areas/floodplains; fish passage; landslide hazard; surface erosion hazard; hydrologic hazard; high risk stream crossings; stream crossing density; and, wetlands. The reuse of existing alignments is consistent with Forest Service policy as described in Forest Service Manual 7703.22. The manual direction states: “Motor vehicle use off designated roads, trails, and areas may be authorized by a contract, easement, special use permit, or other written authorization issued under federal law or regulation (36 CFR 212.51(a)(8); FSM 7716.2).”

2.2.5 Landings

The project also includes landings to facilitate all logging systems (helicopter, cable yarding and ground-based logging). Landings are areas on or directly adjacent to roads where logs are brought to be loaded onto log trucks. Landing sizes vary based on the logging system and the types of equipment that need to be safely accommodated. For similar projects on the eastside of the Forest, the following landing sizes are typical:

- An average ground-based logging landing is 50-feet wide by 70-feet long. The average landing size increases to 100-feet wide by 100-feet long for units with whole tree yarding and fuels reduction projects. This landing size allows room for tractors to come and go, a loader to sort logs, and a log deck.
- An average skyline logging landing is 40-feet wide by 70-feet long. The cable logging landings increase to 40-feet wide by 100-feet long on average for units with whole tree

[1] The intent is to have the temporary roads located as depicted in the map; however, they may need to be adjusted during the layout phase. Any changes would have to meet the design criteria stated in this section and all Project Design Criteria (Section 2.3). Any change to the Proposed Action following a signed Decision Notice would have to follow the change condition requirements in NEPA and be approved by the Responsible Official.

yarding and fuels reduction projects. This allows room for a yarder, a loader to sort logs, and a log deck. Some landings provide access for a tractor unit on one side of a road and a skyline unit on the other side.

- An average helicopter landing size is approximately 100-feet wide by 200-feet long with some additional trees removed for the flight path coming into the landing. Some service landings approximately 60-feet wide by 60-feet long are also needed where helicopters land and refuel. Where possible, helicopter landings utilize existing openings, such as rock quarries or road intersections.

The increased size of landings for fuels reduction projects is to accommodate all the project needs while meeting the health and safety standards established by Occupational Safety and Health Administration (OSHA). While this project does not propose any hazardous fuels treatments, PDC F-1 may require tops attached yarding in some units to meet Forest Plan down woody tons per acre requirements (FW-032 – FW-036). Tops attached yarding would have the same effect on landing size as whole tree yarding and would necessitate the larger landing size. As such the estimation of total landings acres below utilized the larger landing size in the final calculation.

Approximately 6 helicopter landings and 339 skyline and ground-based landings are needed for this project. Every effort would be made to minimize the acres of disturbance associated with landings during lay-out and logging implementation. All landings would be located within existing units for this project. As the majority of these treatment units have been logged previously, existing landings would be reused whenever feasible. Many landing locations occur on the existing road system and would require minor maintenance and rebuilding to become functional. Some existing landings have brush or small trees growing on them that would be removed before use. The final landing locations are determined by sale administrators using the design criteria within the Project Design Criteria/Mitigation Measures (PDC).

In addition to the clearing associated with the landings, additional snags would be removed in the area immediately adjacent to the landings in order to meet the OSHA requirements. The number of snags to be removed can be estimated using the average number of snags within the treatment unit and the required clearing limits set by OSHA.

Table 2-3 outlines the average number of snags by size class for the proposed treatment units based on stand exam, field evaluations, and Forest Vegetation Simulator (FVS) model runs of current conditions. Based on the estimated acres of disturbance associated with landings (approximately 49.0 acres of disturbance) and number of snags within the plantations, it is estimated that 2.3 snags per acre would be removed to meet the current OSHA standards for clearing limits around landings. As a result, the estimated number of additional snags to be removed to meet OSHA standards would be 113 snags.

Table 2-3: Average Number of Snags per Acre by DBH

11 inches – 20 inches DBH	20 inches +
2.1	0.2

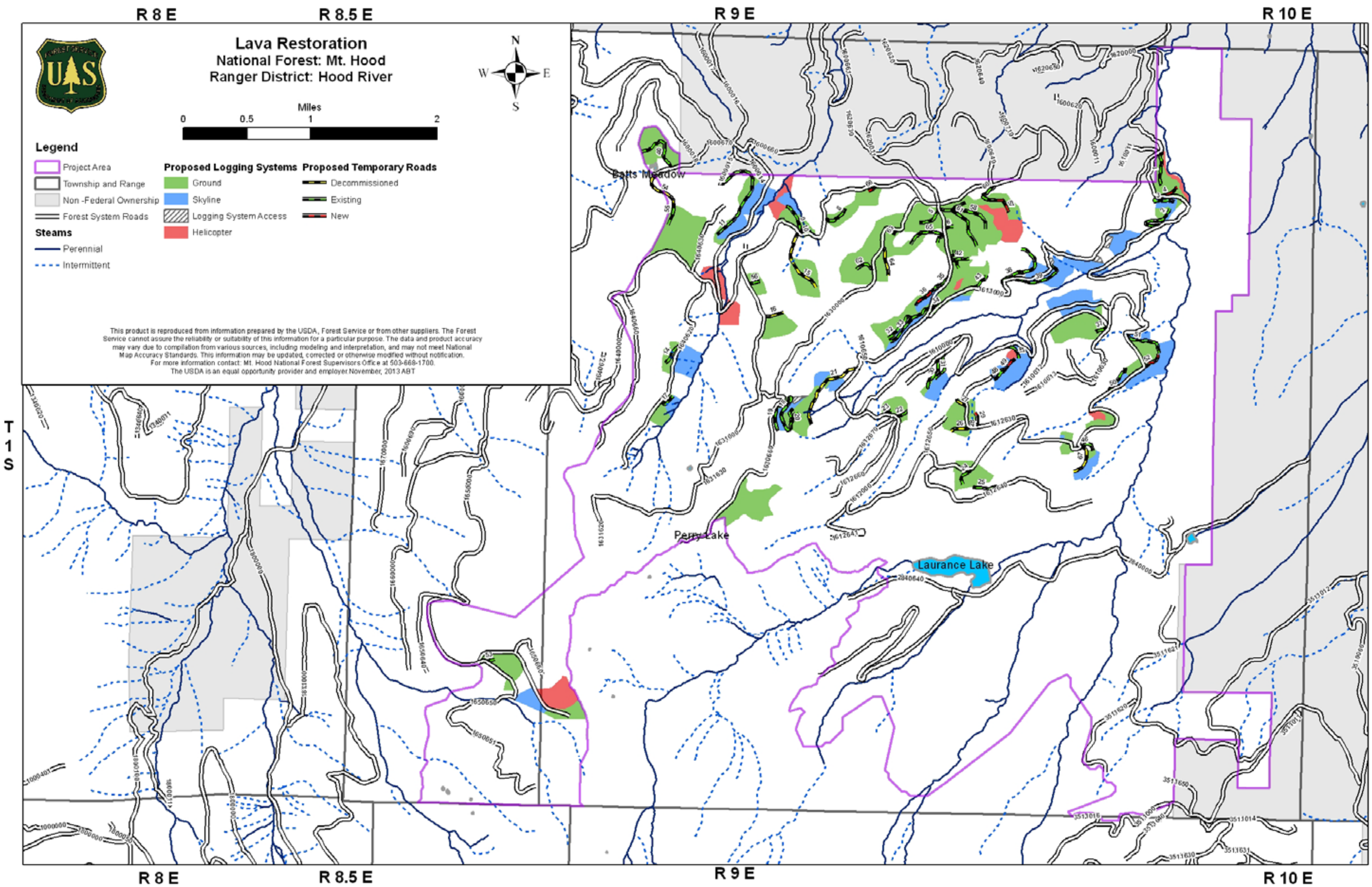


Figure 2-3: Map of Logging Systems and Temporary Roads

2.2.6 Riparian Prescription

Management direction regarding appropriate silvicultural activities in riparian areas comes from the Northwest Forest Plan, the Land and Resource Management Plan of the Mt. Hood National Forest (LRMP), as well as East Fork Hood River & Middle Fork Hood River (EMFWA), and West Fork Hood River Watershed Analysis's (WFWA). The Northwest Forest Plan Standard and Guideline [Timber Management - 1(c)] for Riparian Reserves allows the application of "silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives". The Aquatic Conservation Strategy directs the Forest Service to "maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability" (U.S. Forest Service & Bureau of Land Management. 1994). The LRMP describes the Desired Future Conditions of riparian areas as "dynamic, multi-age communities" that are "fully occupied by historic plant community types" with "frequent and well distributed complexes of large wood." Riparian areas have "Frequent small openings in canopy" that "favor a variety of species and successional stages" (Forest Service 1990).

The 1996 EMFWA speaks directly to local riparian conditions and gives recommendations for management:

- The EMFWA states, "Riparian enhancement on Forest is also of importance, particularly within the Middle Fork watershed. Development of late seral structural characteristics, including placement of large down logs, is needed in many of the creek systems. Older cull decks could be used to place partially decayed logs within the riparian system…"

While the WFWA also speaks directly to local riparian conditions and gives recommendations for management, no vegetative treatments are proposed in Riparian Reserves within this watershed. Much of the riparian management recommendations for the WFWA were addressed as part of the Red Hill planning process. The only treatment proposed in the West Fork Hood River Watershed as part of this project is huckleberry enhancement.

The Mt. Hood National Forest has a standard of six downed logs per acre measuring 20 inches in diameter and 16 feet in length (FW-223). The Forest standard for in-stream large wood east of the Cascade Crest is 20 logs per 1,000 lineal feet of stream with 80 percent of the logs greater than 12 inches in diameter, and 20 percent greater than 20 inches in diameter, and a minimum of 35 feet in length (FW-095).

Other considerations for designing thinning prescriptions in the Lava project area Riparian Reserves include:

1) A portion of the planning unit is in the West Fork Hood River Tier I Key Watershed.
2) Bear Creek and Ladd Creek are listed in the Department of Environmental Quality's (DEQ) 2010 Integrated Report Assessment Database as Category 2 – Attaining for water temperature and Middle Fork Hood River is TMDL Approved for water temperature. All

three of these streams are listed as "Category 3 – Insufficient Data" on the same report for sedimentation.

3) The East Fork Hood River, Middle Fork Hood River, and West Fork Hood River have an approved Total Maximum Daily Loads (TMDL) for stream temperature.
4) Federally listed fish species, including Threatened Lower Columbia River (LCR) Chinook and Coho salmon, LCR steelhead trout, and CR bull trout are present and or have critical habitat present in the East Fork Hood River, Middle Fork Hood River, and West Fork Hood River Watersheds. No Federally listed fish species are found in the Lava project area of the East Fork Hood River or West Fork Hood River Watersheds, but bull trout critical habitat is designated in Red Hill Creek where crossed by a proposed log haul route. Middle Fork Hood River and its tributaries have federally listed fish species and or their critical habitat present in the Lava project area, including Middle Fork Hood River, Tony Creek, Bear Creek, Clear Branch Creek, Eliot Branch Creek, Coe Branch Creek, and Pinnacle Creek.
5) Mt. Hood National Forest aquatic Management Indicator Species (MIS) include all salmonids. There are resident rainbow and cutthroat trout present or suspected in many streams within the Lava Project area. For further details regarding fish species and their critical habitat location in the Lava project area see Section 3.6, Fisheries and Aquatic Fauna.
6) The Columbia duskysnail, a Survey and Manage species as defined in the Northwest Forest Plan, has been found throughout the Hood River Basin, including within the Lava Restoration project area. The basalt juga, also a Survey and Manage species, has never been found in the Hood River Basin and is not believed to occupy any streams in the Lava Restoration project area.

Based on this management direction, we are proposing to treat riparian forests where there is a silvicultural prescription that would improve ecological function and aquatic or terrestrial habitat. The primary goals of the riparian treatments include improving species composition, enhancing structural diversity, and improving future quality of downed wood and in-stream large wood. Structural diversity is a combination of several stand characteristic which would include, but would not be limited to, number of canopy layers, down wood, and snags. The riparian stands that are being proposed for treatment are currently highly stocked even-aged stands. The stands have very little growth and lack snags and downed wood suitable for riparian and wildlife needs. In addition, the stands have low tree diversity, are single-canopied, even-aged stands, or have trees that are insufficient in size to provide quality snags or downed wood. Thinning can have both immediate effects on stand diversity and long-term effects restoring native plant communities as understory species are released and provide a seed source for future recruitment (Bahaus 2009). Structural diversity would be improved directly by initiating a new age class and by creating openings. Within Riparian Reserves for perennial streams, gaps would only be allowed within one site potential tree (140 feet) if the stream is glacially or spring fed or if the gap is located on the north side of the stream. If these conditions are met, gaps could be created within Riparian Reserves, but they would be limited to no greater than 3 acres in size and would be excluded from the protection buffers outlined in the Project Design Criteria (see PDC A-2 and Table 2-7). The thin would also have an indirect impact by releasing the green retention trees. These retention trees would later become the large diameter snag and downed wood needed to meet riparian and wildlife needs. Thinning may have a short-term negative effect on downed wood quantity, but increased tree growth is expected which would speed the ability of the stands to provide the size of downed wood needed to meet the Forest standard. In addition, the prescription would also immediately provide down wood in stream channels as some near stream trees would be dropped into streams to provide channel roughness, aquatic habitat and sediment storage.

The silvicultural treatment would be a variable density thin from below. The treatment would utilize skips, gaps, and heavy thins to initiate regeneration, protect existing diversity, and stimulate growth of green retention trees. Thinning would retain all minor species to further protect existing diversity. The stand would be thinned to an overall minimum target of 40% canopy cover to protect stands from the risk of blow down. In addition, the largest trees would be retained and released to accelerate growth in riparian areas that do not have sufficient size to provide quality snags and downed wood to the forest or the stream channel. Un-thinned protection buffers of varying widths would be left adjacent to streams and wetlands. Eight units would have trees felled into steam channels (units 3, 4, 12, 13, 14, 15, 30 and 47) to provide short and long-term channel and floodplain roughness needed to maintain and improve stream and riparian function. These units were selected because the stream segments were identified during field reconnaissance as not meeting minimum instream large wood requirements. Un-thinned protection buffers would be the source of wood dropped into stream channels at the rate of 2 to 3 trees per 100 feet of stream. The felling of trees into the stream channel would be consistent with all requirements within the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) Programmatic Biological Opinions for Aquatic Restoration Activities in the States of, Oregon, Washington and portion of California, Idaho and Nevada (ARBO II).

Riparian treatments would be designed to maintain or improve stream and wetland function. Perennial streams, wetlands, lakes, and ponds would all have a variable width protection buffer as outlined in the Project Design Criteria (PDC A-2 and Table 2-7). This protection buffer would serve to help maintain current shade conditions, maintain small wood recruitment to streams, maintain snags for standing and down wood recruitment, and protect streams from sediment generated from timber harvest activities. The buffer would also provide effective sediment filtration from project generated surface erosion (Rashin et al. 2006, Lakel et al. 2010) and help protect sources of coarse wood to streams and adjacent riparian areas (Johnston et al. 2011). In first and second order headwaters streams, small wood (10-40 cm in diameter) and organic debris was found to play a major role in forming steps and storing sediment while large wood was responsible for less than 10 percent of step pools (Jackson and Sturm 2002). Johnston et al. (2011) found that 90 percent of wood recruitment came from within 18 meters of the stream channel in 90 percent of forest sites studied and that the source distance for large wood recruiting to streams increased as a function of tree height.

Riparian Thinning Units

Riparian thinning treatments have been identified in 24 units in the project area (see Table 2-4). These units were identified and evaluated through a process that included a review of past management and disturbance history, stand exams, and hydrologist and fisheries site evaluations. During field evaluations, instream large wood (wood greater than 12 inches diameter and 35 feet long) and wood channel forming pieces (stable instream wood) were evaluated in all perennial and intermittent stream channels. See Table 2-4 where it was determined riparian thinning treatments could be used to help meet Forest Standard (FW-095) for instream wood, or help maintain or improve stream channel stability and sediment storage (in small perennial and intermittent tributaries)

Table 2-4: Unit Specific Purpose for Riparian Thinning Treatment

Unit	Acres	Riparian Reserve Acres	Riparian Treatment Purpose					
			Downed Wood	Snags	Instream Large Wood	Wood Channel Forming Pieces	Species Composition	Structural Diversity
1	57	12.4	X	X			X	
3	22	9.5	X	X	X		X	X
4	38	7.9	X	X	X		X	X
5	16	0.8	X	X	X	X	X	X
6	68	2.4	X	X	X	X	X	X
12	47	21.0	X	X	X	X	X	
13	41	8.4	X	X	X	X	X	
14	25	5.4	X	X	X		X	X
15	39	20.9	X	X	X		X	
16	35	3.5	X	X	X	X		
18	41	17.8	X	X	X		X	
19	36	1.5	X	X	X	X	X	X
21	23	13.3	X	X	X	X	X	
22	24	0.6	X	X				X
23	26	10.2	X	X				
27	46	2.8	X	X		X	X	X
30	39	6.3	X	X	X	X	X	X
31	19	6.2	X	X	X		X	X
42	42	3.3	X	X			X	X
44	15	1.0	X	X	X		X	X
45	11	0.4	X	X			X	X
46	18	1.6	X	X			X	X
47	43	12.3	X	X	X		X	
48	71	22.3	X	X	X		X	

2.2.7 Road Decommissioning and Road Closures

All of the National Forest System roads within the project area were analyzed to determine if decommissioning or road closures were appropriate following the completion of the proposed vegetation treatments. The criteria used to determine if the road would be decommissioned, closed, upgraded or remain open included: public and administrative access; likelihood and timing of future timber/fuels treatment; level of aquatic risk; current road conditions; and, future road maintenance needs. As defined by the 2003 Roads Analysis Report, an aquatic risk rating was assigned to each road segment based on combining the values of individual aquatic risk factors. The individual risk factors are: riparian areas/floodplains; fish passage; landslide hazard; surface erosion hazard; hydrologic hazard; high risk stream crossings; stream crossing density; and, wetlands.

This project would decommission approximately 2.1 miles of unneeded roads over several years, as implementation funding becomes available. The roads would not be decommissioned until the proposed thinning has occurred. Road decommissioning includes active (i.e., mechanical) and/or passive (i.e., inactive) methods. Also, the beginning portion of a decommissioned road is treated in order to block vehicles from entering the decommissioned road. If hydrologic and ecological processes are adversely impacted by the road, then the decommissioned road is stabilized and restored to a more natural state. A decommissioned road is removed from the Forest's transportation system and no longer receives any maintenance.

In addition, 15.4 miles of road would have a year round closure. Lastly, 7.0 miles of road would be seasonally closed allowing access only during huckleberry harvesting season. The roads activities are summarized in the table below.

Table 2-5: Proposed Road Activities

Decommission	
Road Number	**Length (Miles)**
1610012	0.3
1612670	0.9
1630660	0.4
1640620	0.5
Total	**2.1**

Year Round Road Closure	
Road Number	**Length (Miles)**
1600014	0.3
1600015	0.4
1610011	0.4
1610630	1.0
1610640	0.6
1610650	0.2
1610670	0.2
1611000	2.9
1612630	1.0
1612650	0.3
1631000	1.1
1631620	0.4
1631630	0.2
1640630	0.6
1640660	1.4
3511012	0.7
3511620	1.4
3511620	1.1
3511621	1.2
Total	**15.4**

Seasonal Road Closure	
Road Number	**Length (Miles)**
1612640	1.8
1630660	1.4
1631000	0.9
1640000	0.2
1640000	1.4
1640620	1.3
Total	**7.0**

Road decommissioning would be accomplished using a suite of tools based conditions on-the-ground. The beginning portion of a decommissioned road is treated in order to block vehicles from entering the decommissioned road. If hydrologic and ecological processes are adversely impacted by the road, then the decommissioned road is stabilized and restored to a more natural state. Decommissioned roads would no longer need maintenance of any kind, since the ground occupied by decommissioned roads would return to a more natural, forested landscape. All decommissioned roads identified in this project would be removed from the Forest Service Infrastructure Database, which is the database system used for the storage and analysis of information in the transportation atlas for the agency.

The tools used to decommission a road is dependent on several factors including: the existing physical condition of the road, the risk posed by the road to terrestrial wildlife, and the risk the road presents to aquatic resources. For consistency with the Roads Analysis, risks to both terrestrial and aquatic resources are ranked on a 2 through 10 point scale with 10 being a high risk and 2 being a low risk. Generally, roads identified as having lower risks are considered for passive methods and roads identified as having higher risks are considered for active methods.

Passive decommissioning methods generally consist of doing minimal work to eliminate entrance opportunities by vehicles to an inactive road. These methods are typically appropriate for roads that have not been actively used for some time, vegetation has naturally overgrown the roadbed, and natural drainage patterns are functioning at a high level. Active decommissioning efforts on these types of roads is not economically justifiable and the environmental effects of the active decommissioning efforts would likely cause more impact than the long-term impacts from leaving the road as is. An example of a passively closed road where natural vegetation has re-established itself is shown in the photo below. In this case, a naturally fallen tree helps serve as a barrier to vehicles, but a more substantial vehicle barrier exists at the connection with a connector road to provide a more effective deterrence to vehicles entry. Also, in this case the road database has been updated to remove this road from our system.

Active decommissioning methods generally include actions utilizing mechanized construction equipment to physically stabilize, restore and allow for revegetation of the roadbed. Mechanized construction equipment might include excavators, backhoes and truck mounted loaders. In order to re-establish roadbeds for vegetation establishment, decompaction techniques would be implemented. These decompaction efforts might include the complete disturbance of the entire width of the roadway (Full Width Decompaction) for up to 12-inch depth.

These active efforts also strive to re-establish natural (pre-road construction) drainage patterns by removal of culverts and other drainage devices including bridges where necessary, removal of deep fills originally needed for installation of deep-fill culverts and stabilization of resultant slopes. In some cases, these efforts also include removing unstable fills and pulling back road shoulders in hill-side construction areas where cut/fill techniques were used to balance cuts and fills in the immediate area during construction. The intent in this case is not to fully restore natural (pre-road construction) contours and slopes, but rather to stabilize unstable fills.

Figure 2-4: Example of a Decommissioned Road

Entrance management techniques are common. One technique that is used in order to eliminate / minimize the temptation of drivers to drive on the closed road and provide the optimum conditions for the rapid re-establishment of vegetation, is to completely decompact the entire width of the roadway for up to 12-inch depth by mechanical construction equipment. This decompaction is generally completed on the initial 1/8 mile (660 feet) of road from where it abuts to an open connecting road. An example of this technique is shown in the photo below. In addition to showing the full-width decompaction efforts, the photo also shows straw mulch placed over the previously seeded areas to minimize erosion potential and provide for rapid seed germination results. Other entrance management techniques would include placement of boulders, large logs, and/or gates to ensure complete closure of the road to vehicle access.

Figure 2-5: Example of Entrance Treatment Method

2.2.8 Road Reconstruction/Maintenance

Road maintenance and reconstruction is necessary on haul routes identified for this project. Weak areas would be reconstructed as needed. The roads would be repaired to a minimum standard for both safety and resource protection before use. No new permanent road construction would be necessary to implement the Proposed Action. The proposed roads activities include actions on National Forest System roads that would be used for timber hauling.

Table 2-6 displays the basic maintenance and repair work categories that would be utilized on all roads during and after use to maintain minimum standards. These work categories include brushing, drainage, blading, maintenance, and surface repair. Maintenance work consists of providing minimum access required for contractors operations and associated Forest Service contract administration and preventing unacceptable resource or road damage. All work would be within the existing road structure.

Brushing work consists of cutting all vegetative growth including trees and other vegetation less than 4-inches in diameter measured 6-inches above the ground, on roadway surfaces and roadsides. Brushing generally occurs within a distance of 8 feet from the road shoulder. Cut material is placed on the downslope (fill) side of the road. Drainage work consists of maintaining ditches and drainage structures to prevent erosion and excess sedimentation. Ditch spoils would be placed below the road prism outside riparian protection buffers listed in the Project Design Criteria. Blading includes shaping the crown or slope of road surface, berms, and drainage dips. Surface repair work consists of placing surface aggregate as designated on the ground. It includes preparing the area, furnishing, hauling, and placing all necessary materials and other work necessary to blend additional material with the adjacent road cross section.

Road reconstruction is any road work that seeks to create or improve an existing system road where such work is not covered by standard maintenance specifications included within a typical timber/stewardship sale contract and which is engineered to meet all applicable standards and guidelines required by federal regulation. Finally, roadbed reconditioning is a particular type of road reconstruction work that consists of repairing soft and unstable areas by removing unsuitable material and filling with approved structural quality backfill, base aggregate, or surface aggregate as required. All oversized material larger than 6-inches from the top 6-inches of subgrade would be removed; the subgrade would be scarified to a 6-inch depth; surface irregularities would be removed; the roadway would be shaped to provide a uniform surface; and, the surface would be compacted to specifications.

Table 2-6: Road Maintenance Needs for Log Haul

Road	Haul Length (Miles)	Description of Proposed Work
1600000	14.1	**Maintenance:** Brushing, 80 cubic yards of Ditch Cleaning & Disposal, Clean 20 Culverts, Remove 7 Danger Trees per mile, Pavement Protection at 6 Temporary Road Intersections. **Reconstruction:**

		Mile post 6.40 – 80' x 8.5', 2' depth, road reconstruction with geotextile reinforcement; resurface with aggregate. Mile post 6.61 - 60' x full width, 3.5' depth, road reconstruction with "rock blanket" underdrain; replace culvert; resurface with asphalt. Mile post 6.85 – 210 'x full width, 2' depth, road reconstruction with "rock blanket" underdrain; resurface with asphalt. Mile post 6.89 - 210' x 15', 2' depth, road reconstruction with geotextile reinforcement; replace culvert; resurface with asphalt. Mile post 7.29 - 140'x10', 2' depth, road reconstruction with geotextile reinforcement; resurface with aggregate. Mile post 8.05 - 150' x full width, 3.5' depth, road reconstruction with "rock blanket" underdrain; resurface with aggregate.
1600015	0.4	**Maintenance:** Brushing, Blading, 30 cubic yards Spot Rock. Remove 8 Danger Trees per mile.
1600670	0.7	**Maintenance:** Brushing, Blading, 100 cubic yards Spot Rock, Remove 8 Danger Trees per mile.
1610000	9.6	**Maintenance:** Brushing, Blading for 3.0 miles, 500 cubic yards Ditch Cleaning & Disposal, Clean 12 Culverts, 500 cubic yards Spot Rock, Remove 7 Danger Trees per mile, Pavement Protection at 13 Temporary Road Intersections. **Reconstruction:** Mile post 4.82 - Road Reconstruction. Mile post 8.03 - Deep Patch.
1610012	0.6	**Maintenance:** Remove & Replace Berm, Brushing & Clearing, Blading, Remove 7 Danger Trees per mile.
1610630	0.3	**Maintenance:** Remove 2 Berms, Remove and Replace 8 Water Bars, Blading, Clean 10 Culverts, 200 cubic yards Ditch Cleaning & Disposal, Remove 5 Danger Trees per mile. **Reconstruction:**

		(Full Length) Specified Road Clearing.
1610640	0.3	**Maintenance:** Brushing, Blading, Remove 8 Danger Trees per mile.
1611000	3.0	**Maintenance:** Remove Berm Both Ends, Brushing, 500 cubic yards Ditch Cleaning & Disposal, 30 cubic yards Spot Rock for Potholes, Clean 15 Culverts, Remove 7 Danger Trees per mile, Pavement Protection at 3 Temporary Road Intersections. **Reconstruction:** Mile post - 1.50 Specified Road Clearing, Ditch Reconditioning.
1612000	3.9	**Maintenance:** Brushing, Blading, 100 cubic yards Ditch Cleaning & Disposal, Clean 10 Culverts, 250 cubic yards Spot Rock, Remove 14 Danger Trees per mile.
1612630	1.0	**Maintenance:** Brushing, Blading, Remove 7 Danger Trees per mile. Install 11 waterbars after haul.
1612640	1.1	**Maintenance:** Brushing, Blading, 75 cubic yards Spot Rock. Remove 8 Danger Trees per mile.
1612650	0.3	**Maintenance:** Remove & Replace Guardrail, Clearing, and Blading. Remove 7 Danger Trees per mile.
1630000	3.5	**Maintenance:** Blading, 2.00 miles Brushing, 120 cubic yards Ditch Cleaning & Disposal, Clean 10 Culverts, 200 cubic yards Spot Rock, Remove 18 Danger Trees per mile. **Reconstruction:** MP 1.50 - 1. 90 Specified Road Clearing.
1630660	0.3	**Maintenance:** Brushing, Blading, 20 cubic yards Spot Rock. Remove 8 Danger Trees per mile.
1631000	1.1	**Maintenance:** Blading, 75 cubic yards Ditch Cleaning & Disposal, Clean 2 culverts, Clean/Recondition 3 Culverts, Remove 104 Danger Trees per mile. **Reconstruction:** (Full Length) Specified Road Clearing.
1631630	0.3	**Maintenance:** (Dollar Quarry Access) Blading, Brushing, 100 cubic yards Spot Rock, Remove 7 Danger Trees per mile, install 4 Drivable Dips.
1640000	0.9	**Maintenance:** Blading, Brushing for 0.22 miles, 100 cubic yards Ditch Cleaning & Disposal, Clean 12 Culverts, 20

		cubic yards Spot Rock, Remove 52 Danger Trees per mile. **Reconstruction:** (Full Length) Specified Road Clearing.
1640620	1.3	**Maintenance:** Blading, Brushing, Clean 5 Culverts, Remove 7 Danger Trees per mile. **Reconstruction:** Mile Post 0.70 - Reconstruct Fill Failure.
1640630	0.4	**Maintenance:** Blading, Clean 7 Culverts, 40 cubic yards Spot Rock, Remove 35 Danger Trees per mile. **Reconstruction:** (Full Length) Specified Road Clearing, Disposal Point at Terminus for all Road Maintenance / Reconstruction Unsuitable Material.
1650000	3.8	**Maintenance:** Blading, Brushing, 190 cubic yards Spot Rock, Remove 7 Danger Trees per mile.
1650650	0.5	**Maintenance:** Blading, Brushing, 50 cubic yards Spot Rock, Remove 7 Danger Trees per mile.
1800000	3.4	**Maintenance:** Brushing

2.3 Project Design Criteria/Mitigation Measures

The National Environmental Policy Act defines “mitigation” as avoiding, minimizing, rectifying, reducing, eliminating or compensating project impacts. The following design criteria and mitigation measures are an integral part of this project and would be carried out if the project is implemented under the Proposed Action. In most cases, the effects analysis in Chapter 3 is based on these project design criteria and mitigation measures being implemented.

2.3.1 Design Criteria/Mitigation Measures for Vegetation Treatments and Road Use

<u>Vegetation Management</u>

V-1. Gap size and distribution (i.e. location and number) would vary depending on stand specific conditions. Individual gaps would range in size from 1 to 5-acres.

V-2. Within Riparian Reserves for perennial streams, gaps would only be allowed within 1 site potential tree (140 feet) if the stream is glacially or spring fed or the gap is located on the north side of the stream. If these conditions are met, gaps could be created, but they would be limited to no greater than 3 acres in size and would be excluded from the protection buffers outlined in the Project Design Criteria. If gaps are created along intermittent streams they would be outside the protection buffer (PDC A-2 and Table 2-7).

V-3. No gaps would be located in Riparian Reserves within skyline units.

V-4. Tree planting would only occur in gaps larger than 2 acres.

V-5. In huckleberry enhancement units a priority on heavy thins and gap locations should be where there are existing big leaf huckleberry plants.

Fuels

F-1. Sale generated slash should be piled where the Forest Plan down woody tons per acre standards and guidelines are exceeded.

F-2. 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.

F-3. 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, or within 100-feet of a stream course.

Roads

R-1. The Mt. Hood National Forest Transportation System Management Road Rules document dated January 1992 would apply to this project.

R-2. 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 may require additional signing to warn traffic of trucks entering onto or across the highway.

R-3. 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.

R-4. The use of steel-tracked equipment on asphalt or bituminous surfaced roads would be prohibited. 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 must restore roads to existing condition.

R-5. 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.

R-6. 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 french drains, drivable dips or materials that provide effective drainage and prevent erosion.

R-7. 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.

R-8. Temporary roads would be obliterated upon the completion of use. Temporary roads and landings on temporary roads should be sub-soiled or scarified as necessary. Culverts should be removed as appropriate and cross-drain ditches or water bars should be installed as needed. Disturbed ground should be seeded and mulched and available logging slash, logs, or root wads should be placed across the road or landing surface. Post-harvest motorized access would be prevented by construction of a berm and/or placement of available large boulders.

R-9. Pit run rock may be used when necessary to reduce erosion, puddling, 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 ripping or scarifying the roadbed following harvest activities.

R-10. Unsuitable excavation[2] resulting from ditch cleaning and other operations would be disposed of only at Forest Service approved sites outside riparian protection 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 3 feet. All disposals should be seeded and mulched at the completion of operations.

R-11. 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

[2] By contract specification, any material containing “excess moisture, muck, frozen lumps, roots, sod, or other deleterious material” along with certain types of soils that contain unacceptable amounts of silt or clay and have insufficient load bearing properties and are considered unsuitable for use in construction of any structural component of a roadway.

sheeting when inclement weather is expected to protect it from precipitation and to prevent water quality degradation from runoff.

R-12. Existing vegetation in ditch lines hydrologically connected to streams (as defined in NWFP) must not be removed unless an effective sediment trap is installed and maintained until vegetation is reestablished. Vegetation and slough removal would be immediately mitigated with sediment control features such as check dams constructed of bio-bags, straw bales, or other biodegradable materials.

R-13. Scheduled soil disturbing road maintenance or reconstruction should occur during the Normal Operating Season (generally June 1 – October 31), unless a waiver is obtained.

R-14. 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 15 – August 15)[3]. Exceptions to the ODFW in-water work windows must be requested by the Forest or its contractors, and subsequently approved by ODFW, National Marine Fisheries Service (NMFS), U.S. Army Corps of Engineers, and Oregon Division of State Lands.

<u>Log and Rock Hauling</u>

L-1. Log and rock hauling would be restricted to operating within the Normal Operating Season (generally June 1 – October 31) unless a waiver is approved. Purchasers desiring to haul outside of the Normal Operating Season would be required to apply for a written waiver from the Forest Service Representative for the Timber Sale, who would obtain approval from the District Ranger prior to the issuance of any waiver.

L-2. Log and rock haul outside of Normal Operating Season (generally June 1 – October 31) should not occur on the following roads or road segments: 1600000 (5.4 miles from the intersection with the 1650000 to the intersection with the 1800000), 1600015, 1600670, 1610000 (3.2 miles from the intersection with the 1610630 to the intersection with the 161200), 1610012, 1610630, 1610640, 1611000 (0.4 miles from the intersection with unit 3 to the intersection with unit 4), 1612000, 1612630, 1612650, 1631000, 1640000, 1640620, 1640630, 1640660, 1650000, 1650650, and 1800000.

L-3. Log haul, rock haul and equipment transportation may be allowed outside the Normal Operating Season (generally June 1 – October 31) on aggregate and native surface roads not listed in L-2, if the following criteria are met:
   a. Haul routes must be inspected weekly, or more frequently if weather conditions warrant. Inspections by the timber sale administrator (or qualified specialist) would focus on road surface condition, drainage maintenance, and sources of erosion and sediment delivery to streams.
   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

[3] All in-water work windows and exceptions are determined by ODFW. If the in-water window changes during the implementation of this project, the Forest Service would work with ODFW to fully comply with any and all new state requirements/regulations.

(or qualified specialist) 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 not hydrologically connected to any stream.

L-4. Log haul and heavy vehicle transport on paved 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 exists or that the subgrade on the paved roads is saturated.

L-5. Log and rock haul on system and temporary roads shall be prohibited at any time there is 1.5 inches of precipitation within any given 24-hour period as measured at the lowest elevation along the haul route. To measure precipitation, the purchaser may install a temporary rain gauge on National Forest System land near or adjacent to the lowest elevation along the haul route as agreed upon; otherwise, precipitation would be measured according to the Log Creek RAWS station (LGFO3). Data for the Log Creek RAWS station can be found at: http://raws.wrh.noaa.gov/cgi-bin/roman/raws_flat.cgi?stn=LGFO3

Aquatic Resources

A-1. No ground based mechanized equipment, including but not limited to tractors or skidders may operate within 100-feet of streams, seeps, springs or wetlands while conducting logging operations.

A-2. No tree felling would occur within designated protection buffers except associated with skyline yarding corridors or woody material introduction into stream channels. The protection buffers for perennial streams and wetlands would be a minimum of 60-feet and a minimum of 30-feet for intermittent streams. Some proposed protection buffers would exceed this minimum as shown in Table 2-7. Trees felled to create skyline yarding corridors within the protection buffer must be left where they fall. Trees can be felled towards streams but any tree, or portion thereof, directionally felled towards surface water that could land in the bankfull stream channel must be felled during the ODFW in-water work window (July 15 to August 15). Buffers are measured from the edge of the bankfull channel on both sides of the stream. Buffers would be expanded to include slope breaks where appropriate.

Table 2-7: Proposed Stream Protection Buffers that Exceed the Minimum Standard Due to Slope Breaks or other Topographical Features

Unit	Stream Protection Buffer - Perennial (ft)*	Stream Protection Buffer - Intermittent (ft)*
1	140	-
3	100	-
4	100	-

Unit	Stream Protection Buffer - Perennial (ft)*	Stream Protection Buffer - Intermittent (ft)*
15	60 and 150	-
18	100	30 & follow slope break
31	60 and 150 (150 on steep slope area Bear Creek)	-
48	60 to 150	-

* Actual protection buffer widths may exceed these values due to slope breaks or other site conditions.
\- Minimum protection buffers apply.

A-3. If a tree located outside a protection buffer lands wholly or partially within the protection buffer when felled, none of the tree located within the protection buffer would be removed.

A-4. Heavy equipment, such as skidders, dozers, and feller-bunchers, operation would not be allowed outside the Normal Operating Season (generally June 1 – October 31) within Riparian Reserves.

A-5. Locate new landings outside of Riparian Reserves[4]. Use of existing landing locations within Riparian Reserves may be allowed if erosion potential and sedimentation concerns can be sufficiently mitigated as determined by a qualified Soil Scientist or Hydrologist. Existing landings within one site potential tree height from streams, seeps, springs or wetlands would not be used unless the slope between the landing and surface water is thirty percent or less and there is an intact vegetated buffer between the landing and surface water.

A-6. Refuel mechanized equipment 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 to prevent direct delivery of contaminants into water. Parking of mechanized equipment overnight or for longer periods of time shall 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 shall be prepared by the contractor as required under EPA requirements (40 CFR 112).

A-7. Skyline yarding may occur over streams outside of listed fish habitat (LFH), but trees must be fully suspended in the corridor within the protection buffers and must have at least one end suspension within the remaining portion of the Riparian Reserve.

A-8. Skyline yarding corridors over perennial stream would be limited to 5 corridors per 1,000 lineal feet of stream. Corridors must not exceed 15-feet in width. Corridors must be spaced at least 100-feet apart.

[4] Riparian Reserve refers to the Northwest Forest Plan Riparian Reserve designation.

A-9. Use erosion control measures (e.g., silt fence, sediment traps) where road maintenance or reconstruction may result in delivery of sediment to adjacent surface water.

A-10. Install sediment and stormwater controls (e.g., ditching) prior to initiating surface disturbing activities to the extent practicable.

A-11. Install suitable stormwater and erosion control measures (e.g., ditching, seeding, mulching) to stabilize disturbed areas and waterways on incomplete projects prior to seasonal shutdown of operations, or when severe storm or cumulative precipitation events that could result in sediment mobilization to streams are expected.

A-12. The timber sale administrator or qualified specialist would monitor disturbed areas, as needed, to verify that erosion and stormwater controls are implemented and functioning as designed and are suitably maintained.

A-13. Maintain erosion and stormwater controls as necessary to ensure proper and effective functioning.

A-14. Limit water withdrawals for road maintenance or other purposes in LFH and within 1,500 feet of LFH to 10 percent or less of stream flow at the point of withdrawal (visually estimated). In non - LFH streams greater than 1,500 feet from LFH limit withdrawal by 50 percent or less of the stream flow (visually estimated). Regardless of water withdrawal location, use of screen material with either of the following maximum openings is required: 1.75 mm opening for woven wire or 3/32 inch opening for perforated plate.

A-15. All trucks used for refueling should carry a hazardous material recovery kit, including absorbent pads to be used during refueling if that occurs in the project area. Any contaminated soil, vegetation or debris must be removed from National Forest System Lands and disposed of in accordance with Oregon State laws.

Soils

S-1. All skid trails would be rehabilitated immediately after harvest activities are completed. Landings and temporary roads normally would have erosion control measures installed following vegetation or reforestation treatments. If those treatments are anticipated to be delayed beyond the current field season, then temporary effective closure of roads would occur to prevent unauthorized use.

S-2. Ground-based harvest systems should not be used on slopes greater than 30 percent to avoid detrimental soil and/or watershed impacts.

S-3. 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:

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 (i.e. not on landings or skid trails)
d. Due to higher PSI's than track mounted equipment, no rubber tired skidders should be used even on skid trails once soils become fully saturated (approach their liquid limit)

Wildlife

W-1. Except for hauling and the removal of hazard trees to protect public safety, no activities would take place within the disruption distance of a known spotted owl activity center during the March 1 to July 15 critical nesting period.
a. The use of chainsaws and heavy equipment would not take place between March 1 and July 15 in Units 27 and 41.
b. The use of helicopters would not take place between March 1 and September 30 in Units 27, 31, 32, 33, 41, 43, 47, and 55.

W-2. No activities would take place in B10 Deer/Elk Winter Range between December 1 and April 1. A portion of the Forest Service Road 2840 (<¼ mile) is within B10. A seasonal restriction for hauling would be in place for this portion of the road.

W-3. To enhance diversity, variable-density thinning would include the retention of snags and wildlife trees where possible.

W-4. All snags larger than 6 inches would be retained where safety permits. If snags must be cut for safety reasons they would be left on site. To increase the likelihood that key snags would be retained, they may be included in skips.

W-5. Certain live trees would also be selected as leave trees that have the "elements of wood decay" as described in the DecAID advisor. This may include trees with features such as dead tops, broken tops and heart rot. They may be retained in skips.

W-6. Down logs currently on the forest floor would be retained. 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.

Invasive Species

I-1. It is recommended that pre-treatment occur in the locations listed in Table 2-8 before harvest activities are implemented. All treatment methods (including herbicide application) would follow the prescriptions and methods in the Record of Decision for the Site Specific Invasive Plant Treatments for Mt. Hood National Forest, including Forest Plan Amendment #16 Environmental Impact Statement (USFS 2008). If locations identified below are within restricted buffer areas only manual treatment (hand pulling, mowing, etc.) would be used if feasible.

Table 2-8: Invasive Species Treatments

ROAD # / LOCATION	VICINITY UNITS	EIS TREATMENT #	SPECIES (Past and/or Present)
1600	Haul route / 42, 54	66-083	Butter and eggs
1610	31, 34, 35, 47	66-063	Meadow and spotted knapweeds; 1 isolated tansy site (historic)
1631-630 Dollar Quarry	Haul route / 20, 22, 23, 25, 26, 27, 58	66-047	Meadow knapweed and yellow star thistle (historic / eradicated)
Junction of roads 1600, 1610, 1620, and 1630 (stockpile at “4-Corners”)	Haul route / 5, 6, 7, 8, 10, 32, 33, 43	66-028	Meadow knapweed eradicated in stockpile
1630	Haul route / 5, 6, 7, 8, 10, 32, 33, 43	To be added	Meadow knapweed
2840-650	39, 41	06-062	Diffuse knapweed; isolated tansy site (historic)
1600 and 2840	Main haul routes	Road system	Spotted and diffuse knapweeds

I-2. Whenever possible schedule implementation of work to start in units and landings that are not infested with noxious weeds and move to areas that are infested, rather than vice-versa.

I-3. 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 (e.g., 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.

I-4. If using straw, hay or mulch for restoration/revegetation in any areas, use only certified, weed-free materials.

I-5. A Forest Service botanist, range specialist, silviculturist, or other FS personal trained to specifically identify ODA certified noxious weeds should inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that are judged to be weed free.

Heritage Resource Sites

H-1. All designated cultural resource sites requiring protection would have a 100-foot buffer zone where heavy machinery and timber harvest would be excluded. Treatment of vegetation by hand could still occur as necessary. Prescribed burning may occur, but piling may not occur within the flagged buffer zones.

H-2. Culturally-modified trees would be flagged individually and avoided. Harvest trees would be felled directionally away from flagged trees.

Recreation

RC-1. Sale Administrator would coordinate trail and road closures and associated signage with eastside recreation staff to lessen impacts to recreationists and Special Use Permit events.

RC-2. No road maintenance, yarding or log haul activities located on or adjacent to Forest Road 1600 from Friday, 12 P.M. through Monday, 12 A.M (weekends) between Memorial Day and Labor Day or on any Federal holidays.

RC-3. Use of Vista Ridge Trailhead as a landing is discouraged during the peak season (May 15-Sept 30). An alternative for a landing zone for unit 52 would be to use old landings associated with older nearby harvest units along the 1650 road. The trailhead would be temporarily inaccessible for short amounts of time during yarding operations. Or the trailhead could be used as a landing during the non-peak hiking season. If it is deemed necessary to use Vista Ridge Trailhead at any time, it should be put back to as good or better condition, restoring the site to at least pre-use visual and capacity conditions.

2.3.2 Design Criteria/Mitigation Measures for Road Decommissioning and Culvert Replacement/Removal

D-1. Ensure that an experienced professional fisheries biologist, hydrologist or technician is involved in the design of road decommissioning and/or culvert removal/replacement projects. The experience should be commensurate with technical requirements of a project.

D-2. Follow the appropriate ODFW guidelines for timing of in-water work (July 15 to August 15). Exceptions to the ODFW in-water work windows must be requested by the Forest or its contractors, and subsequently approved by ODFW, NMFS, U.S. Army Corps of Engineers, and Oregon Division of State Lands.

D-3. Project actions would follow all provisions and requirements (including permits) of the Clean Water Act for maintenance of water quality standards as described by the Oregon Department of Environmental Quality.

D-4. All equipment used for restoration work should be cleaned and leaks repaired prior to entering the project area. Remove external oil and grease, along with dirt, mud and plant parts prior to entering National Forest system lands. Thereafter, inspect equipment daily for leaks or accumulations of grease, and fix any identified problems before entering streams or areas that drain directly to streams or wetlands. This practice does not apply to service vehicles traveling frequently in and out of the project area that would remain on the roadway.

D-5. The contractor would have a written Spill Prevention Control and Containment Plan (SPCCP) as required under EPA requirements (40 CFR 112), which describes measures to prevent or reduce impacts from potential spills (fuel, hydraulic fluid, etc.). The SPCCP should contain a description of the hazardous materials that would be used, including inventory, storage, handling procedures; a description of quick response containment supplies that would be available on the site (e.g., a silt fence, straw bales, and an oil-absorbing, floating boom whenever surface water is present.).

D-6. All trucks used for refueling should carry a hazardous material recovery kit, including absorbent pads to be used during refueling if that occurs in the project area. Any contaminated soil, vegetation or debris must be removed from National Forest System Lands and disposed of in accordance with Oregon State laws.

D-7. Refuel mechanized equipment 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 to prevent direct delivery of contaminants into water. Parking of mechanized equipment overnight or for longer periods of time shall 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.

D-8. Absorbent pads would be required under all stationary equipment and fuel storage containers.

D-9. Dispose of slide and waste material at a Forest Service approved sites outside riparian protection buffers (PDC A-2 and Table 2-7). Waste material other than hardened surface material (asphalt, concrete, etc.) may be used to restore natural or near-natural contours.

D-10. Trees that need to be felled during project implementation should be directionally felled, where feasible, away from the road prism and into the surrounding forest. Trees would not be bucked and would be left undisturbed to the extent possible.

D-11. Prior to implementation of any road decommissioning, culvert removal, or culvert replacement invasive plant surveys should be performed at the project site(s). If any invasive plants are found on or near roads, the full extent of the invasion should be determined by surveying off road to the extent that it is reasonable to assume the invasive species may have spread. The invasive plant infestations should then be mapped and weed site reports completed. Depending upon the seriousness of the weed invasion, as determined by a trained botany or noxious weed coordinator, recommendations for treatment of the weed site(s) would be made and an updated Noxious Weed Risk Analysis and Mitigation Report would be prepared.

D-12. Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that are judged to be weed free by District or Forest weed specialists.

D-13. Place sediment barriers prior to construction around sites where substantial levels of fine sediment may enter the stream directly or through road ditches. Maintain barriers throughout construction.

D-14. For road decommissioning projects within riparian areas, re-contour the road prism to mimic natural floodplain contours and gradient to the greatest degree possible.

D-15. Drainage features used for storm proofing projects should be spaced to disconnect road surface runoff from stream channels.

D-16. Minimize disturbance of existing vegetation in ditches and at stream crossings to the greatest extent possible.

D-17. Conduct activities during dry-field conditions—low to moderate soil moisture levels.

D-18. Restore the stream channel and banks to original pre-road (natural) contours as much as possible when culverts are removed from the road prism.

D-19. The following PDC apply to culvert removal/replacement when water is in the channel:

a. Dewater Construction Site – Upstream of the isolated construction area, coffer dams (diversions) constructed with non-erosive materials are typically used to divert stream flow with pumps or a by-pass culvert. Diversions constructed with material mined from the streambed or floodplain are not permitted. Pumps must have fish screens and be operated in accordance with NMFS fish screen criteria. Dissipate flow energy at the bypass outflow to prevent damage to riparian vegetation or stream channel. If diversion allows for downstream fish passage, (i.e., is not screened), place diversion outlet in a location to promote safe reentry of fish into the stream channel, preferably into pool habitat with cover. When necessary, pump seepage water from the dewatered work area to a temporary storage and treatment site or into upland areas, and allow water to filter through vegetation prior to reentering the stream channel.
b. Stream Re-Watering – Upon project completion, slowly re-water the construction site to prevent loss of surface water downstream as the construction site streambed absorbs water and to prevent a sudden increase in stream turbidity. Monitor

downstream during re-watering to prevent stranding of aquatic organisms below the construction site.

2.4 Monitoring Requirements

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 (BMP) 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 (e.g., 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.

Beginning in 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 Purchaser 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.

Also, resource specialists may visit the site to conduct a post-harvest review before completing any secondary activities, such as slash clean up, KV or retained receipt projects, or firewood removal. 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 BMP. 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 web site at http://www.fs.usda.gov/goto/mthood under Forest Publications.

BMP 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, BMPs are not monitored on every project or activity that occurs on National Forest System 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 BMPs are targeted." This project would go into a pool of similar projects to be selected for project level BMPs implementation and effectiveness monitoring as per the National BMP Monitoring Protocol. If selected an Interdisciplinary Team (IDT) would evaluate whether the site-specific BMPs were implemented and the effectiveness of the BMPs. Monitoring for each BMP is outlined in Appendix 2: Best Management Practices for Water Quality Protection.

2.5 Alternatives Considered, but Eliminated from Detailed Study

During the collaborative process and the scoping comment period, no issues were brought forward that generated additional alternatives. Several concerns and specific recommendations were raised during the scoping and collaborative group processes which were specifically addressed in adjustments to the Proposed Action, changes to the project design criteria/mitigation measures and environmental analysis (see Section 1.7, Issues). As such no additional alternatives were brought forward.

2.6 Mt. Hood Land and Resource Management Plan Consistency

2.6.1 Forest Plan Standards and Guidelines

There are some Forest Plan standards that would not be met in order to meet the Purpose and Need for Action as described above. Exceptions to the Forest Plan standards are allowed under the Forest Plan, if they are identified during the interdisciplinary process. The exceptions were identified during the interdisciplinary planning analysis and the IDT process concluded that these exceptions were within the Purpose and Need for Action. Forest Plan page 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.” Also, the exceptions were shared with the public during the scoping period. All other standards and guidelines are expected to be met with this proposal.

- Snags and Down Log Associated Species (FW-215): Where new timber harvest units occur (e.g., regeneration harvest and commercial thinning), wildlife trees (i.e., snags and green reserve trees) should be maintained in sufficient quantity and quality to support over time at least 60 percent of the maximum biological potential of primary cavity nesting species, e.g., woodpeckers.

- Snags and Down Log Associated Species (FW-219): An average total of at least 6 logs per acre in decomposition classes 1, 2 and 3 (USDA Forest Service 1985, Brown editor) should be retained in all project activity areas, e.g., clearcut, commercial thin, salvage, or overwood removal.

  Overall, these standards cannot be met because of the on-the-ground conditions present within the stands. Implementation of the Proposed Action would reduce the amount of small snag recruitment that would have occurred through the process of stress and mortality in the next 20 to 30 years. Some of the snags and downed logs that might have formed from the death of the intermediate and suppressed trees would be removed by thinning activities. As a result the attainment of moderate-sized snags and down wood would be delayed because of the reduction in density of the stands which would reduce the levels of suppression mortality. For more information see Section 3.8, Wildlife.

2.6.2 National Forest Management Act Findings for Vegetation Manipulation

<u>Suitability for even-aged management</u>
Forest Plan guidelines advise against uneven aged management in stands with dwarf mistletoe and/or root disease. Even-aged management is the effective way to manage dwarf mistletoe and root disease, based on Forest Plan direction found in Forestwide Standards (FW) 316 and 317, C1-019 through C1-021, and C1-024. Project design criteria/mitigation measures, such as patch openings are written into the design of the Proposed Action in order to meet Forest Plan direction.

<u>Suitability for reforestation</u>
Forest plan guidelines advise timber harvesting shall be completed in a fashion that reasonably assures each harvest area can be adequately restocked within 5 years after final harvest (FW-358) Replanting would occur to a minimum of 125 trees per acre (FW361-363) in root rot openings large enough to support resistant tree species establishment. Interplanting would be used to maintain genetic quality and desired species composition (FW-332). The proposed treatments would be consistent with all of the above mentioned standards for reforestation

2.6.3 Best Management Practices

Best Management Practices (BMP) are defined as "methods, measures or practices selected by an agency to meet its nonpoint source control needs. BMPs include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters" (EPA Water Quality Standards, Regulation, 40 CFR 130.2). Appendix H of the Forest Plan provides management direction on the BMP implementation process. Appendix H states: "The general BMP's described herein are action initiating mechanisms which are for the development of detailed, site-specific BMP prescriptions to protect beneficial uses and meet water quality objectives. They are developed as part of the NEPA process, with interdisciplinary involvement by a team of individuals that represent several areas of professional knowledge, learning and/or skill appropriate for the issues and concerns identified. BMP's also include such requirements as Forest Service Manual direction, contract provisions, environmental documents, and Forest Plan Standards and Guidelines. Inherent in prescribing project-level management requirements is recognition of specific water quality objectives which BMP's are designed to achieve." Appendix H of the Forest Plan continues on to describe the implementation process and format for project specific BMP requirements.

According to the Northwest Forest Plan, BMP would be incorporated into the implementation of the project. BMP are drawn from General Water Quality Best Management Practices, Pacific Northwest Region (November 1988); Draft Environmental Protection Agency Region 10 Source Water Protection Best Management Practices for USFS, BLM (April 2005); Mt. Hood National Forest Standards and Guidelines, Northwest Forest Plan Standards and Guidelines and The National Best Management Practices for Water Quality Management on National Forest System Lands - Volume 1: National Core BMP Technical Guide (April 2012) and professional judgment. The BMP have been adjusted and refined to fit local conditions and then incorporated in the project design criteria/mitigation measures as described in Section 2.3 as well as the standard contract language for implementing these projects. According to the USFS National Core BMP Technical Guide (April 2012) "Site-specific BMP prescriptions are developed based on the proposed activity, water quality objectives, soils, topography, geology, vegetation, climate, and other site-specific factors and are designed to avoid, minimize, or mitigate potential adverse impacts to soil, water quality, and riparian resources. State BMPs, regional Forest Service guidance, land management plan standards and guidelines, monitoring results, and professional judgment are all used to develop site-specific BMP prescriptions."
Appendix 2 of this PA details the site-specific Best Management Practices for Water Quality for this project. The appendix includes all the required components of the site-specific BMPs as specified in Appendix H of the Forest Plan, including BMP title, objective, explanation, ability to implement, effectiveness, and monitoring. In addition, the site-specific BMP table provides a cross-walk with the PDC and planning process. The refined BMP selected for this project have been found to be implementable and effective based on prior field observations and professional judgment, other pertinent research described in Chapter 3 of this document, and monitoring on the Mt. Hood National Forest. These BMPs are fully analyzed in Chapter 3 of this document (see Section 3.5, Water Quality and Section 3.6, Fisheries & Aquatic Fauna).

CHAPTER 3 – ENVIRONMENTAL CONSEQUENCES

This chapter presents information on the physical, biological, social, and economic environments of the affected project area, and the potential direct, indirect and cumulative effects to those environments due to the implementation of the alternatives. Each resource area discloses the direct, indirect and cumulative effects for that resource area.
The National Environmental Policy Act defines these 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
- **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

The Preliminary Assessment herby incorporates by reference the project record (40 CFR 1502.21). The project record contains specialist reports, biological evaluations, and other technical documentation used to support the analysis and conclusions in this Preliminary Assessment. Specialist reports were completed for vegetation resources, transportation resources, geology, soils, water quality, fisheries, wildlife, botany, invasive plants, recreation, visual quality, fuels, and heritage resources. Separate biological evaluations were completed for botanical species, aquatic species, and terrestrial wildlife species. Full versions of these reports are available in the project record, located at the Hood River Ranger District office in Mount Hood/Parkdale, Oregon.

Each of the specialist reports and biological evaluations conduct an analysis of cumulative effects resulting from this project. Table 3-1 lists the projects that the IDT considered in their analysis.

Table 3-1: List of Projects Considered in Cumulative Effects Analysis

Past Activities
Dollar Lake Fire, including burn area rehabilitation
Timber harvests on federal, county and private lands (including associated road/landing construction)
Road decommissioning and road closures
Ongoing Activities
BPA powerline maintenance
Timber harvests on federal, county and private lands (including associated road/landing construction)
Road decommissioning and road closures
Cloud Cap hazard tree removal
Middle Fork Irrigation District operations (diversions and dams)

Pre-commercial Thinning
Red Hill Restoration (Bull, Bronco and Mule Stewardship Contracts and associated road treatments)
National Forest System Road and Trail maintenance
Site-Specific Noxious Weed Treatments
Snowplowing of FSR 1300 & 1800 by Confederated Tribes of Warm Springs and Lost Lake concessionaires
Future Activities
BPA powerline road storm proofing
BPA powerline maintenance
Timber harvests on federal, county and private lands (including associated road/landing construction)

3.1 Vegetation Resources

More information is available in the project record including the full silviculture analysis file as part of the Silvicultural Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.1.1 Methodology

The intent of this report is to analyze how the vegetation resources would be affected by the management actions proposed by the U.S. Forest Service. Professional judgment and stand level data was utilized in determining the project's potential effects. Effects analyses were based on several components outlined in the following sections.

Landscape Scale

Information regarding the vegetative conditions of the larger landscape within the Lava Restoration Project Area is largely provided by East Fork Hood River and Middle Fork Hood River Watershed Analysis (EMHRWA), which was conducted in the recent past by the Mt. Hood National Forest (Forest). Refer to the project record for maps with the boundaries of the landscape area.

The EMHRWA characterizes resource conditions at their respective scales, identifies issues, discusses trends and changes in conditions over time, defines desired conditions, and identifies possible management opportunities to be pursued at both the landscape and at the project planning level. Only the elements from these analyses most pertinent to the proposal are discussed in this section. For the complete analysis of vegetation conditions and ecological processes at the landscape scale, refer to the EMHRWA at http://www.fs.usda.gov/main/mthood/landmanagement/planning/ East and Middle Fork of Hood River WA.pdf . The Existing Conditions of this report provides an additional summary of this landscape information as related to the project.

Site-Specific Scale

The analysis area boundary for disclosing effects at the site-specific level is comprised of the West Fork subwatershed (including the Upper West Fork Hood River sixth field watersheds), Middle Fork subwatershed (including the Lower and Upper Middle Fork Hood River sixth field watersheds), and East Fork subwatershed (including the Lower and Middle East Fork Hood River sixth field watersheds). This analysis area totals 12,064 acres and represents the area where stands were evaluated for possible treatment actions as part of the Lava Restoration project. The project record provides detailed documentation on individual stand conditions and the selection process. Additional information sources including stand records and field surveys conducted in the 1980s, 1990s, as well as field reviews conducted in the year 2012 are also available in the project record, located at the Hood River Ranger District in Parkdale, Oregon.

Common Stand Exams

As part of the initial data gathering for this project, Common stand exams (CSE) were conducted within the project area. CSE provides one set of national data collection protocols, data codes, portable data recorder software, forms, reports, and export programs. All stand examination data is stored in a common database structure, Field Sampled Vegetation (FSVeg). Data from multiple Districts, Forests, Regions, and participating Agencies can be analyzed with ease. The CSE protocols are used to collect stand, plot, tree, surface cover, vegetation, and down woody data. This data is stored in FSVeg along with strategic grid data, insect and disease study data, Forest Inventory and Analysis (FIA), and re-measured growth plot data.

Forest Service Vegetation (FSVeg) Module

FSVeg module contains data that has been collected in the "field." FSVeg contains plot vegetation data from field surveys such as FIA data, stand exams, inventories, and regeneration surveys. It includes data on trees, surface cover, understory vegetation, and down woody material.

Forest Vegetation Simulator

The Forest Vegetation Simulator (FVS) was used to interpret data collected utilizing the CSE. FVS is a growth and yield model used for predicting forest stand dynamics that is used extensively in the United States. FVS is the standard model used by various government agencies, including the U.S. Forest Service. Forest managers have used FVS extensively to summarize current stand conditions, predict future stand conditions under various management alternatives, and update inventory statistics (USDA, 2008).

Plant Associations

Field Guide to the Forested Plant Associations of the Westside Central Cascades of Northwest Oregon was used to analyze the effects of proposed treatments. Plant association classification describes repeating patterns of plant communities that indicate different biophysical environments. This includes a combination of factors, such as moisture and temperature regimes, light, and soil nutrients, provide habitat for a group of plant species. There are few distinct boundaries along the environmental continua. However, categorizing discrete plant associations provides a means to track and predict vegetation composition, structure, and response to disturbance. Plant association classification of forested lands has been a forest management tool for many years. Ecosystem management and concerns with biodiversity also require understanding the plant and animal habitats that occur across our landscapes.

Stand Structure Types

Stand structure types as described by Larsen and Oliver (1996) were used to describe landscape and stand conditions. Table 3-2 describes the potential stand types. Stand patterns is the spatial and temporal distribution of trees and other plants within a given stand. Both distributions can be described by species present, vertical or horizontal spatial patterns, size of plants (or their parts), age, or by any combination of the above. Stand development is the part of stand dynamics concerned with change in stand structure over time (Larson, 1996).

Table 3-2: Stand Type and Descriptions

Stand Type	Description
Stand Initiation	Young, single cohort stands whose canopy has not yet closed; seedlings and small saplings; remnant of previous stand may be present.
Stem Exclusion	Relatively young, single cohort stand whose canopy has closed and thinning has begun; saplings and poles; remnants of previous stand may be present
Understory Reinitiation	Middle-aged, medium sized trees with variable canopy closure; second cohort of young trees present in the understory; scattered mortality in all size classes; remnant of previous stand may still be visible
Mature Stem Exclusion	Middle-aged medium sized to large trees with closed canopy; crowns of second cohort intermingled with crowns of first cohort such that a second canopy layer is not readily distinguished' scattered mortality; some small clumps of snags may be present
Late Seral Multistory	Main canopy dominated by older, large trees; canopy closure variable; 2-3 canopy layers distinguishable; mortality both scattered and clumped and in higher proportion of stand than other stages

3.1.2 Existing Condition

The desired future condition for the selected stands would be to move them towards a more properly functioning plant community as described in Section 1.3.2. By moving the stand toward a properly functioning plant community, the stands would become more multi-storied uneven-aged stands with multiple canopy layers and larger trees. Variable density thinning (VDT), including skip, gaps and heavy thins, would be used to achieve these conditions by creating openings for more shade intolerant species to establish; providing more space for green retention trees to grow; providing space in the understory for shade tolerant species to grow; and, maintaining and protecting already existing large trees and minor species. Stands should be monitored over the next 50 years to evaluate the response to the thinning and determine if a re-entry thinning is needed to create more openings.

Landscape Scale

The EMHRWA describes the landscape on the northeast side of Mt. Hood and along the Cascade crest. Sixty-five percent of these watersheds are National Forest System lands with non-federal ownership as the other principal landowners. The two dominant vegetative zones within the subwatershed include Pacific silver fir (*Abies amabilis*) and western hemlock (*Tsuga heterophylla).*

The analyses completed at the larger landscape scale (refer to EMHRWA) noted that there have been some marked changes in the nature and condition of the vegetation across the landscape from historical conditions (the period prior to Euro-American occupation). Most of these changes reflect the consequences of European settlement of the area and timber harvest beginning in the earliest years of the 20th century. The first substantiated contact of Euro-Americans with the Native groups that occupied the Columbia River valley occurred during the Lewis and Clark Expedition in 1805. However, it wasn't until the mid-1800s that settlement of the valley by non-native peoples took off, primarily because of the discovery of gold. The lumber industry began its development in the area in the 1850s, although the Hudson Bay Company constructed the first sawmill on Mill Creek in the 1820s. By the end of the 1800's, much of the timber was being cut from public lands at what was perceived as an alarming rate. This led to the establishment in 1893 of the Cascade Forest Reserve as part of a regional plan to preserve the forests of the western United States. The Mt. Hood National Forest contains the northern portion of the original reserve.

Before 1900, very large patches of similar type stands as mentioned above dominated the uplands. The species mix is similar today in both the understory and overstory. Due to the disturbance regimes on the uplands, only three structure types (see Table 3-2) tended to dominant the watershed at any one point in time. Major disturbance were rare. Some diversity did exist as the result of smaller scale disturbances, creating scattered smaller patches of a different stand structure within the larger landscape.

The current vegetation differs from the typical pre-1900 vegetation primarily in terms of landscape patterns. Instead of a large continuous area dominated by one or two stand types, the landscape currently has a mosaic of stand types. The watersheds are dominant by a forests structure of small diameter trees within the stem exclusion stage. The watersheds do have small pockets of Understory Reinitiation and Mature Stem Exclusion but they are not a dominate stand condition on the landscape like they would have been prior to 1900.

Site-Specific Scale

The project area occurs within the East and Middle fork of the Hood river watersheds. The project area is dominated by three plant associations, Pacific silver fir / big leaf huckleberry / beargrass (A1), Western hemlock / rhododendron / bear grass (A2), and Mountain hemlock / big leaf huckleberry / bear grass (A3). Common to these plant associations is an overstory dominated by Douglas-fir (*Pseudotsuga menziesii*), Pacific silver fir and Western hemlock. All three plant associations have a low to moderate productivity with site indices of between 60 to 140 feet for Douglas-fir, 70 to 140 feet for Western hemlock and 20 to 120 feet for Pacific silver fir. They are usually found on moderate slopes with an average elevation between 3,200 to 4,800 feet. Other plant associations in proposed treatment areas within the project area including those previously mentioned are list in Table 3-3.

Table 3-3: Existing Acres by Plant Association Within Proposed Treatment Stands

Stand Group	Plant Association	Acres* Within Proposed Treatment Units
A1	Pacific silver fir / big leaf huckleberry / bear grass	580
A2	Western hemlock / rhododendron / bear grass	404
A3	Mountain hemlock / big leaf huckleberry / bear grass	440
A4	Pacific silver fir / rhododendron / bear grass	121
A5	Pacific silver fir / dwarf Oregon grape	220
A6	Pacific silver fir / coolwort foamflower	115
A7	Western hemlock /devil's club / starry false Solomon's seal	22
TOTALS		**1,899**

* Acreages are rounded and may not agree with overall acreage due to approximations from GIS. Units may be comprised of more than one plant association.

A1 should have an overstory dominated by Douglas-fir and Pacific silver fir with a minor component of western and mountain hemlock(*Tsuga mertensiana*), noble fir (*Abies procera*), and western white pine (P*inus monticola*). On average, stands have a 62 percent canopy closure and 15 percent understory cover. This plant association has a well-developed shrub layer dominated by big leaf huckleberry (*Vaccinium membranaceum*), beargrass (*Xerophyllum tenax*) and rhododendron (*Rhododendron macrophyllum*).

A2 should have an overstory dominated by Douglas-fir and western hemlock with western red cedar (*Thuja plicata*) as a minor component. On average, stands have 70 percent overstory canopy closure and 45 percent understory cover. This plant association often has a high percentage of shrub cover dominated by big leaf huckleberry, dwarf Oregon grape (*Mahonia nervosa*), rhododendron (*Rhododendron macrophyllum*), bear grass, and vine maple (*Acer circinatum*)

A3 should have an overstory dominated by Pacific silver fir, and mountain hemlock with a minor component of Douglas-fir and noble fir (*Abies procera*). On average, stands have a 55 percent canopy closure and 17 percent understory cover. This plant association has a moderate shrub layer dominated by big leaf huckleberry and bear grass.

A4 should have an overstory dominated by Douglas-fir and Pacific silver fir with a minor component of western and mountain hemlock. On average, stands have a 61 percent canopy closure and 11 percent understory cover. This plant association has a moderate shrub layer dominated by rhododendron, bear grass and big leaf huckleberry.

A5 should have an overstory dominated by Douglas-fir and western hemlock with a minor component of Pacific silver fir and western red cedar. On average, stands have a 77 percent canopy closure and 19 percent understory cover. This plant association has a well-developed shrub layer dominated by dwarf Oregon grape, vine maple, big leaf huckleberry and rhododendron.

A6 should have an overstory dominated by Pacific silver fir and Douglas-fir with a minor component of western red cedar and western hemlock. This plant association has a well-developed shrub layer dominated by vine maple and rhododendron.

A7 should have an overstory dominated by western hemlock and Douglas-fir with a minor component western red cedar. On average stands have a 68 percent canopy closure and 45 percent understory cover. This plant association has a moderate shrub layer dominated by devil's club (*Oplopanax horridum*) and vine maple.

Currently, the majority of the project area contains immature stands less than 80 years old (See Table 3-4). The majority of stand structure for the project area is in stem exclusion stage (see Table 3-5) dominated by small to medium size material (quadratic mean diameter (QMD) of 10 to 20 inches). The project area is deficient in the stand reinitiation stage with little to no regeneration occurring outside of regeneration harvest (See Figure 3-1 and Figure 3-2). The stands lack species diversity in the overstory and understory with key plant species absent. Average QMD for the project area is 5.9 inches diameter at breast height (DBH) and average height is 78 feet. On average the proposed treatment units are below Mt. Hood Land and Resource Management Plan (Forest Plan), FW-215 and 216) standards for snags. Currently, there are roughly 0.2 snags per acre 20 inches DBH and greater across all dominant plant associations. Forest Plan standards require for Western hemlock 2.2 snags per acre and Pacific silver fir 2.4 snags per acre. On average the project area (excluding the Dollar Lake fire) averages an estimated 2.3 snags per acre of with 11 inch DBH trees and larger.


Figure 3-1: Stand Re-initiation Stage Photos


Figure 3-2: Stem Exclusion Stage Photo

Table 3-4: Current Percent of Age Class Within the Project Area

Age Class	Percent
< 20 Years	8%
21-40 Years	16%
41-60 Years	10%
61-80 Years	8%
81-100 Years	7%
101-120 Years	9%
121-140 Years	2%
141-160 Years	1%
161-180 Years	2%
181-200 Years	10%
200 + Years	6%
Unknown	6%

Table 3-5: Current Percent of Stand Structure Within the Project Area

Stand Structure	Percent of the Project Area
1: Sparse <10% Cover	8%
2: Stand initiation	20%
3: Stand Reinitiation	6%
4: Stem Exclusion	40%
5: Mature Stem Exclusion	5%
6: Late Seral Multistory	15%
Unknown	6%

Furthermore, riparian corridors have similar conditions to the uplands. The majority of the riparian corridors are highly stocked with a single-storied canopy. The corridors have very little growth, lack snags and downed wood suitable for riparian and wildlife needs, and have low species diversity.

Ecological Processes and Disturbances

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 (i.e., windstorms), insects, pathogens, fire, and human influences (i.e. timber harvest).

Over the last century, there have been broad changes in vegetative conditions in the Cascade Range, as summarized in the landscape analysis referenced earlier. The disturbances or factors of change, influencing vegetation in the project area include diseases, insects, timber harvest, and fire associated with timber harvest activities. These replacement forests also tend to be overstocked with vertical structure (Carlson et al. 1995). A brief discussion of insects, diseases, and timber harvesting follows below.

Insects and diseases can be natural elements of the ecosystem that can exert equal, if not greater, influence on forest development and conditions as 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. In the past, with regular small scale disturbances like floods or avalanches, they probably existed most commonly at endemic levels (i.e., present in an area but causing low or moderate levels of mortality). Population fluctuations were normal with epidemic conditions of some insects or diseases developing periodically and causing high levels of tree mortality over short periods (Harvey et al. 1995). In addition to native species there are also non-native insects present in the project area including the balsam woolly adelgid (Adelges piceae) species, which has the potential to slowly eliminate true fir species from the ecosystem.

<u>Balsam Wooly Adelgid</u>

The balsam woolly adelgid is a tiny sucking insect that was introduced into North America from Europe. In North America, it has caused substantial damage and mortality to true firs in both eastern and western forest. Primarily in the West, it occurs in subalpine, Pacific silver and grand fir stands. Symptoms of the adelgid attack appears as stunting of terminal growth, swelling around buds and branch nodes, dying foliage resulting in the foliage turning yellow then red or brown in color. All sizes of trees can be attacked, although trees that are pole-sized or larger seem most susceptible. Due to the fact that it is a non-native species, there are few natural predators or parasites to the adelgid. Climate and environmental factors are important influences allowing for the insect survival. Cold winters and high elevation rarely allow enough heat accumulation for the insect to complete a second generation. Site conditions and stand age can also play a role in affecting the insect survival, depending on the susceptibility of the host species at a given site.

<u>Douglas-fir beetle</u>

Douglas-fir beetles (*Dendroctonus pseudotsugae Hopkins*) are a bark beetle that as adults tunnel through the bark to construct galleries in the cambial area in which they feed and lay their eggs. When abundant favorable breeding habitat (weakened trees, moist conditions, etc.) becomes available, usually as windthrow, Douglas-fir bark beetle populations can rise to epidemic levels creating mortality in live trees. Disturbance by insects and disease is closely associated with windthrow. There have been no known recent insect outbreaks in the proposed treatment areas, but with the existing conditions of highly stocked Douglas-fir plantations, the project area is at a higher risk for Douglas-fir beetle outbreak.

<u>Dwarf Mistletoe</u>

Dwarf mistletoe is small, leafless, parasitic plant, which extracts water and nutrients from live conifer trees. Mistletoe is generally host specific, occurring only on one principal species. Mistletoe causes decreased height and diameter growth, reduction in seed and cone crops and direct tree mortality or a predisposition to other pathogens or insects. Once the dwarf mistletoe has spread throughout the crown, it usually takes ten or more years for tree mortality to occur.

There is increasing evidence that important interactions exist between dwarf mistletoe and animals (Hawksworth and Wiens 1996). Birds, porcupines, squirrels, and other animals eat seeds, shoots and other parts of the plant. The dense branch masses (witches brooms) caused by dwarf mistletoe provide cover and nesting sites for some birds and mammals.

Presently, throughout the project area there are minor occurrences of western hemlock dwarf mistletoe (*Arceuthobium campylopodum tsugense)* in the overstory. The potential for mistletoe spread to younger western hemlock regeneration would increase as the understory begins to differentiate and become established as a second layer.

Root disease

The dense, single-canopied Douglas-fir dominated forests in the project area are perfect conditions for the proliferation of root disease. Most of the stands in the watershed have some level of root disease present as laminated and/or Armillaria root rot (*Phellinus weirri*) and (*Armillaria ostoyae*). Highly susceptible species include Douglas-fir, grand fir and mountain hemlock, with moderately susceptible species including noble fir, pacific silver fir, and western hemlock. Species that are tolerant or resistant to laminated root rot include lodgepole pine, western white pine and western red cedar (Goheen and Willhite 2006). Root disease organisms can cause increased stress, severe reduction in tree growth, and direct or indirect mortality to trees. Trees infected with *P. weirii* are sometimes killed by bark beetles in combination with other root diseases. The Douglas-fir beetle and fir engraver are commonly associated with laminated root rot (Schowalter and Filip 1993 *in* Rippy et al. 2005). It is recognized that root decay and stem decay are natural processes, which contribute downed wood thus creating a variety of structural components in the forest. Though these organisms themselves are a natural and integral part of the ecosystem, the condition of the vegetation across the landscape and within individual stands is in many cases not natural. When there is an abundance of a susceptible species in a stand, root disease centers continue to grow. When there is a wide variety of species in a stand, including some less susceptible species, it may be slowed. Current stand conditions have provided an abundance of susceptible species and available habitat for these organisms (dense, single-canopied Douglas-fir forest) and therefore may cause more severe effects to the forests than has typically occurred in the past. Stands previously entered for selection harvest had the larger trees removed, mostly Douglas-fir and western hemlock.

Timber Harvest

Timber harvesting has been a major contributor to the change in vegetative conditions that have occurred across the project area as well as the rest of the Middle and East Fork of Hood River watershed. This has altered the normal functioning of ecosystem processes. Past practices of regeneration harvest have impacted stand structure and species diversity within the project area.

In the project area, records show about 9,685 acres that have previously been treated during the period from 1950 to 2010 (see Table 3-6 below) on federal lands. The Forest does not have records of historical harvest for private or federal lands between 1880 and 1950, only information from field observations.

Table 3-6: Acres by Harvest Type in Lava Restoration Project Area

Decade	Harvest Activities	Thinning
1950-1959	1,151	-
1960-1969	1,404	-
1970-1979	1,325	-
1980-1989	3,735	-
1990-1999	811	-
2000-2012	-	1,259
Total	**8,426**	**1,259**

3.1.3 Effects Analysis

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:

1) Total acres treated and acres treated within each affected plant association;
2) Changes in forest structure and composition;
3) Effects on residual trees; and
4) Effects on insect and disease processes and forest vulnerability to these elements.

The proposed roads treatments and all required project design criteria have no direct or indirect effects to the vegetation. As such, this section only analyzes the impacts of the vegetation management treatment.

No Action – Direct and Indirect Effects

No acres are treated under this alternative, and thus there are no direct effects to the vegetation at the landscape or site-specific scale in the short-term. Existing condition, as described above, would be maintained with little change in the current condition relative to forest structure and composition, residual tree densities or insect and disease processes.

Due to the limited size of the project area there would be little to no effect at the landscape scale to stand structure and composition, residual trees, and insect and disease processes. The landscape would still have under-represented or lack necessary stand types (see Table 3-2) vital to maintaining and sustaining properly functioning plant communities.

In the long-term, the stand structure and composition would be dominated by Douglas-fir in the overstory, and the understory would remain under-developed with low occurrences of ecologically important tree and shrub species. The stand structure would remain in a single story dominant stem exclusion type stand (Refer to Table 3-7 and Figure 3-3 below). Young stands would continue to grow in densely stocked conditions with little regeneration. Densely stocked stands would continue to have large amounts of small patches with increasing crown closure with little species or structural diversity.

Ultimately, with no vegetation treatments, the stand would remain in dense overstocked conditions with no mosaic reinitiation of understory; risk of insect and disease levels and vulnerability of the stands to infestations would remain high; and, stand density would continue to increase (Refer to Table 3-8 for treatment area densities). By maintaining high tree competition, stems would continue to grow in height but diameter growth would continually slow. These trees would become more dependent on neighboring trees for support. When trees develop in this manner they are more likely to blow down in large groups or if drought conditions persist. By maintaining a high blowdown risk, the risk of Douglas-fir beetle infestation remains high.

Quadratic mean diameter (QMD) is the diameter corresponding to the tree of arithmetic mean basal area, or average diameter by basal area (BA). The QMD slowly increases over time with little fluctuation. This is indicative of stands that had little regeneration occurring through time. Stands QMD should fluctuate over time to reflect the ingrowth of smaller diameter trees that contribute to the BA. The stand heights also continue to grow, but level out over time due to lack of growing space.

Table 3-7: Comparison of Current Treatment Stand Types Compared to Historical Conditions

Stand Structure	Current Percentage	Historical Percentage* (Average for the Range)
Sparse <10% Cover	8%	5%
Stand Initiation	20%	12%
Stem Exclusion	40%	28%
Stand Reinitiation	6%	15%
Mature Stem Exclusion	5%	15%
Late Seral Multistory	15%	25%
Unknown	6%	n/a

* (Wimberly, 2002 & North 2004)

The stands currently occupied by densely stocked Douglas-fir would experience the continuing spread of root disease and resultant mortality over the long-term. Without the reinitiation of the understory to a more typical species composition characteristic of the plant association, the spread of western hemlock dwarf mistletoe would be limited due largely to the lack of western hemlock regenerating. The risk of balsam wooly adelgid would remain moderate to low in stands dominated by Douglas-fir. Any susceptible species that the adelgid does come in would be at high risk due to poor growing conditions and stress from competing neighboring trees.

Table 3-8 provides modeled density measurements for the proposed treatment areas if no action was taken. The density measurement indicators used below can be used in determining stand health, and productivity. The density measurements mentioned below can also be used to evaluate the stands vulnerability to large scale insect disturbances and processes. These measurements are used to determine the stands response to thinning in both the long- and short-term. The amount of trees present, the species composition and the size of the trees present in the stand indicate the overall health and vigor of the stand. Stands that maintain higher than normal tree densities for their specific plant association have less growth and less species composition.

With less growth the health and vigor of the trees decline, making them more vulnerable to insect and disease.

Table 3-8: Resulting Density Levels from FVS Modeling of the No Action Alternative

Time After Treatment	[1]Basal Area (BA)	[2]Trees per Acre (TPA)	[3]Quadratic Mean Diameter (inch)	[4]Average Stand Height (feet)
2013	279	3514	5.3	78
2053	363	2419	7.1	109
2113	415	1483	10.3	110

1. Basal Area is the cross-sectional area of all stems of a species or all stems measured at breast height and expressed per unit of land area.
2. Trees per acre is the average number of stems within an acre.
3. Quadratic mean diameter is the diameter corresponding to the tree of arithmetic mean basal area, or average diameter by basal area. The use of the quadratic mean gives greater weight to larger trees and is equal to or greater than the arithmetic mean.
4. Average stand height is the height of the dominant and co-dominant trees within the stand.

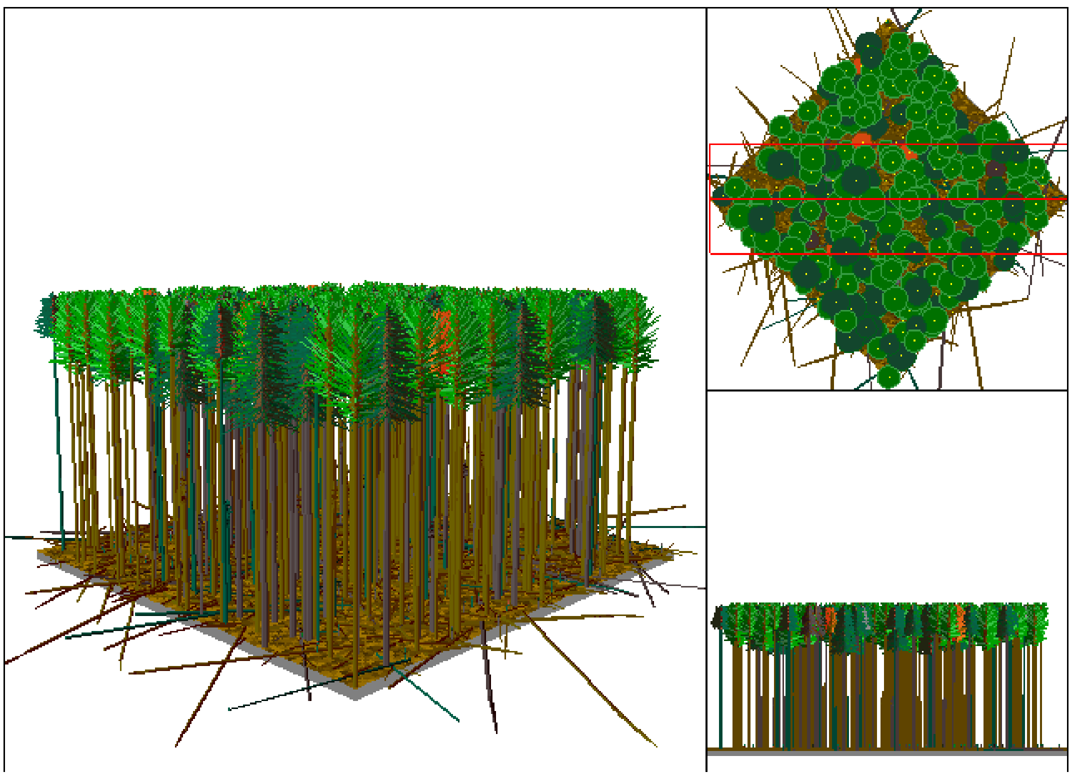


Figure 3-3: Projected Stand Structure 100 Years after no Treatment is Applied

Proposed Action – Direct and Indirect Effects

Landscape Scale

The total effects for this project would be minimal. The total acreage treated by thinning in the Proposed Action is approximately 1,714 acres. This is around 6% of the proposed project area and represents less than 2% of the Upper West Fork, Upper and Lower Middle Fork, and Lower and Middle East Fork of Hood River subwatershed. Because the Proposed Action alternative treats a portion of the dense Douglas-fir plantations of concern, it moves the overall landscape vegetation towards a condition that would have occurred under natural small and large scale disturbance regimes. Insect and disease intensity across the landscape would be decreased. Stands would be moved to more historic vegetation composition and stand structure, which would help ensure that key ecosystem elements and processes are sustained. The acres of late seral and mature stand classes would remain very similar after treatment, due to the fact that stands would be thinned and would retain the majority of the large overstory trees.

Site-Specific Scale

The Proposed Action would thin from below with a variable density thinning on 1,714 acres. Approximately 1,714 acres of all forest types would be moved from mostly dense, closed canopy stem exclusion and mature stem exclusion stages towards a more open less dense conditions. These conditions would have moderate canopy cover with large enough openings to stimulate natural regeneration of shade intolerant tree and shrub species within these types of plant associations. Species diversity in the overstory, seedlings and saplings and shrub layer is essential to the seven plant associations present in the treatment area. In the short-term, overstory species diversity would remain limited. Over time as a diversity of species regenerates and gets established the overstory diversity would increase. With the use of larger (1 to 5 acre) openings, more shade-intolerant trees and shrubs species can become establish.

In variable density thinning, selected trees of all sizes down to saplings (i.e., 3-inches or less in diameter) would be removed. The focus would be on leaving the most vigorous, healthiest trees and favoring minor species. Thinning from below must retain some young trees of desired species if stands are to retain a healthy age structure. (Perry et al. 2004). Overall, the average stand diameters would be maintained or increased (Lindh and Muir 2004). In the long-term, the stand structure would be moved towards a multistory late seral stage (Refer to Figure 3-4).

With vegetation treatments the stand would be less dense with a new mosaic of understory reinitiation (Refer to Table 3-9 for treatment area densities). By creating less dense stands with less tree competition, residual trees would benefit from the increased availability of sunlight, nutrients and water. Low stocking levels would result in less volume production, but larger average tree sizes (O'Hara et al. 1995).

With vegetation treatments, the QMD would increase over time from 5.9 to 12.5 inches DBH. This is indicative of stands that have regeneration occurring through time. Stands QMD is fluctuating to reflect the ingrowth of smaller diameter trees that begin to contribute to the stand BA. The stand heights continue to grow through time from an average of 78 feet to 120 feet. The stands TPA and BA also continue to increase indicative of stands with multiple regenerations (Refer to Table 3-9). What these density measurement indicators are used for is evaluating the stand health and productivity over time. The density measurements mentioned below can be used to evaluate the stands vulnerability to large scale insect disturbances and processes. These measurements are used to determine the stands response to the thinning in both the long- and short-term. The amount of trees present, the species composition, and the size of the trees present in the stand indicate the overall health and vigor of the stand. Stands that maintain higher than normal tree densities, for their specific plant association, have less growth, and less species composition. With less growth the health and vigor of the trees decline, making them more vulnerable to insect and disease.

Table 3-9: Resulting Density Levels from FVS Modeling of the Proposed Action

Time After Treatment	BA	TPA	QMD (Inch)	Average Stand Height (Feet)
2013	136	320	9.7	78
2053	250	527	9.5	110
2113	352	419	12.5	120

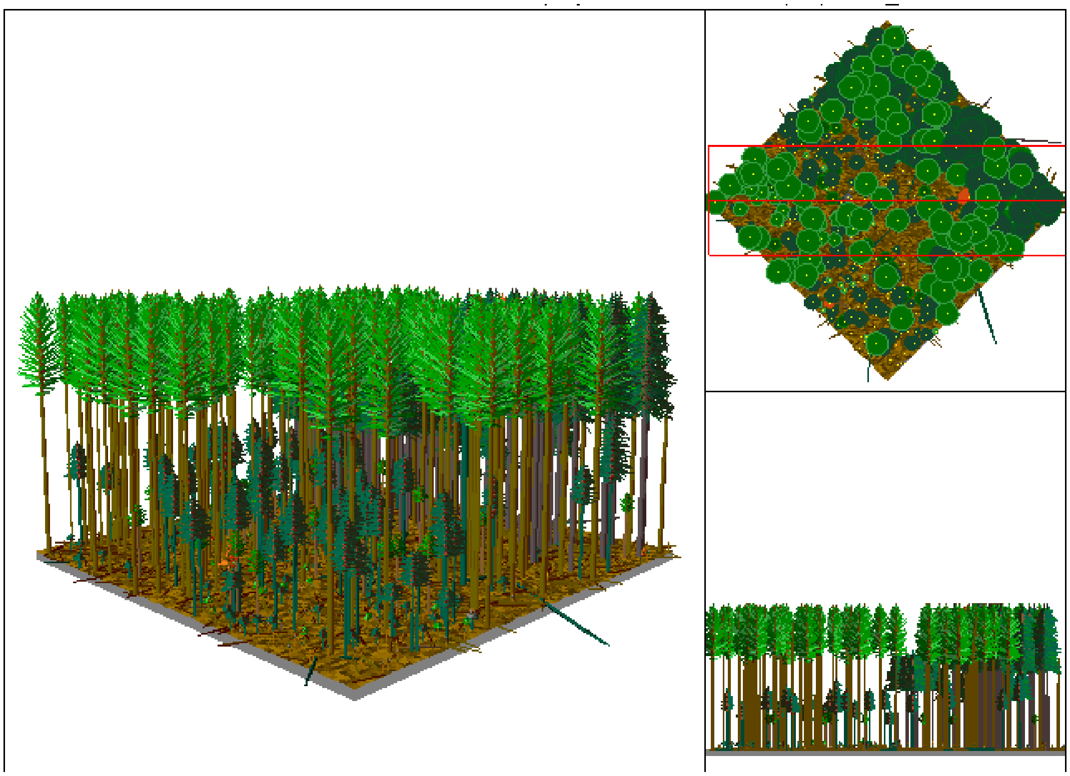


Figure 3-4: Projected Stand Structure 100 Years after Treatment is Applied

Residual Stand Conditions

There is a short-term increased risk of bending and breakage of the residual trees from snow loading or windthrow. Trees that have grown for many decades in densely stocked conditions and are relatively small in diameter as a result (i.e. <9-inches diameter at breast height) are often more vulnerable to these effects if a thinning occurs and the surrounding "supporting" trees are removed. However, it is not expected that these effects would be substantial in this area. Tree diameters would vary, but many, if not most, trees would be of large enough diameter and strength to withstand the effects of winds and snow. In locations of higher blowdown potential (i.e. ridge tops) treatments may vary to reflect the need to provide support trees around our desired leave trees.

In utilizing mechanized equipment there is some risk of damage to residual trees from equipment strikes. However, residual tree spacing would be sufficient to allowing machinery adequate room to maneuver; and therefore, should be able to avoid any appreciable damage to residual trees.

Within thinning units there would be little direct effects on existing suitable snags (11-inch dbh and 10 feet tall) as snags would be maintained unless they pose a health and safety risk. In the long term, with the proposed treatments, stands would be provided a greater number of larger green retention trees for future snag recruitment. Snag densities of trees 20-inch DBH and greater would increase in the future moving the stands closer to Forest Plan snag density standards (FVS runs).

Under the proposed action suitable snags, as defined above, within the firewood removal area would be reduce from 20 snags per acre to 10.5 snags per acre providing adequate snags to meet Forest Plan standards.

<u>Ecological Processes and Disturbances</u>
Within the proposed treatment areas the canopy closure would be reduced from 87% to 50% on average (FVS runs). By creating less dense stands with less tree competition, residual trees would benefit from the increased availability of sunlight, nutrients and water. With the increase of available nutrients, trees should be more vigorous and less susceptible to large scale insect out breaks. Small scale insect outbreaks would continue including the balsam wooly adelgid. The treatment areas are focused in stands were the balsam wooly adelgid is minor. Treatments would favor removal of susceptible species to the adelgid to create stands that would help moderate the outbreak. Also, with healthier more vigorous trees, mortality would be more endemic to small scale disturbances.

A direct reduction in dwarf mistletoe populations would occur within treatments areas under this alternative. This would occur mostly because many of the trees parasitized by dwarf mistletoe would be removed from the site in the thinning treatment. Dwarf mistletoe would not be eradicated from the project area due to the minimal acres being treated. Douglas-fir, which is the dominant overstory tree within the proposed treatment areas, is not a susceptible to the species of dwarf mistletoe common in the project area and would effectively block most of the parasites spread.

Thinning and small patch openings would reduce root to root contact and promote the growth of species in the stands that are resistant or have an increased tolerance to root disease. Trees with improved vigor would be more resistant to root disease, as well as the commonly associated insects. Root disease would still remain in the project area, but small patches of forest would be restored to include a component of historical species with natural resistance (Carlson et al. 1995). Treating the rot pockets with patch cuts and encouraging the growth of root rot resistant species would improve species diversity, move the stand composition toward a more naturally occurring mix associated with the plant association while improving the stand resilience and forest health.

<u>Cumulative Effects</u>
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. Refer to Table 3-1 at the beginning of Chapter 3 in the Lava Restoration PA for a summary of all possible activities that were considered in this cumulative effects analysis for vegetative conditions. Only the vegetation related proposed projects in the Lava Restoration Project that have direct or indirect effects are included in the cumulative effects analysis. The spatial context for the following cumulative effects analysis is the landscape and site-specific area as described previously in the existing conditions. The temporal context depends on the past, existing or future project/activity and if there is an overlap in time from an effects perspective.

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 1,714 acres. This is around 6% of the proposed project area and represents less than 2% of the Upper West Fork, Upper and Lower Middle Fork, and Lower and Middle East Fork of Hood River subwatershed. Therefore, the total cumulative effects for this project would be very nominal, and as such no cumulative effects are expected as a result the proposed projects to the vegetation resource.

3.1.4 Consistency Determination

NFMA Findings for Vegetation Manipulation

As required by regulations (FSH 1909.12 5.31a), "all proposals that involve vegetative manipulation of tree cover for any purpose must comply with the seven requirements found at 36 CFR 219.27(b)." All of these requirements are met by the project (refer to project record).

As a pre-cursor to the silvicultural diagnosis process, stand examinations are conducted to determine existing stand conditions, and a determination of suitability (in regard to management of the stand for timber production) is made for each stand. Stands proposed for harvest treatment were examined for suitability in accordance with 36 CFR 219.13, Timber resource land suitability. Stands were found to be suitable for timber management based upon the following:

- Meet the definition of forestland as described in 36 CFR 219.3.

- Technological feasibility exists to ensure soil productivity and watershed protection. All sites considered for treatment would use established harvesting and site preparation methods. In combination with resource protection standards in the Forest Plan and applicable Best Management Practices, these methods would be sufficient to protect soil and water resource values.

- There is reasonable assurance that lands could be restocked within 5 years of final harvest *(this **generally** does not apply to the proposed harvest units, as they would be thinned. Small openings in root disease pockets would be regenerated with rot resistant species.).*

Mt. Hood Forest Plan

Suitability for even-aged management

Even-aged management is the effective way to manage dwarf mistletoe and root disease, based on Forest Plan direction found in Forestwide Standards (FW) 316 and 317, C1-019 through C1-021, and C1-024. Project design criteria/mitigation measures, such as patch openings and risk of windthrow, are written into the design of the Proposed Action in order to meet Forest Plan direction.

Suitability for reforestation

Forest plan guidelines advise timber harvesting shall be completed in a fashion that reasonably assures each harvest area can be adequately restocked within 5 years after final harvest (FW-358). Replanting would occur to a minimum of 125 trees per acre (FW361-363) in root rot openings large enough to support resistant tree species establishment. Interplanting would be used to maintain genetic quality and desired species composition (FW-332). The proposed treatments would be consistent with all of the above mentioned standards for reforestation

3.1.5 Summary of Effects by Alternatives

Table 3-10 compares the action and no action alternatives. Compared to the No Action alternative, the Proposed Action would reduce the trees per acre and basal area while still increasing stand QMD and height. Lower TPA and BA result in stands that mimic more natural conditions for these plant associations. Increased diameters and tree heights would move the stands towards late successional characteristics. The stands would also be less vulnerable to large insect and disease outbreaks. With the use of variable density thinning, the stands would be moved towards a more sustainable vegetative condition in regards to species composition and stand structure. Larger openings would increase the regeneration of shade intolerant tree and shrub species. Within the openings, new age classes would be established moving the stand towards a multi-aged stand. Over time lower densities and larger tree heights are maintained in the Proposed Action versus No Action alternative. The QMD of the Proposed Action would drop initially, due to the variety of size classes thinned and because created openings would contribute to an increase in small tree establishment. These small trees would contribute to the stand BA thus lowering the overall QMD. Again, the use of the quadratic mean gives greater weight to larger trees and is equal to or greater than the arithmetic mean.

Table 3-10: Differences between the Action and No Action Alternatives from FVS Modeling

Time After Treatment	BA		TPA		QMD (inch)		Average Height (feet)	
	No Action	Action	No Action	Action	No Action	Action	No Action	Action
2013	279	136	3514	320	5.3	9.7	78	78
2053	363	250	2419	527	7.1	9.5	109	110
2113	415	352	1483	419	10.3	12.5	110	120

3.2 Transportation Resources

More information is available in the project record including the full transportation analysis file as part of the Transportation Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.2.1 Methodology

A Roads Analysis has been developed at the Forest scale (USDA Forest Service, 2003) titled Roads Analysis: Mt. Hood National Forest (Roads Analysis). This document conducted a full analysis of the transportation system at the Forest level and considered the effect of the National Forest System Roads on riparian areas and flood plains, impediment to fish passage at road stream crossings, slope stability, surface erosion and sediment delivery, water quality of municipal water supplies, threatened or endangered species, special habitat connectivity, invasive species and noxious weeds, and operational budgetary constraints. The 2003 Roads Analysis has in turn been utilized to inform the development of road Access and Travel Management Guidelines (ATMs) and to develop Road Management Objectives (RMOs) for each segment of road on the Mt. Hood National Forest. Road management decisions at the Forest and District levels are informed by this analysis and adhere to these guidelines and objectives wherever feasible. This document is incorporated by reference into this specialist report and is available on the Forest website at: http://www.fs.usda.gov/main/mthood/landmanagement /planning.

In addition to the Forest Roads Analysis, this project takes into consideration the effects and recommendations documented in the East Fork Hood River and Middle Fork Hood River Watershed Analysis (USDA Forest Service Pacific Northwest Region, 1996) and is further focused by project specific information obtained by observations and measurements taken in the field during the 2012 summer and autumn field season. This report is a project level analysis intended to document the effects of and on National Forest System Roads within the project area, and helps ensure that the future road system can be one that is safe, environmentally sound, efficient, and cost effective from a transportation perspective.

Reconstruction and maintenance for timber sales is limited to the proportionate share of the total traffic on a road (Commensurate Share Policy). The Commensurate Share Policy (Forest Service policy) is used to determine maintenance and reconstruction responsibilities for any project that has commercial haul. Under this policy, all competing users would be assessed their commensurate share of responsibility for maintenance and reconstruction. The commensurate share of responsibility for any given commercial haul is determined by examining typical structural degradation of roads under heavy haul.

For considering structural design of the subgrade, base, and surfacing of roads, the weight-per-axel loading of typical log haul trucks over the life of the timber sale is calculated using an estimated volume of timber passed over each segment of roadway [critical design vehicle per AASHTO's "Policy on Geometric Design of Highways and Streets" (AASHTO, 2004) and "Geometric Design of Very Low-Volume Local Roads; ADT < 400" (AASHTO, 2001)]. The result of this calculation is used to determine structural degradation and maintenance needs of the road system. The calculation is based on the Normal Operating Season, generally from June 1st through October 31st, and excepts unusual conditions which may occur, such as higher than normal moisture content or frozen subgrade (USDA Forest Service Mt. Hood National Forest, 1989).

Determination of road reconstruction needed to safely conduct operations associated with the Proposed Action was made utilizing the standards and guidelines set forth in the following documents with authority under 36 CFR Parts 212, 251, 261, and 295:

- Roads Analysis: Mt. Hood National Forest;
- Forest Service Manual (FSM) 7700 – Travel Management;
- FSM 7710 – Travel Planning;
- FSM 7730 – Transportation System Road Operation and Maintenance
- Highway Safety Act of 1966 (P.L. 89-564) in compliance with applicable Highway Safety Program Guidelines, as specified in the Memorandum of Understanding found in FSM 1535.11;
- Forest Service Handbook (FSH) 7709.55 – Travel Analysis Handbook;
- FSH 7709.58 – Transportation System Maintenance Handbook; and,
- FSH 7709.59 – Transportation System Operations Handbook.

All of these documents are available in the project record, located at the Hood River Ranger District in Parkdale, Oregon.

Costs associated with needed road reconstruction were estimated by utilizing the process and format outlined in "Cost Estimating Guide for Road Construction: Cost Guide Zone 5, Davis Bacon Area 5" (USDA Forest Service Region 6, April 2002) and by applying equipment and labor costs from updated tables of the same cost guide.

Quantities shown in this report were compiled using data from the Region 6, Mt. Hood National Forest, INFRA database, the Transportation GIS Geodatabase, the Hood River Ranger District Roads and Topography Map, and measurements and observations taken in the field.

3.2.2 Existing Conditions

Road Densities

The Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) guides all natural resource management activities and establishes management standards and guidelines for the Forest. It describes resource management practices, levels of resource production and management, and the availability and sustainability of lands for resource management. One of the key guidelines set forth within the Forest Plan that affects the Forest Transportation System is the setting of target road densities, measured in linear road miles per square mile of area, for each Land Use Allocation (LUA) category. Chapter 1 provides more details on the Forest Plan and each land use allocation. The Land Use Allocation categories applicable to this project are shown in the table below, with designations and target road densities represented as follows:

Table 3-11: Project Area Land Use Allocations and Associated Road Density Targets

Land Use Allocation	Road Density Requirement (miles / square mile)
A4 – Special Interest Areas	n/a
B1 – Wild, Scenic, and Recreational Rivers	n/a

B2 – Scenic Viewsheds	1.5*
B3 – Roaded Recreation	n/a
B5 – Pileated Woodpecker/Pine Martin Habitat Area	2.0
B6 – Special Emphasis Watershed	n/a
B10 – Deer and Elk Winter Range	1.5*
C1 – Timber Emphasis	n/a

* Prescribed road density is a seasonal density determined as being between the dates of December 1 and April 1 (winter closures).

The following table presents data for the road densities in each category as it exists in the field as of June 2013. The target densities for each category, as prescribed by the Mt. Hood Forest Plan, are presented below the table.

Table 3-12: Existing Road Densities Data Table

Unit of Measure	Land Use Allocation								
	Project	A4	B1	B2	B3	B5	B6	B10	C1
Acres	13,800	1,152	1,096	2,962	546	1,258	255	36	8,850
Square Miles	21.6	1.8	1.7	4.6	0.9	2.0	0.4	0.1	13.8
Total Road Linear Miles	59.4	0.7	1.9	15.0	1.5	4.5	0.5	0.1	41.7
Open Road Linear Miles	49.3	0.3	1.9	11.9	1.2	4.0	0.3	0.1	38.2
Open Road Linear Miles (December 1 to April 1)	46.9	0.3	1.9	10.6	1.2	4.0	0.3	0.1	37.1
Total Miles / Square Mile	2.8	0.4	1.1	3.2	1.8	2.3	1.2	2.3	3.0
Open Road Miles / Square Mile	2.3	0.2	1.1	2.6	1.4	2.0	0.8	2.3	2.8
Open Miles / Square Mile (December 1 to April 1)	2.2	0.2	1.1	2.3	1.4	2.0	0.8	2.3	2.7
Forest Plan Max. Open Road Miles / Square Mile	2.5	NA	NA	1.5*	NA	2.0	NA	1.5*	NA

* Prescribed road density is a seasonal density determined as being between the dates of December 1 and April 1 (winter closures).

Notes:

1. Open road miles per square mile are within the overall allowable range as defined by the LRMP, Mt. Hood National Forest, 1990, however, open road densities are above the established target for the B2 and B10 LUA's.
2. There are no defined limitations on open road miles per square mile for the A4, B1, B3, B6 or C1 allocation categories.
3. In addition to the LUA's listed in Table 3-12 the Forest Plan also identifies Inventoried Deer and Elk Winter Range outside of the B10 LUA with a road density target of no more than 2.0 miles of open road per square mile. Within Inventoried Deer and Elk Winter Range the current open road density is 1.3 miles per square mile.

As demonstrated in the preceding table, the road system within the project area meets or exceeds the open road density targets for each Land Use Allocation as it currently exists, with the exceptions of the B2 and B10 allocations.

Road and Trail Use Designations (Motorized Traffic)

The Regional Forester for Region 6 has issued a letter, dated April 23, 2012, with the subject line "Documentation of Existing Roads Information in Environmental Analysis". The letter, "…provides direction regarding roads, trails, and motorized use data that should be included in baseline information and analyses for all projects in the Pacific Northwest Region that may affect species listed under the Endangered Species Act (ESA). Data to be documented and analyzed includes: acres open to motorized cross-country travel (if any), mile of roads and trails, miles of roads and trails within Riparian Areas as defined in applicable Forest Plans (RHCAs or Riparian Reserves), and total number of stream crossings." The following table presents this information as it exists in the field within the Red Hill Restoration project area. Miles by designated use within the project area were determined using the Motor Vehicle Use Map: Mt. Hood National Forest, sections F3 and F2.

Table 3-13: Existing Motorized Route Designations

Route Miles, Stream Crossings, and Routes in RHCAs	Existing Condition
Project Action Area - Non-Wilderness (Acres)	**13,800**
Action Area Open to Motorized Cross-country Travel (Acres)	**0**
Grand Total Motorized Route: System Miles	**89.8**
1. Total Miles of Roads	**89.8**
a. Miles designated as open yearlong	80.7
b. Miles designated as open seasonally	0
c. Miles designated as closed yearlong (ML1)	9.1
2. Total Miles of Motorized Trails	**0**
a. Miles of designated roads open year round for use of OHV‟s	0
b. Miles of designated road open seasonally for use of OHV‟s	0
c. Miles of trail available for use by OHVs < 50 in wide	0
d. Miles of trail available for use by OHVs > 50 in wide	0
e. Miles of trail designated for motorcycle use	0
3. Total Miles of Routes in Riparian Reserves	**0**
a. Total miles of designated open OHV trails in Riparian	0
b. Total miles of designated open roads in Riparian	0
c. Total miles of designated closed OHV trails in Riparian	0
d. Total miles of designated closed roads in Riparian (ML 1)	0
4. Total Stream Crossings by Designated Route	**42**

Route Miles, Stream Crossings, and Routes in RHCAs	Existing Condition
a. Total number of open OHV trail stream crossings	0
b. Total number of open road stream crossings	41
c. Total number of closed OHV trail stream crossings	0
d. Total number of closed road (ML1) stream crossings	1
5. Total Miles of Designated Routes Available to OHVs	**0**

As demonstrated in the preceding tables, (1) there are no OHV designated routes within the project area, and (2) there are no routes that fall within Riparian Reserves on this project. Road-stream crossings within the project area are being analyzed by the Water Quality and Fisheries Specialist Reports for this project. Given these facts, and since other information related to road miles will be presented later in road density tables, no further discussion of road use designations will be presented in this report.

Road Conditions

The Forest's transportation system provides multi-use access for trans-forest travelers, the recreating public, commercial users, and administrative users. System roads within the Forest range from Maintenance Level 5 (commonly paved or continuously dust controlled for travel at speeds of nominally 35 mph) to Maintenance Level 1 (storage roads closed to public traffic and not maintained for use), and include asphalt paved roads, aggregate (gravel) surfaced roads, improved (stabilized or pit-run aggregate) roads, and native surface roads. Maintenance for these roads is conducted utilizing appropriated funding, which is prioritized to focus on maintenance for those roads which accommodate higher levels of traffic and are commonly used by passenger vehicles. Funding for the maintenance and reconstruction of lower priority, low volume roads used primarily for commercial and administrative use is provided for, in multiple ways, through the commercial value of timber. This timber may provide revenue directly as a product derived from C1 allocated timber emphasis lands, or indirectly as a by-product of restoration work done on lands allocated for other management objectives.

However, across the Forest funding for road maintenance is lower than the level needed to properly maintain the approximate 3000 miles of open roads on the Forest. The Forest-wide Roads Analysis identified, for approximately half of the road system existing at that time, the need to change maintenance levels to lower standards, to store roads in a maintenance level one category, or to decommission roads. In April of 1981 the "Reduced Road Reconstruction Policy" was implemented on the Mt. Hood National Forest with stated objective of reducing the total cost of developing, maintaining, and operating the transportation system. The policy statement from FSM 7730 - Transportation System Road Operation and Maintenance:

7730.3 (b) Existing Road Reconstruction

(1) Existing roads not meeting Forest Service Manual (FSM) requirements now or for future critical elements may be operated without reconstruction when the Forest Engineer determines the inadequacies can be mitigated (made less severe) by

(a) User scheduling (sale or public);

(b) Maintenance; and

(c) Adequate traffic devices that identify the hazards.

System roads within the planning area range from Maintenance Level 4 to Maintenance Level 1 and include asphalt paved roads, aggregate surfaced roads, improved roads, and native surface roads. Maintenance Levels are defined as follows:

- 4 – Higher consideration than level 3 is given to comfort and convenience of the passenger car and commercial user at prudent driving speeds above 25 mph with positive surface drainage and surface that is cross sloped or crowned.
- 3 – Minimum conditions are provided for passenger car use. Surface provides moderately convenient travel at prudent driving speeds between 15 and 25 mph with corresponding surface roughness tolerated.
- 2 – Conditions are suitable for high clearance vehicle travel at prudent driving speeds less than 15 mph.
- 1 – Road is treated for hydrologic stability and placed in storage for administrative use at a future time. Road is not maintained for public use.

Due to the recent downturn in the economy and the resulting decrease in budgets, appropriated funding tends to be allocated to maintaining the higher volume roads designated as Maintenance levels 3, 4, and 5. Consequently roads with lower level maintenance designations have been largely neglected in spite of the volume of traffic that they receive. Roads such as National Forest System Road (NFSR) 1650, which leads to the popular Vista Ridge Trailhead and receives relatively large amounts of traffic compared to other roads with the same maintenance level designation, are in need of maintenance that has not been funded. Along NFSRs 1610630, 1611, 1630, 1631, 1640, 1640630, and 1640660 vegetative growth along the roadside has begun to encroach upon the road prism, limiting sight distances around horizontal curves and creating a hazardous condition for road users. Ditch lines and drainage structures along the roadway are blocked by trees which have grown in excess of 4 inches in diameter, causing these drainage features to operate inadequately or fail, resulting in ponding and surface erosion that increases the delivery of sediments and contaminants to streams and degrades water quality. Even paved roads such as NFSR 1600 have begun to deteriorate to a point where passage by high clearance vehicles is hazardous and commercial heavy haul would be impassable under current conditions. This road has multiple fill slope failures and full width structural failures resulting from inadequate drainage, organic material in the subgrade, and from vegetation growing up through the paved surface. In more extreme cases, aggregate and native surface roads such as NFSRs 1640660, 1631630, and 1650651 have eroded and degraded to a point where the road is difficult to navigate even in a high clearance vehicle. These roads are well rutted and exhibit signs of severe erosion.

As well as reduced maintenance resulting from budgetary constraints, haul outside of the Normal Operating Season has had substantial detrimental effects on the transportation system. Heavy haul of materials is the most impactful action regularly applied to the transportation resource. The amount of moisture present in the subgrade or base course of a road is a primary concern. Given the existing conditions and life expectancy of these National Forest System Roads, heavy haul under wet weather conditions could compromise the structural integrity of the road prism. Past commercial haul over the roadway during wet weather conditions has weakened the load bearing capacity of aggregate surfaced as well as asphalt surfaced roads. Once compromised, even normal traffic during wet weather conditions is likely to cause further damage. Continued heavy haul on compromised roads with saturated or near saturated subgrades would accelerate the rate of damage to the transportation resource as well as to other natural resources.

Past hauling during winter, under freeze/thaw conditions, has damaged the road's structural integrity as well. As frost penetrates into the road prism, it draws moisture from the road bed up into the road base and subgrade materials, saturating the aggregate nearly to or beyond its plastic limit. As the water freezes and expands, it breaks apart the particles in the aggregate reducing the roadway compaction and degrading the aggregate's design gradation. Under these conditions, a truck at or near the legal limit of 80,000 pounds traveling over the road surface would produce five times more stress on the travel way than it would during optimum moisture conditions (USDA Forest Service Technology and Development Program, 1995).

3.2.3 Effects Analysis

Direct and Indirect Effects - No Action

The No Action Alternative would involve no haul of commercial wood fiber. Since heavy haul of materials is the most impactful action regularly applied to the transportation resource, the No Action Alternative would result in no additional wear and tear on the roads within the project area. The only wear and tear that would occur would come from trans-forest travel, recreation, and administrative use; normally in passenger vehicles. This would benefit the transportation resource to a certain degree, but would not be able to address current maintenance and reconstruction needs on this portion of the Forest.

Due to current budget prioritizations, no action on this proposed project would mean that none of the road maintenance and reconstruction planned under this proposal would occur. Lack of road maintenance exhibits a strong adverse effect with respect to both safety and the environment. Road surface, road subgrade, and road base failures present physical hazards to drivers, reduce a driver's ability to maintain positive control of a vehicle, and increase the potential for the development of erosion hazards on road slopes including soil slumps and slides due to pooling of water and increased soil saturation in the road bed (USDA Forest Service Engineering Staff Washington D.C., 1994). Failed or poorly functioning drainage systems increase sedimentation in streams and waterways due to their failure to properly mitigate erosion. They also increase the likelihood of waterway contamination from vehicular fluids due to water being forced onto the traveled way of roads prior to draining into natural stream courses. Unbrushed roadways also present an additional safety hazard to road users due to decreased sight/stopping distance (AASHTO, 2001). 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 within the same time frame as the proposed action (issues would become or continue to be Deferred Maintenance).

Since this alternative would not include cutting of wood fiber, there would be no need for the construction or reconstruction of temporary roads. This would be considered a beneficial effect with respect to habitat connectivity, potential erosion, and soil compaction, but this preventative measure represents a lesser benefit, ecologically speaking, when measured by mileage differential between the proposed action and this alternative. Since there would be no need for access to proposed units, the absence of temporary roads would have no direct impact to the transportation resource.

This alternative would not include system road status changes such as road closures or decommissionings, 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. 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 increasing difficult due to lack of road maintenance and lack of funding sources with the capability of appropriately addressing road reconstruction issues. Unauthorized use by Off-Highway-Vehicles (OHVs) of roads proposed for decommissioning would continue unabated. It should be noted, though, that this action alternative would not necessarily preclude the consideration of these road status changes as independent projects or projects that could receive analysis and consideration under other restoration or reconstruction projects as appropriate.

Road densities and road use designations would both remain unchanged with no action. As demonstrated with our existing conditions data, road densities are within target parameters for the project area and there are no designated OHV use roads or trails within the project area. So, in these respects, the no action alternative has no substantial effect at all, neither beneficial nor detrimental.

Direct and Indirect Effects - Proposed Action

The Proposed Action would involve log haul. The roads within the project area were designed for hauling timber during the Normal Operating Season. Moisture content in the materials of the road base and road subgrade must remain below the soil plasticity limit (AASHTO, 2006; T-87, T-89, T-90, T-99) to remain within design parameters.

For the purpose of this analysis, in order to quantify expected stresses, we can expect weather during the Normal Operating Season to behave within measured norms for the local area (http://www.weatherbase.com/weather/weather.php3?s=664853&refer=&cityname=Mount-Hood-National-Forest-Oregon-United-States-of-America). Then the moisture content of materials within the subgrade of the roadways remains within design parameters. Since commercial haul under this proposal would be limited to the Normal Operating Season to the extent practical, we can expect stresses produced by heavy haul to result in relatively normal wear and tear that does not create undo cost and damage to resources. The Forest Service can also regulate the cause of these types of negative effects through timely enforcement of contract provisions that require log haul to be suspended when wet weather conditions make continued haul unsafe, would contribute to stream sedimentation, or would threaten the integrity of the road’s surface or subgrade. The Project Design Criteria/Mitigation Measures (PDCs) would further mitigate the adverse effects of wet weather or winter condition haul.

A cost analysis for reconstructing main haul roads to withstand winter haul shows that such an undertaking is economically prohibitive and unfeasible for any currently available source of road maintenance or reconstruction funding. As such, the PDCs provide restrictions to the road use outside the normal operating season (See Project Design Criteria).

The following table presents a list of roads that would be utilized for commercial haul on this project and presents a general maintenance/reconstruction regime that would occur for each, along with estimated costs associated with that work.

Table 3-14: System Road Reconstruction and Maintenance

Road	Road Length	Required Road Maint = $	Description
1600	14.1	$335,000	**Maintenance:** Brushing, 80 cubic yards of Ditch Cleaning & Disposal, Clean 20 Culverts, Remove 7 Danger Trees per mile, Pavement Protection at 6 Temporary Road Intersections. **Reconstruction:** Mile post 6.40 – 80' x 8.5', 2' depth, road reconstruction with geotextile reinforcement; resurface with aggregate. Mile post 6.61 - 60' x full width, 3.5' depth, road reconstruction with "rock blanket" underdrain; replace culvert; resurface with asphalt. Mile post 6.85 – 210 'x full width, 2' depth, road reconstruction with "rock blanket" underdrain; resurface with asphalt. Mile post 6.89 - 210' x 15', 2' depth, road reconstruction with geotextile reinforcement; replace culvert; resurface with asphalt. Mile post 7.29 - 140'x10', 2' depth, road reconstruction with geotextile reinforcement; resurface with aggregate. Mile post 8.05 - 150' x full width, 3.5' depth, road reconstruction with "rock blanket" underdrain; resurface with aggregate.
1600015	0.4	$2,400	**Maintenance:** Brushing, Blading, 30 cubic yards Spot Rock. Remove 7 Danger Trees per mile.
1600670	0.7	$5,600	**Maintenance:** Brushing, Blading, 100 cubic yards Spot Rock, Remove 8 Danger Trees per mile.

Road	Road Length	Required Road Maint = $	Description
1610000	9.6	$87,750	**Maintenance:** Brushing, Blading for 3.0 miles, 500 cubic yards Ditch Cleaning & Disposal, Clean 12 Culverts, 500 cubic yards Spot Rock, Remove 7 Danger Trees per mile, Pavement Protection at 13 Temporary Road Intersections. **Reconstruction:** <u>Mile post 1.28</u> - Deep Patch. <u>Mile post 4.49</u> - Road Reconstruction.
1610012	0.6	$3,850	**Maintenance:** Remove & Replace Berm, Brushing & Clearing, Blading, Remove 7 Danger Trees per mile.
1610630	0.3	$15,900	**Maintenance:** Remove 2 Berms, Remove and Replace 8 Water Bars, Blading, Clean 10 Culverts, 200 cubic yards Ditch Cleaning & Disposal, Remove 5 Danger Trees per mile. **Reconstruction:** Specified Road Clearing.
1610640	0.3	$2,100	**Maintenance:** Brushing, Blading, Remove 8 Danger Trees per mile.
1611000	3.0	$26,700	**Maintenance:** Remove Berm Both Ends, Brushing, 500 cubic yards Ditch Cleaning & Disposal, 30 cubic yards Spot Rock for Potholes, Clean 15 Culverts, Remove 7 Danger Trees per mile, Pavement Protection at 3 Temporary Road Intersections. **Reconstruction:** <u>Mile post 1.50</u> - Specified Road Clearing, Ditch Reconditioning.
1612000	3.9	$31,650	**Maintenance:** Brushing, Blading, 100 cubic yards Ditch Cleaning & Disposal, Clean 10 Culverts, 250 cubic yards Spot Rock, Remove 14 Danger Trees per mile.
1612630	1.0	$3,250	**Maintenance:** Brushing, Blading, Remove 7 Danger Trees per mile. Install 11 waterbars after haul.
1612640	1.1	$6,300	**Maintenance:** Brushing, Blading, 75 cubic yards Spot Rock. Remove 8 Danger Trees per mile.
1612650	0.3	$1,500	**Maintenance:** Remove & Replace Guardrail, Clearing, and Blading. Remove 7 Danger Trees per mile.

Road	Road Length	Required Road Maint = $	Description
1630000	3.4	$24,300	**Maintenance:** Blading, 2.00 miles Brushing, 120 cubic yards Ditch Cleaning & Disposal, Clean 10 Culverts, 200 cubic yards Spot Rock, Remove 18 Danger Trees per mile. **Reconstruction:** 1.42 miles Specified Road Clearing
1630660	0.3	$1,700	**Maintenance:** Brushing, Blading, 20 cubic yards Spot Rock. Remove 8 Danger Trees per mile.
1631000	1.1	$6,500	**Maintenance:** Blading, 75 cubic yards Ditch Cleaning & Disposal, Clean 2 culverts, Clean/Recondition 3 Culverts, Remove 104 Danger Trees per mile. **Reconstruction:** Specified Road Clearing
1631630	0.3	$5,950	**Maintenance:** (Dollar Quarry Access) Blading, Brushing, 100 cubic yards Spot Rock, Remove 7 Danger Trees per mile, install 4 Drivable Dips.
1640000	0.9	$11,300	**Maintenance:** Blading, Brushing for 0.22 miles, 100 cubic yards Ditch Cleaning & Disposal, Clean 12 Culverts, 20 cubic yards Spot Rock, Remove 52 Danger Trees per mile. **Reconstruction:** Specified Road Clearing
1640620	1.3	$8,200	**Maintenance:** Blading, Brushing, Clean 5 Culverts, Remove 7 Danger Trees per mile. **Reconstruction:** Mile Post 0.70 - Reconstruct Fill Failure
1640630	0.4	$4,500	**Maintenance:** Blading, Clean 7 Culverts, 40 cubic yards Spot Rock, Remove 35 Danger Trees per mile. **Reconstruction:** Specified Road Clearing Disposal Point at Terminus for Unsuitable Material.
1650000	3.5	$16,050	**Maintenance:** Blading, Brushing, 190 cubic yards Spot Rock, Remove 7 Danger Trees per mile.
1650650	0.5	$2,450	**Maintenance:** Blading, Brushing, 50 cubic yards Spot Rock, Remove 7 Danger Trees per mile.
1800000	3.4	$4,100	**Maintenance:** Brushing

In addition to National Forest System Roads, the project intends to utilize temporary roads. Temporary roads are constructed upon stable native soils and are intended for project use only. These temporary access roads are built or reconstructed in order to access landings needed for logging, and are rehabilitated upon completion of logging in each unit.

To minimize impacts to the environment and natural resources, pre-existing temporary road alignments and alignments of previously decommissioned system roads are utilized wherever practical. There are cases where it is not feasible or it is undesirable to use the same alignments or landings. In some places, in order to protect residual trees, soil, and water, new temporary roads are proposed to access landings where existing system roads and old alignments are not adequate for accessing strategic locations on the ground.

After use, temporary roads would be bermed at the entrance, water barred, decompacted, and roughened as needed with the jaws of a loader or excavator. Debris such as root wads, slash, logs, or boulders would be placed near the entrance and along the first portion of the road. The following table and accompanying notes present the proposed temporary roads to be utilized by timber unit (road lengths are approximate).

Table 3-15: Temporary Road Construction

Temporary Road		Unit #	Notes
Road #	Length (mi)		
1	0.29	1	Existing Temp Road
2	0.36	1	Existing Temp Road
3	0.22	1	Existing Temp Road
4	0.15	1	New Temp Road
5	0.21	10	Existing Temp Road
6	0.08	10	Existing Temp Road
7	0.08	10	Existing Temp Road
8	0.22	11	Existing Temp Road
9	0.20	12	Existing Temp Road
10	0.07	12	Existing Temp Road
11	0.85	13, 14	Existing Temp Road
14	0.20	18	Existing Temp Road
15	0.54	19	Old NFSR 1600.012
16	0.15	20	Old NFSR 1630.670
17	0.15	21	Existing Temp Road
18	0.61	27	Existing Temp Road
19	0.20	27	Existing Temp Road

Temporary Road		Unit #	Notes
Road #	Length (mi)		
20	0.13	27	Existing Temp Road
21	0.68	27, 55	Old NFSR 1600.680
22	0.10	28	Existing Temp Road
23	0.05	28	Existing Temp Road
24	0.17	29	Existing Temp Road
25	0.21	29	Existing Temp Road
26	0.16	30	Old NFSR 1612.634
27	0.11	30	Old NFSR 1612.636
28	0.04	30	Old NFSR 1612.632
29	0.07	30	New Temp Road
30	0.25	31	Existing Temp Road
31	0.28	31	Existing Temp Road
32	0.27	32	Existing Temp Road
33	0.44	32, 33	Existing Temp Road
34	0.11	33	Existing Temp Road
35	0.16	33	Existing Temp Road
36	0.21	33	New Temp Road
37	0.11	34	Existing Temp Road
38	0.53	4	Existing Temp Road
39	0.44	4	Existing Temp Road
40	0.44	42	Existing Temp Road
42	0.16	43	Existing Temp Road
43	0.16	43	Existing Temp Road
44	0.07	43	Existing Temp Road
45	0.13	43	Existing Temp Road
46	0.13	44	Existing Temp Road
47	0.17	47	Existing Temp Road
48	0.22	47	Existing Temp Road
49	0.13	47	New Temp Road
50	0.32	48	Existing Temp Road
51	0.34	48	Existing Temp Road

Temporary Road		Unit #	Notes
Road #	Length (mi)		
52	0.16	48	New Temp Road
53	0.08	53	Existing Temp Road
54	0.34	54	Old NFSR 1600.671
55	0.18	54	Existing Temp Road
56	0.10	58	Existing Temp Road
57	0.19	6	New Temp Road
58	0.46	6, 10	Existing Temp Road
59	0.08	6, 10	Existing Temp Road
60	0.22	6, 10	Existing Temp Road
61	0.37	6, 7, 10	Existing Temp Road
62	0.17	8	Existing Temp Road
63	0.05	8	Existing Temp Road
64	0.24	8	Old NFSR 1630.620
65	0.32	8, 10	Existing Temp Road
66	0.08	9	New Temp Road
67	0.27	44	Old NFSR 1612.011

The proposed project would decommission or close a number of system roads within the project area. Site-specific treatments would be tailored to site-specific conditions using one or more of the following treatments:

1. Seasonal Closure – Install a gate to provide seasonal access or closure as needed (remains a system road at current maintenance level).
2. Administrative Closure – Install a gate to provide intermittent administrative access as needed, becomes closed to public use year-round (remains a system road at current maintenance level).
3. Maintenance Level 1 Closure – Install a berm or gate (remains a system road at maintenance level 1).
4. Stormproofing – Install waterbars or other structures to provide drainage (remains a system road); Retain culverts unless specified; Reduce the depth of fill material over culverts, where appropriate.
5. Passive decommission with entrance management – Install one or more large earth berms or deep trenches, deeply decompacting approximately 1/8 mile; Retain culverts unless specified.
6. Active decommission with stabilization – Remove culverts, reestablish former drainage patterns or natural contours at stream channels, install water bars, remove gravel surfacing, decompact road surfaces, pull back unstable fill slopes or road shoulders, scatter slash on the roadbed, apply erosion control mulch and seed on disturbed areas, and

block and disguise the former road entrance to prevent motorized vehicle traffic.

Table 3-16: Road Treatments within Project Area

Decommissionings	
Road Number	**Length (Miles)**
1610012	0.3
1612670	0.9
1630660	0.4
1640620	0.5
Total	**2.1**

Year Round Road Closures	
Road Number	**Length (Miles)**
1600014	0.3
1600015	0.4
1610011	0.4
1610630	1.0
1610640	0.6
1610650	0.2
1610670	0.2
1611000	2.9
1612630	1.0
1612650	0.3
1631000	1.1
1631620	0.4
1631630	0.2
1640630	0.6
1640660	1.4
3511012	0.7
3511620	1.4
3511620	1.1
3511621	1.2
Total	**15.4**

Seasonal Road Closures	
Road Number	**Length (Miles)**
1612640	1.8
1630660	1.4
1631000	0.9
1640000	0.2
1640000	1.4
1640620	1.3
Total	**7.0**

These road closures and decommissionings, as informed by the ATM guidelines, the RMOs, the Forest Plan, and the Watershed Analysis, are intended to produce direct beneficial effects in terms of erosion prevention, aquatic and terrestrial habitat connectivity, and reduced road maintenance liability. Concurrently, due to the amount of money that would be spent to implement these status changes, it is expected that the Proposed Action would have a short-term stimulative economic effect in the local area in terms of jobs during implementation.

With regard to access and displacement, these status changes affect roads that receive no use by trans-forest travelers and low use by the recreating public. When considering the volume and frequency of road use on all types of closures and decommissionings overall by use category, access to management areas by commercial and administrative users would be the categories most heavily affected by the changes. The recreational traffic on these roads is very low. Hunters and campers in the area would still be permitted access to their traditional recreational grounds, but would need to access those grounds by means other than motorized vehicles. Roads designated for seasonal winter closures for deer and elk winter range are for the protection of the indicated species and are closed from December 1 to April 1, but are open to the public the remainder of the year. This implements limited displacement of hunters, winter recreation users such as snowmobilers, and limits potential winter haul of commercial products. Since these roads are only closed to motorized traffic, other winter recreational users such as cross-country skiers and dogsledders would not be displaced. Roads designated for seasonal huckleberry closures, on the other hand, would remain closed for the majority of the year, being open to the public only during huckleberry gathering season. NFSR 1640 provides access to ongoing seismic and volcanic study and monitoring, but the installation of a gate on this seasonal closure road would provide administrative access when needed.

This action would also have an effect on road densities within the area. The following table presents data for the road densities in each category as they would exist as a result of the Proposed Action:

Table 3-17: Project Road Densities as a Result of Proposed Action

Unit of Measure	Land Use Allocation								
	Project	**A4**	**B1**	**B2**	**B3**	**B5**	**B6**	**B10**	**C1**
Acres	13,800	1,152	1,096	2,962	546	1,258	255	36	8,850
Square Miles	21.6	1.8	1.7	4.6	0.9	2.0	0.4	0.1	13.8
Total Road Linear Miles	57.3	0.7	1.9	15.0	1.5	4.2	0.2	0.1	40.1
Open Road Linear Miles	39.5	0.3	1.9	9.2	1.2	3.6	0.0	0.1	28.9
Open Road Linear Miles (December 1 to April 1)	32.1	0.3	1.9	8.8	1.2	3.6	0.0	0.1	21.8
Total Miles / Square Mile	2.7	0.4	1.7	3.2	1.8	2.1	0.5	2.3	2.9
Open Road Miles / Square Mile	1.8	0.2	1.7	2.0	1.4	1.8	0.1	2.3	2.1
Open Road Miles / Square Mile (December 1 to April 1)	1.5	0.2	1.7	1.9	1.4	1.8	0.1	2.3	1.6
Forest Plan Max. Open Road Miles / Square Mile	2.5	NA	NA	1.5*	NA	2.0	NA	1.5*	NA

* - Prescribed road density is a seasonal density determined as being between the dates of December 1 and April 1 (winter closures).

This change represents a 32 percent reduction to the combined road density for the overall project area. The Proposed Action would reduce road density by 17 percent within the B2 - Scenic Viewshed allocation, though the resulting road density misses the Forest Plan target (seasonal) by 0.4 miles per square mile. The Proposed Action also reduces road densities by 10 percent within the B5 - Pileated Woodpecker/Pine Martin Habitat allocation, by 87 percent in the B6 – Special Emphasis Watershed allocation, and by 41 percent in the C1 – Timber Emphasis allocation. Open road densities for the A4 – Special Interest Area allocation, the B1 – Wild, Scenic, and Recreational Rivers, and the B10 – Deer and Elk Winter Range allocation remain unchanged. Road densities within the B5 allocation exceed the Forest Plan target density by 0.2 miles per square mile as a result of the Proposed Action, while road densities within the B10 allocation miss the Forest Plan target by 0.8 miles per square mile. However, B10 allocated lands consist of only 36 acres with a short segment (approximately 0.1 miles) of NFSR 2840 existing within the B10 allocation in this planning area, resulting in an unrepresentatively high road density that cannot be reduced at this time due to access needs.

Cumulative Effects

The spatial scale analyzed for cumulative effects is the planning area, and the temporal scale is five to ten years based on the anticipated effects associated with road maintenance activities. Roads require regular maintenance to function effectively because maintenance work, by definition, has a limited effect over time. The duration of these effects would vary case-by-case depending on the road surface, geologic stability of the site, type and volume of traffic, and weather conditions, but road maintenance work conducted at any given time can be expected to contribute to the effective functionality of a road prism for an average of about two to three years, in this area, before some road functions begin to deteriorate appreciably.

No wood fiber harvest activities have taken place in the project area within the last four years on federal lands. Within the next five to ten years we can expect to see harvest and restoration activities occurring in conjunction with the proposed Red Hill Restoration project that would overlap in time and space with this proposed action. Commercial haul of materials and road maintenance work, as well as possible road reconstruction projects, can be expected to take place on NFSRs 1600, 1600670, 1640, 1650, 1650650, and 1650651. Road status changes such as decommissioning or closure of these roads, which has been analyzed under this Proposed Action would be delayed until completion of operations under both proposed actions to avoid waste and inefficient use of government funds. This future project has very similar Project Design Criteria to protect resources and mitigate erosion and sediment delivery to streams, and should comply with all clean water Best Management Practices and conform to accepted engineering design standards. Therefore, it is assumed that these activities would have similar or identical effects with respect to the Transportation Resource.

Given the spatial and temporal boundaries, it is expected that private wood harvest activities would take place on the adjacent lands and inholdings. These activities would conduct haul over roads within the project area that may overlap in time and space with the haul associated with this project. While the Forest Service does not have enough data to accurately measure the effects of these private industry activities, the Forest Service utilizes Road Use Permits issued to these private companies to implement similar requirements for road maintenance and road use regulations that mimic the transportation Project Design Criteria. Because permitted private haul on Forest roads is mostly limited to collector routes and primary haul routes, the maintenance work that would be conducted under this Proposed Action and maintenance work conducted by private parties would have very limited overlap in time and space and any cumulative effects produced by maintenance work is expected to be negligible. Therefore, it is assumed this type of haul would have similar or identical effects as the Proposed Action with respect to the transportation resource.

The Forest-Wide Restoration project can also be expected to perform restoration activities that involve road reconstruction work within the Lava planning area that may overlap in time as well. With respect to the Transportation Resource this involves primarily aquatic organism passage projects along NFSRs 1600 and 1800. The primary implications for the transportation system involve safety and logistical mitigations such as temporary traffic control, construction of work area bypasses, or detour routes. This presents only minor inconvenience for recreational, commercial, and trans-forest travelers in the form of five to twenty minute delays in travel time. The roadway improvements that would take place at these locations is so limited in terms of spatial area that the effect of the improvements would be negligible, and we should not expect any transportation effects to culminate from this project.

3.2.4 Consistency Determination

The Proposed Action, with respect to the transportation resource, has been reviewed for consistency with the Forest Plan. All Proposed Actions related to the Forest Transportation System are consistent with the Forestwide Transportation Standards and Guidelines; A2-102 through A2-104, A4-036, 038, 042, and 044, B1-008, B1-077 through B1-079, B2-053 through 055, B2-058 though B2-062, B3-035, B5-032, 033, and 035, FW-407 through FW-411, FW-413 through FW-416, FW-419 through FW-434, and FW-436.

The Forest-wide Roads Analysis (2003) and the project specific transportation analysis documented in this report implements guideline FW-416.

All system road decommissioning decisions would be made following the guidance provided under FW-432.

All temporary roads constructed for project use under the Proposed Action would be obliterated and/or blocked and treated to meet or exceed the standards of FW-433 and FW-436.

All other standards and guidelines under the Forest Plan are specifically addressed and enforced through contract provisions included with each individual timber sale, stewardship project, or public works contract and/or the stated Project Design Criteria.

3.2.5 Summary of Effects by Alternative

Summary of Effects - No Action

The No Action alternative for this project would have no heavy haul of materials, no road reconstruction or maintenance, no construction of temporary roads, and no road closures or road decommissionings.

Lack of road maintenance would have several measurable detrimental effects on the Forest's transportation resource. As deferred maintenance would continue to increase while funding for road maintenance continues to decrease, the condition of system roads within the project area would begin to deteriorate over time, resulting in increased cost to the taxpayer. Road maintenance issues are likely to become road reconstruction issues in times of immediate need. Fire suppression activities, search and rescue operations, and utility infrastructure maintenance/repair activities would be hindered to varying degrees. Forest access for travel, tourism, recreation, and research in the local area is already being negatively impacted by reduced safety and navigability of the roadways and would continue to decline in the absence of road maintenance and road maintenance funding that is typically provided for by timber purchasers or stewardship contractors.

Unused or little used aggregate and native surface roads that are proposed for closure or decommissioning would be overtaken by vegetation in time, and effectively decommission themselves. This represents a savings to the taxpayer. Drainage culverts would remain, however, and unauthorized OHV use would likely continue as users create their own OHV trails.

Summary of Effects - Proposed Action

The Project Design Criteria (PDCs) for this project have incorporated the requirements of the Fisheries Biological Assessment (with regard to sediment and erosion control and protection of natural resources where road maintenance and road reconstruction is concerned) and implement the guidance of the Northwest Forest Plan. The Best Management Practices (BMPs) associated with this project together with the applicable road maintenance specifications (USDAFS, 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. While the Forest Service does not dispute the fact that forest roads contribute to increased erosion and sediment delivery to streams and waterways, we utilize these PDCs, BMPs, and engineering design standards to control, minimize, and mitigate for the known detrimental effects of our National Forest System Roads and temporary project roads. Over the last 60 years research and experience supporting the design, construction, and maintenance of forest roads has focused on minimizing the impacts of these roads on the environment, and a wealth of information exists on the physical effects of roads on hydrologic and geomorphic processes. Key findings of many studies have uncovered factors that can lessen negative effects of roads by better integrating engineering approaches with our knowledge of road effects (USDA Forest Service Pacific Northwest Research Station, 2001) (Rice, 1992) (USDA Forest Service Intermountain Forest and Experiment Station, 1989) (Swift, 1984) (USDA Forest Service Pacific Northwest Research Station, 1980).

Given these measures, the Proposed Action would result in increased effectiveness and overall value of the Forest's transportation system with minimal effect on other resources. Road maintenance and reconstruction work increases the safety and navigability of open system roads for administrative users, commercial users, recreational users, and trans-forest travelers, while decreasing the potential for contamination and sediment delivery to streams and waterways. Road repairs along NFSR 1600 would return subsurface water flows to a more natural condition and allow for water transport to be returned to natural pathways in a manner that reduces the sediment contribution of the roadway to natural water bodies. Transportation management decisions such as road closures and road decommissionings contribute to increased habitat connectivity for both aquatic and terrestrial organisms, while decreasing taxpayer liability for maintenance of these roads that no longer serve critical infrastructure needs. However, the long term impacts of commercial haul and the incremental impacts of public and administrative use would eventually necessitate the reconstruction or decommissioning of any given system road, with the road's life span extended by regular maintenance. The costs associated with road reconstruction are substantially higher than that which could be supported by traditional levels of appropriated road maintenance funding at the District level, and continue to require additional funding sources to complete (See USDAFS 2003 Roads Analysis).

3.3 Geology

More information is available in the project record including the full geology analysis file as part of the Geology Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.3.1 Methodology

The likelihood of thinning-induced landslides occurring within a planned timber harvest unit is determined by inspection of the slope by a slope-stability specialist. All but three of the proposed treatment units where timber removal would occur are located in previous regeneration harvest units (clearcuts) or selective harvest units. Trees have a beneficial effect on slope stability by lowering the groundwater table through evapotranspiration. Tree roots stabilize the upper several feet of soils. Previous regeneration harvest units or selective harvest units that show no signs of shallow or deep-seated post-harvest slope instability are assumed to remain stable after thinning. Areas that have post-harvest signs of instability are dropped from consideration for thinning.

Three of the proposed treatment units where timber removal would occur (units 51, 52, 53) are located in tree stands that have never been harvested before. Each of these units is surrounded or nearly surrounded by previous regeneration harvest units (clearcuts) on similar landforms. The previous regeneration harvest units are examined for signs of shallow or deep-seated post-harvest slope instability. Previous regeneration harvest units that show no signs of shallow or deep-seated post-harvest slope instability suggest that adjacent ground with similar soils, slope angle, and aspect would also remain stable after thinning.

Four units (units 37, 38, 39, 41) are plantations that were burned during the Dollar Lake Fire of 2011. These units are proposed for planting. Planting trees has only a beneficial effect on slope stability.

The determination of landslide incidence after the original unit harvest is accomplished by using historical aerial photos, existing landslide mapping (GIS layer), field reports of landslide incidence by other resource specialists and field visits to selected units by a slope stability specialist.

3.3.2 Existing Condition

The Lava Restoration project area is located on a series of subparallel flat-topped ridges and moderately incised drainages, all generally aligned and sloping downward toward the northeast. All of these landforms are underlain by relatively young volcanic rock, consisting of layers of pyroclastic material topped by lava flows. All this volcanic material originated from vents located to the southwest and flowed toward the northeast. The vents and their products predate the Mount Hood volcano with one exception, the Parkdale Lava Flow. More recent fluvial and glacial erosion has shaped the landscape into its present form.

The andesite lava flows form layers that are resistant to erosion and that often cap present-day ridge crests in this area. This durable but brittle material fractures readily and the numerous fractures allow groundwater to penetrate deep into the flow. The pyroclastic flows consist of tuff breccia, conglomerate, and sandstone. All these rock types have an ashy matrix that is soft and highly erodible. As a result this material tends to weather more rapidly than the andesite lava flows and underlies gentle to moderate slopes. The pyroclastic material is not dense enough to be very brittle and therefore has few fractures. Groundwater cannot easily penetrate into the pyroclastic layers.

The contacts between the andesite lava flows and the pyroclastic flows tend to be mostly planar surfaces that are dipping slightly to the northeast. Groundwater penetrates down through the andesite lava flows until it reaches the contact with the pyroclastic material. Since the groundwater is unable to descend further, it flows downdip along the contact until it daylights onto a hillslope, forming springs or a spring line.

During the last major ice age small glaciers modified the upper Tony Creek and Bear Creek valleys. A large valley glacier, fed by glaciers in the Clear Creek, Coe Branch and Eliot Branch valleys, occupied the Middle Fork Hood River valley, deepening and widening that feature. After the glaciers retreated, removing lateral support to the valley walls, some landslides collapsed down onto the valley floors, particularly along the west valley slopes. Most relevant to this Proposed Action, some landslides collapsed along the west valley slope of the “West Fork” of Bear Creek.

Coe Branch, Eliot Branch, and Middle Fork Hood River are the only drainages within the project area that are still fed by glacier meltwater. Coe Branch and Eliot Branch have a history of large, destructive, weather-induced debris flows. The most recent event was on November 7, 2006.

Within the area covered by this Preliminary Assessment, the highest landslide hazards are:

1. Areas where the lava / pyroclastic contact (or spring line) intersects steep hillslopes; and,

2. Areas within the older post-glacial landslide deposits along the west valley slope of the "West Fork" of Bear Creek. Elsewhere, most hillslopes are less than 50 percent and relatively dry, and any landslide occurrence there is unusual.

The lava / pyroclastic contact crosses 6 of the proposed thinning units: units 3, 4, 15, 19, 27, and 31. Four of the proposed thinning units are located partially within the older post-glacial landslide deposits: units 27 (again), 32, 33, and 55.

Poorly located, poorly constructed, or poorly maintained roads can result in slope stability problems and can result in resource damage. Well located, well-constructed, and well maintained roads would have a minimal effect on slope stability. Most of this area was heavily roaded beginning in the early 1950's and continuing through the 1980's. Road construction practices gradually improved though the decades, but there remain many roads that were poorly located and/or poorly constructed in the past. Without proper maintenance these roads can be a threat to water quality and fish habitat. Beginning in the mid-1970's and continuing to the present, many unstable portions of existing roads have been rebuilt or modified to stabilize the road and the hillslope. More recently, road decommissioning projects have removed many problem sections and reduced the potential for road-related landslides and the resulting adverse effects on water quality and fish habitat.

3.3.3 Effects Analysis

Landslide Analysis

The slope stability specialist visited the nine proposed thinning units determined to be most likely to contain unstable or potentially unstable slopes: Units 3, 4, 15, 19, 27, 31, 32, 33, and 55. Many of these units contain springs and/or shallow subsurface ground water flow, but the combination of wet soils and oversteepened slopes does not occur. In addition, as part of the Proposed Action for Lava Restoration project, all springs and wetlands would be protected by a 60-foot, no-touch protection buffer. The Proposed Action would not initiate new landslides or accelerate movement in old landslide deposits.

Some unstable or potentially unstable areas may be discovered during unit layout. If so, then a slope stability specialist would check the area and guide or assist with unit layout.

No Action - Direct and Indirect Effects

No thinning would occur under the no-action alternative. The overcrowded trees would continue to grow slowly. Road access would remain as it presently exists. No temporary road construction would occur so there would be no increased landslide risk from road construction. Little maintenance or repair of existing roads would be scheduled so there would be an increasing risk of resource damage from the existing road system.

Proposed Action - Direct and Indirect Effects

Under the Proposed Action, thinning would occur in areas that are considered to be stable by a slope stability specialist. Any unstable areas identified during unit layout would be designated as "skips". The thinning would enhance tree growth and tree root growth over the long-term, restoring hill slope stability to original levels. The thinning would likely reduce hill slope stability slightly for a few years after thinning when dying tree roots have not yet been replaced by new root growth, but not by enough to result in new landslides.

Under this alternative about 1.0 miles of new temporary roads would be constructed and 13.7 miles of existing road alignments would be reused as temporary roads. All temporary roads are located on stable ground and their construction or reconstruction would have no perceptible effect on slope stability. These roads would be rehabilitated after use. Existing system roads that would be used for timber haul would be maintained and repaired. These actions would greatly reduce the risk of resource damage from these roads. Decommissioned system roads would total 2.1 miles, year round closed system roads would total 15.4 miles, and another 7.0 miles of road would be seasonally closed.

Properly decommissioned roads reduce the potential for road-related landslides and the resulting adverse effects on water quality and fish habitat. Roads that are properly decommissioned or storm-proofed and closed require no maintenance and therefore allow the limited forest road maintenance funds to be applied more effectively to a smaller road system. Better maintained roads have less environmental impact than poorly maintained roads.

Cumulative Effects

Recent projects or activities within the analysis area include thinning of second growth trees, planting trees, road decommissioning, road repair projects, bridge replacement projects, stream improvement projects, forest fire rehabilitation, and many others. The analysis area is defined as the treatment units and road treatments (including closures, decommissioning, storm proofing and maintenance) for this project. Table 3-1 is a list of recent, current, and future projects or activities that have been tracked in the analysis, including activities on private lands.

Numerous projects listed in Table 3-1 have no effect on slope stability. Many of the projects considered in this analysis have a beneficial effect on slope stability. However, individual projects that disrupt hillslope hydrology and/or decrease tree root strength on steep or moderately steep hillslopes could adversely affect slope stability given the disruption in hydrologic function or the decrease in tree root strength is sufficiently large.

Adverse slope stability effects from two or more projects that are located physically near each other and that occur within a few years of each other could compound the individual project effects and result in a much greater impact. The possibility of multiplying slope stability effects likely only occurs if the individual projects are adjacent and occur within 20 years or less of each other. After 20 years the root strength of a plantation and the stability of the hillslope have nearly returned to pre-harvest levels. For thinning projects the return of root strength to pre-harvest levels can be as short as 10 years. The combination of individual projects that have the potential to adversely affect slope stability and that are close in space and time does not occur with any of the projects considered in this analysis.

In addition, all projects and activities listed above on Forest Service managed land have either been individually considered regarding their effect on slope stability or they obviously have no effect. Any projects with potential adverse effects to slope stability have mitigation measures in place. Timber harvest projects in this area have been previously examined by a slope stability specialist and the unstable portions of the units have been dropped from the project. The thinning projects result in a temporary reduction in the tree canopy, which would very slightly increase peak stream flows in the project area. Stream channels are protected with buffers that mitigate against increases in channel bank instability caused by the slightly higher peak flows. The longer term effect is an increase in slope stability and water quality. Private lands are located downslope and downstream from the Lava Restoration project. No activities on private lands overlap with this project in space and time within the analysis area. Also, no future activities on federal lands overlap with this project in space and time. Therefore, no cumulative effects are expected.

Past, current, and future road repair, maintenance, decommissioning, and closure projects have a beneficial effect on slope stability and water quality. These projects have and would remove a large number of creek crossings and some road segments on potentially unstable ground and allow more road maintenance to occur on the roads that remain. Better maintained roads have less environmental impact than poorly maintained roads. No adverse cumulative effects on road-related slope stability are expected.

The actions and activities of this project, past projects, and reasonably foreseeable future actions in this area combined would have a net beneficial effect on slope stability and water quality. The beneficial effect would last as long as the stands remain healthy. With a stand replacing fire return frequency of 200 years in this area, the beneficial effect of this project on slope stability could last as long.

3.3.4 Consistency Determination

All proposed treatment units, totaling approximately 1908 acres, are within Forest Plan (Mt. Hood Land and Resource Management Plan) land use allocations where Forestwide Geology standards and guidelines apply. The Lava Restoration project is consistent with Forestwide Geology Forest Plan standards and guidelines FW-001 through FW-021. The proposed thinning, planting, road repair, road maintenance, and road decommissioning that is part of this project would maintain the existing slope stability in this area and eventually improve it as thinning enhanced tree growth and tree root growth restore the hill slope stability to pre-development levels.

3.3.5 Summary of Effects by Alternative

Under the No Action alternative, there would be an increasing risk of resource damage from road-related erosion as a result of postponed road maintenance and road repairs. Under the Proposed Action alternative, there would be no perceptible adverse effect on hill slope stability, a beneficial long-term effect on hill slope stability, and the project-related road repair, maintenance and decommissioning would greatly reduce the risk of resource damage from those roads.

3.4 Soil Productivity

More information is available in the project record including the full soils analysis file as part of the Soil Productivity Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.4.1 Methodology

Regional soil productivity protection standards were originally implemented in 1976, and have been revised several times since then, including incorporation into the Mt. Hood Land and Resource Management Plan (Forest Plan) as part of the soil productivity chapter.

Soil distribution across this project area is not very complicated compared with areas just to the south and west. Less than a dozen different soil types are mapped within the north part of the project area; the majorities have no activities proposed on them. Each type of soil is given a soil map unit (number) to show where they occur on a soil map. Then, each soil type is assessed for many risks and hazards called management ratings (e.g. erosion risk, compaction hazard), which are located in the Mt. Hood National Forest Soil Resource Inventory (SRI, Howes, 1979). The scale at which the mapping was produced in the SRI is one inch to the mile, which makes it useful 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 (Figure 3-5) was taken to the field and validated, and no changes were needed to reflect what was observed on the ground.

The methodology used to gather data needed for this effects analysis include field visits as well as previous field experience, including monitoring of activities on these and similar soils. Personal observation and knowledge of how soils respond to the proposed types of management actions was used to predict impacts.

Analysis Approach

The analysis area for soil resources in this Preliminary Assessment (PA) are the proposed treatment unit boundaries. A comparison of alternatives will be conducted using applicable Forest Plan standards and guidelines (Table 3-18) as the method of measure to answer the following questions:

- If the Proposed Action is implemented, what measurable *changes* occur to the soil, and of the changes, which do we use in the analysis to describe the *effect?*
- What are the risks to the soil and related/associated values from the Proposed Action?
- Is it possible to reduce risks through mitigations or project design criteria?
- What are the consequences of taking no action?

Table 3-18: Summary of Forest Plan Soil Standards guiding the soils analysis. Full texts of these standards are on pages 4-49 and 4-50 of the Forest Plan.

FW – 025 (Page 4-49)	In the first year following surface disturbing activities, the percent effective groundcover by soil erosion hazard class should achieve at least the following levels:

Soil Erosion Hazard Class	Effective Groundcover
Slight to Moderate	60%
Severe	75%
Very Severe	85%

FW – 022, 023 (Page 4-49)	The combined cumulative detrimental soil impacts occurring from both past and planned activities should not exceed 15% of an activity area (paraphrased).
FW – 032, 033, 034 (Page 4-50)	Favorable habitat conditions for soil organisms should be maintained for short and long-term soil productivity. At least 15 tons per acre should be maintained and evenly distributed across managed sites (paraphrased).

For this analysis and project type, the following three measures will be used to assess impacts and answer these questions.

1. The risk of erosion and subsequent sedimentation of watercourses.

   Measured by: Erosion Hazard
   The possible impact of concern stemming directly from soil erosion is runoff from bare areas carrying sediment that affect watercourses. This hazard rating is based upon a particular soils' texture, slope, etc. for bare soil. Surface soils across the entire area are very consistent, resulting in similar erosion hazard ratings.

2. The risk of causing detrimental soil conditions such as heavy compaction and intense burning that alter water movement through the soil and reduce site productivity.

   Measured 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 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.

3. The risk of altering the soil biological ecosystem because of 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.

   Measured 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.

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 will also consider restorative actions as well as the Project Design Criteria/Mitigation Measures (PDC) and best management practices 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; skyline lateral yarding and corridors; temporary road use (some 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 treatments (decommissioning, storm proofing, and closures). Other aspects of the Proposed Action would not have a meaningful or measurable effect on soil productivity.

Assumptions

The analysis within this report is based on the following assumptions:

- It is assumed damage on skid trails would not exceed 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; and
- It is assumed ground impacts would take place during the normal operating season, when soil damage risk is lower than for the same activities occurring in winter.

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 and the Billy Bob areas on the Barlow Ranger District).

- 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.
- 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.
- 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 (i.e. not on landings or skid trails).
- Due to higher PSI's than track mounted equipment, no rubber tired skidders should be

used even on skid trails once soils become fully saturated (approach their liquid limit).

3.4.2 Existing Conditions

The productivity and health of entire plant communities depend on the presence of healthy soils. A complex array of soils exists across the overall project area, ranging from unvegetated talus slopes to wetlands to outwash plains and everything in between. They have been derived from glacial deposits of various ages mixed with thin layers of volcanic ash. Where soils are present, surface textures are sandy and loamy, with a noticeable increase in rock content below about 10 inches. Occasionally, there is a compacted glacial till deposit at depth in Upper Tony Creek drainage, but for the most part soils are freely and well drained. Soil types 333 and 115 occur on slopes less than 30 percent with similar soil characteristics. The primary differentiating factor is actually slight changes in elevation, with a corresponding difference in the mapped climax plant association. Soils 334 and 335 are basically the same soil type occurring on different aspects of 60 to 90 percent slopes.

A summary of soil mapping units where activities are proposed and their associated management interpretations is located in Table 3-19 below. All other soil types, where no activities are proposed, are not analyzed in this report. Key observations from the table include:

- All potentially impacted soils have a low to moderate compaction hazard;
- Erosion risk for soils on less than a 30 percent slope range from slight to moderate for undisturbed, bare soil; and,
- Erosion risks for bare soils on greater than a 30 percent slope are rated as moderate.

Table 3-19: Summary of soil types in the analysis area and associated management interpretations from Mt Hood Soil Resource Inventory, adjusted based upon field observations.

SRI Soil Map Units	Compaction Hazard	Erosion Potential (bare surface soil)
333	Low-Moderate	Slight
334*	Low	Moderate
335*	Low	Moderate
115	Moderate	Slight
116*	Low-Moderate	Moderate
117*	Low-Moderate	Moderate

* Greater than 30 percent slope

As defined in the SRI Interpretations Section, Surface Soil Erosion Potential is based on expected losses of surface soil when all vegetative cover, including litter, is removed. Evaluations of climate, slope gradient and length, soil texture and structure, soil permeability, and hydrologic characteristics of the soil and bedrock materials of each mapping unit are considered in making interpretations. Medium to coarse textured soils with rapid permeability and high porosity generally erode less than fine textured soils. However, these soils may be easily displaced by the forces of channeled water.

- A rating of Very Slight means practically no loss of surface soils materials is expected.
- A rating of Slight means little loss of soil materials is expected. Some minor sheet and rill erosion may occur.
- A rating of Moderate means some loss of surface soil materials can be expected. Rill erosion and some small gullies or sheet erosion may be occurring. Sheet erosion can be determined by some soil pedestals and considerable accumulation of soil materials along the upslope edge of rocks and debris. At this level of erosion there is a possible fertility loss.
- A rating of Severe means considerable loss of surface soil materials can be expected. Rill erosion, numerous small gullies, or evidence that considerable loss from sheet erosion may occur. Sheet erosion is indicated by frequent occurrence of soil pedestals and considerable accumulation of soil materials along the upslope edge of rocks and debris. This is accompanied by a probable fertility loss.
- A rating of Very Severe means a large loss of surface soil material can be expected in the form of many large gullies and/or numerous small gullies or large loss from sheet erosion. Sheet erosion loss is exhibited by numerous examples of soil pedestals and extensive accumulation of soil materials along the upslope edge of rocks and debris. This is accompanied by fertility loss.

Compaction Hazard interpretation indicates a soils inherent ability to be compressed by ground yarding equipment to a point where plant growth is either slowed considerably or stopped. Soil factors evaluated in making this interpretation include: Soil texture, structure, bulk density, pore size distribution, and infiltration rate.

- A rating of Low means factors indicate the soil would resist compaction.
- A rating of Moderate means factors indicate the soil has tendencies to become compacted under tractor yarding operations. Time of operation is important on these soil units.
- A rating of High means factors indicate that soil compaction would be severe unless tractor yarding is curtailed until the soil has dried adequately.

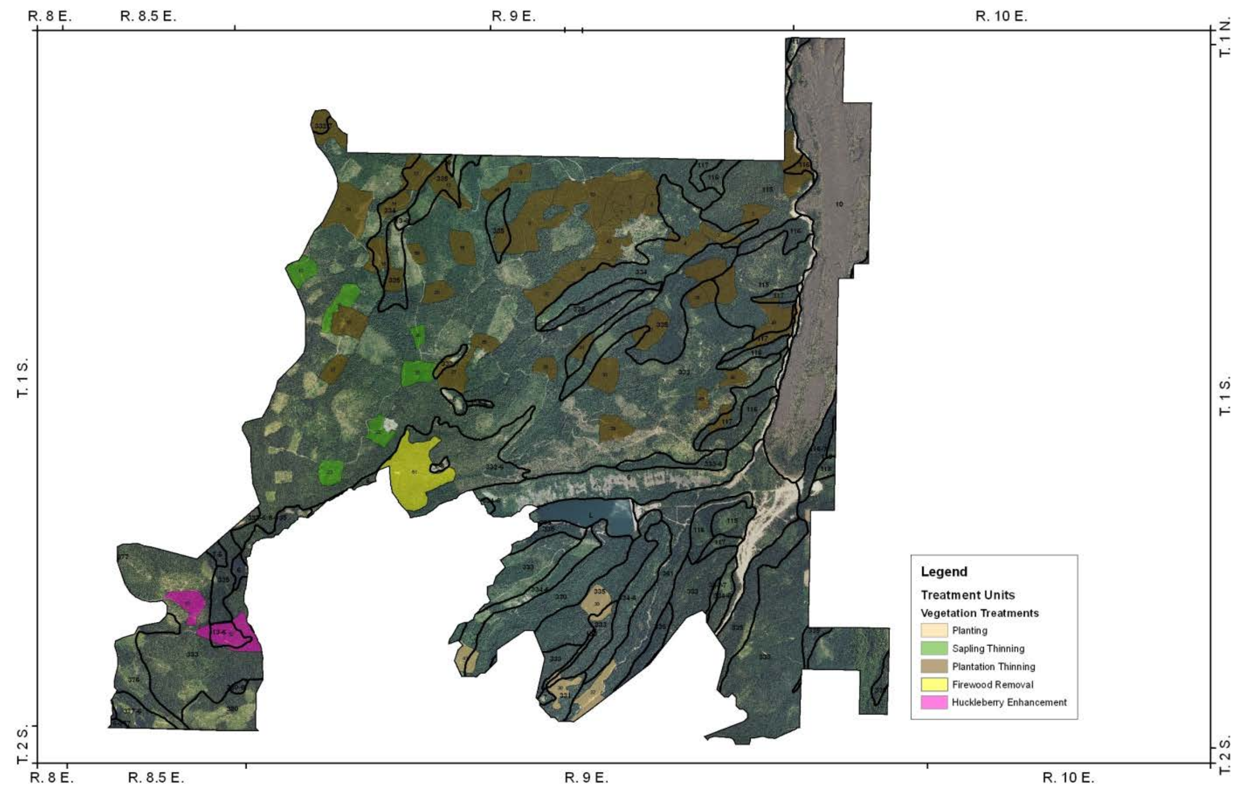


Figure 3-5: Soil map units overlaid with proposed treatment areas.

3.4.3 Effects Analysis

<u>No Action Alternative – Direct and Indirect Effects</u>

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 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.

<u>Proposed Action – Direct and Indirect Effects</u>

<u>Current and Predicted Changed Conditions Caused by the Proposed Action</u>

Soil erosion risk: No active erosion from previous vegetation management was observed during the field reconnaissance for this project. All stands proposed for treatments are expected to meet the effective groundcover standard following ground disturbing activities. The various road treatments proposed would each result in varying amounts of increased infiltration and ability for rooting of vegetation, thus accelerating the overall reforestation of road prisms from the current rate.

Detrimental soil conditions: The results of soil quality field surveys performed over several years are shown in Table 3-20 below. Monitoring occurred on glacial soil types that exist within the project area, or on soil types expected to respond in a similar fashion. All areas listed as proposed were either clearcut 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 1980's through the mid-1990's (Mt. Hood Forest Plan Monitoring Report, 2006). Reduced impacts may be attributed primarily to the following: major changes in practices, such as the elimination of machine (dozer) piling of logging slash; lower ground pressure machinery that reduce compactive forces; 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.

Table 3-20: Summary of stands monitored with shovel probe transects. MP = Fuel concentrations were machine piled with small excavator.

Sale Name and Unit Number or Planning Unit Number	Year Monitored	Silvculture Treatment	Logging System	Fuel Treatment	% Monitored Detrimental Soil Impacts
BS Thin 43	2009	Proposed Thinning	N/A	N/A	Less than 2
BS Thin 58	2009	Proposed Thinning	N/A	N/A	Less than 2
BS Thin 59	2009	Proposed Thinning	N/A	N/A	Less than 3
BS Thin 64	2009	Proposed Thinning	N/A	N/A	Less than 2
BS Thin 70	2009	Proposed Thinning	N/A	N/A	Less than 3
BS Thin 76	2009	Proposed Thinning	N/A	N/A	Less than 3
Bear Knoll 145	1999	Proposed Thinning	N/A	N/A	1
Bear Knoll 169	1999	Proposed Thinning	N/A	N/A	1
Juncrock 8	1999	Proposed Thinning	N/A	N/A	3

Sale Name and Unit Number or Planning Unit Number	Year Monitored	Silvculture Treatment	Logging System	Fuel Treatment	% Monitored Detrimental Soil Impacts
Hi-Thin 1	2009	Thinned	Processor	MP	3
Hi-Thin 2	2009	Thinned	Processor	MP	Less than 3
Chee 18	2003	Thinned	Feller Buncher,Rubber tired skidder	MP	13
Yaka 21	2000	Thinned	Feller Buncher,Rubber tired skidder	MP	6

The conceptual layout of logging system patterns for the proposed treatment areas have been designed to ensure less than 15 percent of the area is impacted (ground disturbance) within each individual stand that uses ground-based equipment. Since ground disturbance does not equate with detrimental soil condition, and design already has an impact area below 15 percent, it is not expected that any of the proposed treatment areas would exceed the Forest Plan standard. Soils underlying skid trails nearest landings are most likely to incur detrimental damage because they receive the most trips with equipment. Further away from landings, soils are impacted less and less as fewer trips occur over them. The past several years of Forest Plan monitoring results indicate a clear trend in the reduction of detrimental impacts due to the increasing use of low ground impact machinery. Observations during monitoring indicate obvious detrimental impacts on main skid trails and landings that receive numerous trips with higher impact machinery (such as skidders) with much less impact on lateral trails, and within the unit where harvester equipment typically works. As an example, in July 2006, a thinning unit in the West Fork Hood River watershed was yarded with a large log loader. Random shovel probes occurring right behind the machine as it moved through the unit showed no detrimental damage at all, and barely an imprint on the ground.

Organic matter levels: Given the amount of material left standing on site, as well as expected slash loading, it is likely additional organic matter levels (tonnage) would be left on the ground verses up in the canopy for site productivity purposes.

<u>Effects Resulting From Changing Conditions</u>

Soil Erosion Risk: Soil erosion risk would increase with the Proposed Action because bare soil would be exposed during implementation. As the amount of bare, 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’, or BMP’s, is discussed by Rashin et.al. (2006) in a recent publication of the Journal of the American Water Resources Association. Comparing the Proposed Action to their application of studied BMP’s 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 PDC's in this project uses setbacks from nearly double to 10 times that distance, in addition to directional felling and hand treatments (i.e., no machinery) that would further reduce erosion features and disturbance. In conclusion, by maintaining proper amounts of protective groundcover along with BMP's and PDC's, 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. The Changed Condition section above explains how logging systems are expected to impact the ground based treatment areas.

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.

Cumulative Effects
The method of soils analysis is cumulative by nature as explained in the Mt Hood Forest Plan (specifically FW-22). More clearly stated, an analysis area (each proposed unit) is evaluated by considering previous damage (if any) that still meets the detrimental soil condition definition, plus any expected detrimental soil impacts caused by the Proposed Action. The cumulative effects project list in Chapter 3 has been reviewed and no additional activities are overlapping in either time or space within the soils analysis areas. Therefore, no adverse cumulative effects are expected.

3.4.4 Consistency Determination

The Proposed Action is consistent with all applicable laws, regulations, and Forest Plan guidance as summarized below.

3.4.5 Summary of Effects by Alternative

Three risk factors were evaluated and addressed through forest plan standards and PDC's:

- Soil erosion risk was assessed by ensuring effective groundcover standards were met per erosion hazard ratings in Table 3-18. The risk of erosion and subsequent sediment delivery caused by the Proposed Action is extremely small.
- Detrimental soil condition was assessed by ensuring the project impacts remain under 15 percent total. An increase in soil damage is expected from the implementation of the Proposed Action, but not expected to exceed 15 percent.
- Soil organic matter was considered to make sure soil biological systems continue to function properly. Sufficient tonnage is expected to remain on site to provide for organic matter input to the ecosystem once all activities are complete.

3.5 Water Quality

More information is available in the project record including the full water quality analysis file as part of the Water Quality Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.5.1 Methodology

The following effects analysis utilizes research, relevant monitoring, field data and modeling to provide a context, amount and duration of effects for each of the alternatives.

GIS analysis and additional modeling were completed for a variety of site conditions and parameters in the project area. The Aggregate Recovery Percentage (ARP) model was used to determine whether watersheds in the project area would meet the Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) standard FW-064 dealing with Watershed Impact Areas. The ARP model is a standard tool used by many Forest Service resource specialists throughout the Pacific Northwest. The model calculates the "hydrologic recovery" of a watershed, which is based on the amount of human caused vegetation disturbance. This disturbance usually results from timber harvest and road building. In addition, some representative sediment erosion and transport concentrations are derived from the Forest Service Watershed Erosion Prediction Project (WEPP) Model. Documentation of the model, assumptions and limitations can be found on the website: http://forest.moscowfsl.wsu.edu/fswepp, and available in the project record located at the Hood River Ranger District in Parkdale, Oregon.

Some considerations about strengths and weaknesses associated with the analysis approach discussed above include the following.

Table 3-21: Strengths and Weaknesses of the Water Quality Analysis Approach

Analysis Method	Strength	Weakness
Aggregate Recovery Percentage (ARP) Model	Gives a good general idea about potential hydrologic recovery in a basin. Model works well when followed up with field data such as stream surveys.	Model utilizes a number of GIS results and a growth simulation model to determine recovery. These may differ somewhat from what is actually on the ground due to mapping inaccuracies and actual site conditions.
GIS Generated Site Data	Provided more site-specific data for effects analysis. This led to a more accurate effects analysis.	Since layers in GIS are updated as new, more accurate data becomes available, there may be some inaccuracies in current

Analysis Method	Strength	Weakness
		mapping. Accuracy depends on the level of field verification and ownership.
Effectiveness of Aquatic Mitigation Measures and Design Criteria	Effectiveness of various erosion control measures in reducing erosion is well documented. General effectiveness of buffers in reducing sediment and other impacts is well documented.	Effectiveness of various buffer widths on reduction of effects to surface water is not extensively documented in a wide variety of physical settings.
WEPP Model	Some of the model input parameters can be adjusted to reflect site conditions. This resulted in more accurate representations of potential erosion and sediment delivery	Not able to adjust all of the variables that reflect all of the actual physical conditions in the project area.
	Model results give an actual value for erosion and sediment delivery.	Model results have been documented to underestimate actual amounts of erosion and sediment delivery (Welsh, 2008). The model documentation states that results can be up to + or – 50% of actual amounts.
Stream Inventories	Provided more site-specific data for effects analysis. This data has been collected in a Nationally standardized protocol by trained resource professionals.	Some of the inventories are older and some conditions may have changed between the time the data was collected and the present time.

The following assumptions are utilized in the Water Quality Analysis:

- All Best Management Practices (BMP) and Project Design Criteria/Mitigation Measures (PDC) listed in Preliminary Assessment (PA), Chapter 2 would be implemented and effective as described in the BMP Table in Appendix 2.
- The areas of impact outlined in PA, Chapter 2 are actual areas of disturbance.
- Monitoring effectiveness of PDC and compliance would be a component of project implementation.
- All surface water areas have been identified through field work.

3.5.2 Existing Condition

The Lava Restoration project is located primarily in the Middle Fork Hood River Watershed on the Mt. Hood National Forest in Hood River County. Vegetation includes mixed conifer forests with some open meadows. Average annual precipitation ranges from 102 inches on the west side to 46 inches on the east side of the planning area, occurring mostly during the fall and winter months. Elevation in areas proposed for treatment ranges from 1,700 feet to approximately 4,400 feet. The primary aquatic feature in the project area is the Middle Fork Hood River.

The Lava Restoration project is located primarily within portions of six 7th field watersheds, 12M (Ladd Creek), 25A (Tony Creek), 25B (Bear Creek), 25D (Coe Branch), 25E (Pinnacle Creek), 25Z (Middle Fork Hood River). Ladd Creek is located within the Upper West Fork Hood River 6th field sub-watershed and the West Fork Hood River 5th field watershed and the rest of the 7th field sub-watersheds are located in the Upper and Lower Middle Fork Hood River 6th field sub-watersheds and the East Fork Hood River 5th field watershed. The analysis area in Ladd Creek is part of a Tier 1 Key Watershed as identified in the Northwest Forest Plan. These 7th field watersheds were used as the basis for the site-specific analysis, while the 6th field sub-watershed were used for other, larger scale cumulative effects analysis and compliance with the Northwest Forest Plan (NWFP) Aquatic Conservation Strategy Objectives. Some treatments are located in other 7th field sub-watersheds, but the treatment areas comprise 1 percent or less of the total sub-watershed area. Effects are expected to be limited due to the small amount of disturbance and will not be included in the analysis for this document. All of the activities for the restoration project are subject to all applicable BMP and PDC regardless of their location.

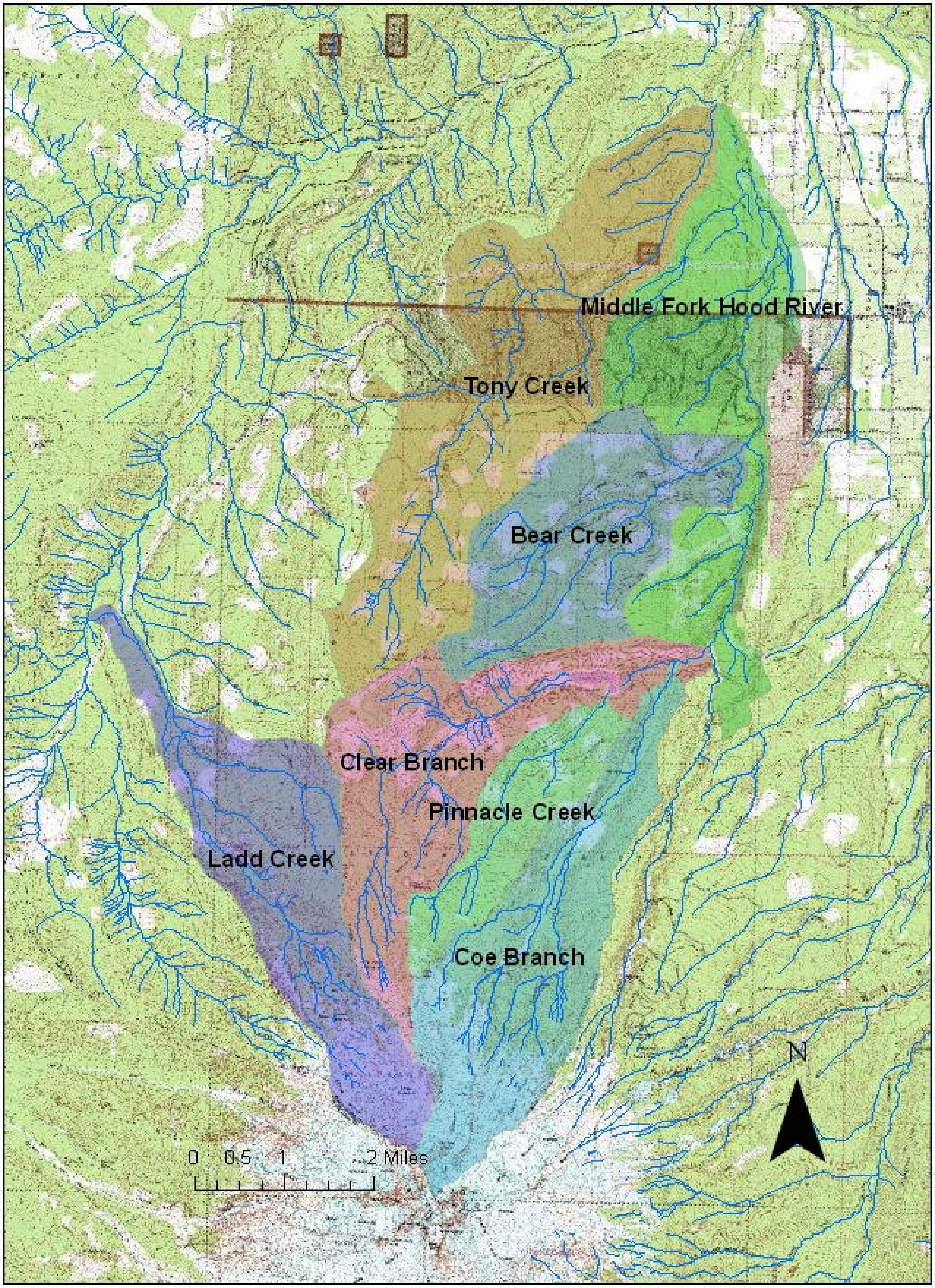


Figure 3-6: Map of the Water Quality Analysis Area showing 7th field sub-watersheds

There are many streams, springs and wetlands located within these sub-watersheds. The primary streams include Middle Fork Hood River, Ladd Creek, Bear Creek, Tony Creek, and Pinnacle Creek. There are approximately 116 miles of stream in the National Forest portion of these 7th field watersheds in the following categories: 82 miles of perennial streams (flow year around) and 34 miles of intermittent streams (streams that dry up for part of the year).

Water Quality

Rivers, streams, and lakes within and downstream of the treatment areas are used for boating, fishing, swimming, and other water sports. Additionally, the Forest streams provide habitat and clean water for fish and other aquatic biota, each with specific water quality requirements. The Clean Water Act (CWA) protects water quality for all of these uses.

The CWA requires States to set water quality standards to support the beneficial uses of water. The Act also requires States to identify the status of all waters and prioritize water bodies whose water quality is limited or impaired. For Oregon, the Department of Environmental Quality (DEQ) develops water quality standards and lists water quality limited waters. In addition, Region 6 of the Forest Service has entered into a Memorandum of Agreement (MOA) with the Oregon State DEQ to acknowledge the Forest Service as the Designated Management Agency for implementation of the CWA on National Forest System (NFS) lands. In an effort to support the CWA, the Forest conducts a variety of monitoring and inventory programs to determine status of meeting state water quality standards as well as other regulatory and agency requirements. In an average year, approximately 50 sites are monitored for water temperature throughout the Forest. In addition, other water quality monitoring occurs at various locations depending on the year. This could be turbidity monitoring, instream sediment sampling, water chemical sampling, or surveys of physical stream conditions. Currently, approximately 25 miles of physical stream habitat is surveyed every year and to date approximately 1300 miles of stream have been surveyed. Some of the information collected during these surveys includes the number of pools and riffles, amount of large wood, riparian area condition and types, and numbers of fish and other aquatic organisms.

By direction of the CWA, where water quality is limited, DEQ develops Total Maximum Daily Load (TMDL) plans to improve water quality to support the beneficial uses of water. For water quality limited streams on NFS lands, the US Forest Service provides information, analysis, and site-specific planning efforts to support state processes to protect and restore water quality. The TMDL plan for water temperature for streams in the project area (West Hood Sub-basin) was completed and accepted by the EPA in 2002. In this document, DEQ concluded that standard and guidelines in the Forest Plan and the Northwest Forest Plan "meet the requirements of a TMDL management plan" (ODEQ 2001). All streams in the planning area are listed as either Category 2 – Attaining Some Criteria, Category 3 – Insufficient Data or Category 4A – Water Quality Limited, TMDL Approved.

Stream Temperature

Water temperature data has been collected by the Forest Service on the above mentioned stream systems for several years. Data has been collected on continuous temperature recording dataloggers in five locations within or directly adjacent to the project area (see figure below).

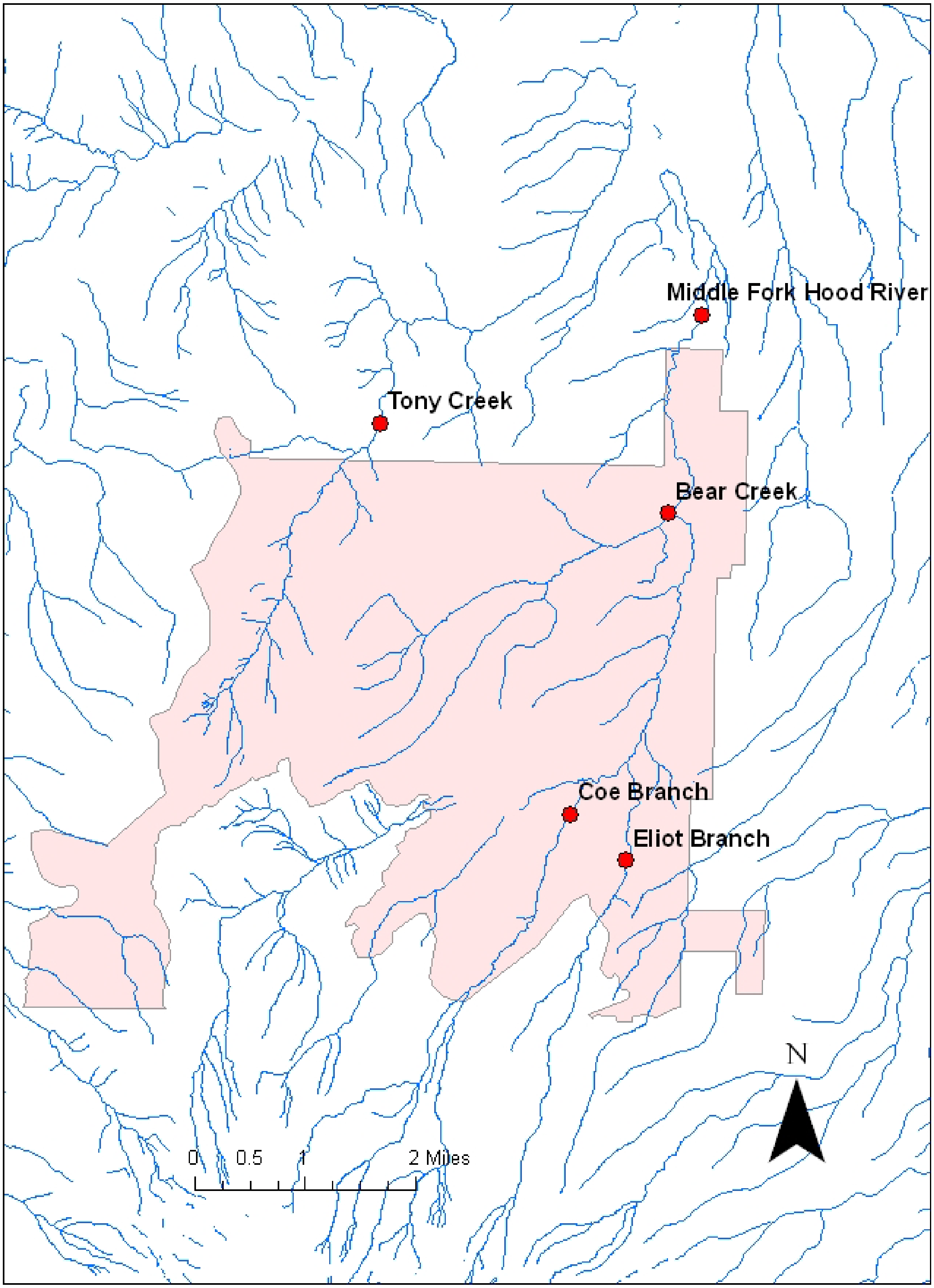


Figure 3-7: US Forest Service Water Temperature Monitoring Sites. Sites are red circles and the Lava Project Area is shown in brown.

The highest 7-day average maximum stream temperatures for the years deployed ranged as follows.

Table 3-22: Highest 7-Day Average Maximum Stream Temperatures in the Analysis Area

Stream	1994	1995	1996	1997	1998	1999	2000
W. Fork Hood River	13.4˚	11.7˚	13.5˚	11.9˚	13.4˚	12.0˚	13.0˚
Red Hill Creek	ND	ND	ND	ND	ND	11.4˚	11.5˚
Jones Creek	ND	ND	ND	ND	ND	ND	ND
McGee Creek	ND	ND	ND	ND	ND	ND	12.3˚

Stream	2001	2002	2003	2004	2005	2006	2007
W. Fork Hood River	13.8˚	12.6˚	13.7˚	13.9˚	14.0˚	13.9˚	13.5˚
Red Hill Creek	12.5˚	11.0˚	ND	ND	ND	ND	ND
Jones Creek	ND	13.2˚	13.4˚	14.7˚	13.5˚	ND	ND
McGee Creek	12.9˚	12.1˚	15.0˚	13.3˚	12.5˚	ND	ND

ND = Not Deployed for that Year

The table illustrates cold water temperatures within the project area, due primarily to a large contribution of surface flow from groundwater and glacial sources. An August 2001 stream survey in Bear Creek identified 4 tributaries directly flowing into Bear Creek in the 2.2-mile survey. These tributaries are contributing up to 60 percent of the total Bear Creek stream flow. Temperatures of the tributaries ranged from 6.5˚ to 9˚ Celsius suggesting a large groundwater flow influence. Additional surveys were completed on two of the larger tributaries and 8 more streams were noted flowing into these tributaries. Stream temperatures of these tributaries ranged from 5˚ to 10˚ Celsius with most of them ranging between 6˚ and 8˚ Celsius. A similar relationship was found during a July 1996 stream survey in Tony Creek. Seventeen tributaries were identified in the 7 mile survey, with temperatures ranging from 4˚ to 13˚ Celsius. Three of these tributaries were contributing 20 to 40 percent of the total Tony Creek flow, and their temperatures ranged from 5.5˚ to 6˚ Celsius. A 1994 stream survey on Middle Fork Hood River noted 8 tributaries in the 4 miles of survey. Temperatures of these tributaries ranged from 3˚ to 6˚ Celsius during the September/October survey. Bear Creek and Ladd Creek are listed in the Department of Environmental Quality's (DEQ) 2010 Integrated Report Assessment Database as Category 2 – Attaining for water temperature and Middle Fork Hood River is TMDL Approved for water temperature.

Stream Channel Condition and Sediment

All creeks in the planning area are characterized by high channel gradient headwaters and moderate gradient, confined middle sections. They typically start out as Rosgen "A" channel types in the extreme upper portions of the streams and grade into "B3" and "B4" channel types throughout the rest of the project area (HRRD stream surveys, 1996, 1997, 2000 and 2002). The "B" channels are generally stable and Rosgen (1996) identified this channel type as having a "low to moderate" sensitivity to human disturbance. He also identified riparian vegetation as having a "negligible to moderate" controlling influence on the stability of "B" channels. These channel types are generally not a large source of sediment resulting from channel bed and bank erosion. "A" channels are high gradient channel types that have a very low to extreme sensitivity to disturbance depending on the type of material it has cut down through. They are generally a high source of sediment naturally, due to the steep surrounding terrain. Riparian vegetation has a negligible influence on channel stability. Some of the upper reaches of tributary streams such as the very upper reach in Tony Creek are classified as steep channels that have a high sensitivity to disturbance and a poor recovery potential. This is due to the unconsolidated material that the streams have cut through. This material can be eroded easily and deposited into adjacent stream channels. Other sections of the stream are located in more stable material and have a low sensitivity to disturbance.

Stream surveys conducted in Bear Creek and Middle Fork Hood River support the characterization of stable stream banks and channel bed in “B” type channels and fairly stable “A” type channels. Bear Creek had 2.7 percent of the surveyed length identified as unstable. The stream survey for Middle Fork Hood River stated that the only identified areas of bank instability were naturally occurring and associated with “…sections of the lava bed...” that were “crumbling and falling into the stream.” Two slide areas were noted near river mile 9.2 as well. The Tony Creek stream survey noted “moderate bank erosion” primarily from undercut banks. The survey states “Although major areas of erosion were observed no significant sedimentation problems were perceived.” The Coe Branch stream survey identified 2.1 percent bank instability while Pinnacle Creek bank instability was 0.2 percent. Several areas of naturally occurring bank instability were noted in the Wilderness Area on the upper reaches of Eliot Branch during the 1994 stream survey. It should be noted that a large portion of the upper Coe Branch basin burned in a moderate to high severity in the 2011 Dollar Lake Fire. This may result in higher slope failure frequency and resulting sedimentation in the area for the next several years.

Natural turbidity in the form of glacial meltwater is present in several streams in the analysis area. Ladd Creek, Coe Branch and Eliot Branch all have glacial influence and higher natural turbidity rates. Turbidity is the measure of the ability of light to pass through water, and is influenced by the amount of suspended sediment and other material in the water sample (MacDonald et al., 1991). Turbidity measurements of water samples utilize an instrument called a nephelometer with the detector setup to the side of the light beam. More light reaches the detector if there are lots of small particles scattering the source beam than if there are few. The units of turbidity from a calibrated nephelometer are called Nephelometric Turbidity Units (NTU). Turbidity monitoring was completed in 2008 on the West Fork Hood River above and below the Ladd Creek confluence. Three grab samples were collected and analyzed in a turbidimeter. The results are displayed in the table below.

Table 3-23: Turbidity Monitoring Results on West Fork Hood River

Sample Date	West Fork Hood River Above Ladd Creek Confluence	West Fork Hood River Below Ladd Creek Confluence	Turbidity Change From Upstream Reading
7/2/2008	0.62 NTU	3.36 NTU	+442%
9/6/2008	0.24 NTU	2.83 NTU	+1079%
10/23/2008	0.28 NTU	0.59 NTU	+110%

As illustrated in the monitoring results above, turbidity in Ladd Creek has a major influence on turbidity in the West Fork Hood River during certain times of the year. The same is true for the

Middle Fork Hood River which has Coe Branch and Eliot Branch as tributaries. In the summer, Ladd Creek turbidity can increase overall turbidity in the West Fork Hood River by over 1000 percent. As temperatures cool, this influence decreases indicating that the origin of Ladd Creek turbidity is glacial meltwater which is related to higher ambient temperature. This is further supported by numerous field observations.

A natural debris flow originating from Mt. Hood deposited large amounts of bedload and suspended sediment in the Middle Fork Hood River. This 2006 event scoured and deposited material for at least 10 miles downstream from the source area. This sediment continues to be transported and deposited down the river and would continue to do so for many years.

Another potential source of coarse and fine sediment to surface water in the area is roads. Sediment can wash off road surfaces into adjacent streams. The potential for erosion is highest on native surface (dirt) roads and lowest on paved or asphalt roads. Road density (miles of road per square mile of basin) can be used as a general indicator of potential problems associated with roads. Road densities within a sub-watershed that exceed 3.0 miles per square mile indicate areas that should be examined more closely for specific sediment related problems, although it is possible to have isolated areas of road instability even in areas of low road density. This value is based on professional judgment by local Forest Service hydrologists, fish biologists, and earth scientists. Following is a table displaying total specified road densities for 7th field watersheds within the project area.

Table 3-24: Sub-watershed Road Density

Sub-watershed	Road Density (mi/mi^2)
Bear Creek	4.7
Coe Branch	0.6
Ladd Creek	1.0
Middle Fork Hood River	1.8
Pinnacle Creek	1.9
Tony Creek	2.7

All but one of the 7th field sub-watershed road densities are below 3 mi/mi^2 (miles per square mile) due in part to past road decommissioning efforts. The Bear Creek stream survey was examined to determine if indications of degradation related to high road densities were detected. These may include a high percentage of fine substrate, channel bank erosion, high width to depth ratio or general comments relating to sediment accumulations observed. The Bear Creek Stream Survey didn't note a high percentage of any of these attributes.

3.5.3 Effects Analysis

<u>No Action – Direct and Indirect Effects</u>

In general, conditions described above in the existing conditions section would be maintained.

<u>Stream Temperature</u>

Stream temperatures would remain at current levels in the watershed due to no reduction in streamside shading and the large groundwater influence in surface streams throughout this area.

Primary shade zones (areas of riparian vegetation directly adjacent to streams) along perennial streams would continue to fill in with vegetation. Since these areas are already densely vegetated, it is not anticipated that this component would reduce stream temperatues any great degree within the project area.

Sediment

As described in the Fisheries and Aquatic Fauna section, the risk of erosion and sediment input to streams would increase under the No Action alternative. This is due mostly from lack of road maintenance which has the potential to increase erosion and sedimentation primarily on native and aggregate surface roads. Since the amount of future road maintenance is not known, it is difficult to predict how much and where erosion and sedimentation would increase.

Sediment delivery to streams in the project area from other sources is expected to remain at current levels. Vegetation that impedes erosion and sediment delivery would be maintained.

In summary, water quality parameters such as stream temperature are not expected to appreciably change in the project area. Some increase in erosion and sedimentation is expected due to lack of road maintenance, but the amount and location are difficult to predict.

Proposed Action – Direct and Indirect Effects

Stream Temperature

This alternative proposes to thin vegetation within Riparian Reserves. Vegetation removal near water bodies has the potential of increasing solar radiation to surface water which in turn may increase water temperature. This analysis utilized tools contained within the *Northwest Forest Plan Temperature TMDL Implementation Strategy* (USDA and BLM 2012) document to identify necessary shade so that stream temperatures within treatment areas would not increase as a result of vegetation treatments. The document was the result of work between the U.S. Forest Service and the Bureau of Land Management (BLM) and identifies how to maintain sufficient stream shading to meet the Clean Water Act while providing the opportunity to treat Riparian Reserve vegetation to improve riparian conditions.

The concept of the sufficiency analysis is to maintain a primary shade zone of vegetation next to the stream and identify a secondary shade zone and other areas within the Riparian Reserves further away from the stream that can be treated to reach Riparian Reserve objectives while maintaining stream temperatures. In order to maintain sufficient shade next to the stream, the primary shade zone is untreated. The size of this zone is dependent on the height of the trees that would be removed and the hill slope (Table 3-25). The buffers were developed by calculating the width of the riparian area adjacent to perennial stream channels that provides stream shade for the period of greatest solar loading (between 1000 and 1400 hours), known as the primary shade zone, and the width of the riparian area that provides shade in the morning and afternoon (0600-1000 hours; 1400-1800 hours), considered the secondary shade zone. In dense riparian stands, optimum shade can be provided by the primary shade zone alone, and the secondary shade zone may contribute little to no shade since trees in the primary shade zone are already blocking the sun's solar radiation.

Table 3-25: Width of Primary Shade Zone

Height of Tree	Hill slope <30%	Hill slope 30% – 60%	Hill slope >60%
Trees < 20 feet	12 feet	14 feet	15 feet
Trees 20 to 60 feet	28 feet	33 feet	55 feet
Trees > 60 feet to 100 feet	50 feet	55 feet	60 feet
Trees > 100 feet to 140 feet	70 feet	75 feet	85 feet

As an example, if the height of trees in the riparian area are predominately <20 feet tall, the primary shade zone would be 14 feet wide for an area that had 30 percent to 60 percent hill slopes next to the stream. Based on field observations in proposed treatment units, most of the hill slopes are between 30 percent and 60 percent and the majority of existing tree heights range from greater than 60 feet to 100 feet. Trees within sapling thinning units are generally less than 20 feet tall. The proposed prescription for riparian area treatments would thin vegetation that would, for the most part be greater than 60 feet and less than 100 feet tall, which translates into a maximum primary shade zone of 60 feet for the project area. Some units would treat vegetation less than 60 feet tall but would still retain a primary shade zone of 60 feet according to the treatment prescription. This area would be left untreated next to perennial streams to maintain current stream shading and water temperatures.

The table below shows treatment units where treatment is proposed within one site potential tree (140 feet) adjacent to a perennial stream. Factors that may influence stream temperature other than those discussed in the Sufficiency Analysis are shown for each treatment unit. Values that are gray indicate an extra factor of safety for protection of existing stream temperatures than what is recommended by the Sufficiency Analysis. These include the following:

- Primary Shade Zone Width Recommendation from the Sufficiency Analysis. As stated above, perennial streams in treatment units would have a 60 foot protection buffer next to them. The value in the table shows what is recommended according to the Sufficiency Analysis. For example, the Unit 18 recommendation is a 33 foot protection buffer primary shade zone which is 27 feet less than the prescription for the Lava Restoration Project.
- Stream Width. In general, “smaller streams have a greater potential for increases in temperature from streamside harvesting than do larger streams, because a greater proportion of their surface areas would be newly exposed to the sun. However, they may be shaded by smaller trees or deciduous vegetation.” (Chamberlain and others, 1991). This factor is not rated and is included in the table for information only.
- Side of the Channel to be Thinned. The orientation of a stream and ultimately the orientation of the strip of riparian vegetation next to the stream has an influence on the effectiveness of stream shading. Stream shading from the south side is more important that shading from the north side due to the sun angle. Streams that would only have vegetation removed on the north side of a stream are shown as having an extra factor of safety.
- Spring/Glacial Influence. Natural groundwater and glacial meltwater play a role in cooling water temperatures and reducing the influence streamside shading has on these temperatures. This relationship has been acknowledged in numerous scientific papers

and studies. Streams where seeps, springs or glacial melt influence were noted in field surveys are shown as having an extra factor of safety.

- Distance to Listed Fish Habitat. Due to the high density of seeps and springs in the project area, there is a good chance that tributaries comprised of this groundwater flow would eventually flow into most stream channels. Units that are greater than 2000 feet from listed fish habitat are shown as having an extra factor of safety.

Table 3-26: Factors that may influence stream temperature other than those discussed in the Sufficiency Analysis are shown for each treatment unit. Values that are gray indicate an extra factor of safety for protection of existing stream temperatures than what is recommended by the Sufficiency Analysis.

Treatment Units	Primary Shade Zone Width from Sufficiency Analysis (ft)	Stream Width (ft)*	Side of Channel to be Thinned	Spring/Glacial Influence	Distance to Listed Fish Habitat (ft)
1	60	25	W	Yes	140
3	55	2	N	Yes	100
4	55	12	N	Yes	100
12	55	10,15	W and SE	Yes	60
13	55	20	W	Yes	60
14	55	20	NW	Yes	60
15	50	5,2,3,13	N,S,W	Yes	150
18	33	6	W	Yes	100
21	33	3,14	NW	Yes	60
27	28	4	N	Yes	5,800
30	50	2	W	Yes	5,280
47	55	13	N and W	Yes	60
48	60	5 and 25	N and W	Yes	140

* This factor is not rated and is included in the table for information only.

All units have at least one additional factor that helps protect stream temperature.

Six units would have tree falling into adjacent perennial streams to provide large wood for aquatic complexity. There would be 2 to 3 trees per 100 feet of stream length that would be dropped into stream channels from the adjacent Riparian Reserve. There is a high likelihood that most of the trees would come from the primary shade zone of the riparian area. This activity is not expected to increase summer stream temperature due to the existence of other factors of safety described above, the small number of trees that would be felled and the activity would be spread out along the stream channel.

Due to meeting or exceeding primary shade width recommendations in the Sufficiency Analysis, plus the existence of additional factors that help protect stream temperature, treatments associated with the Lava Restoration Project are expected to have an immeasurable effect to existing stream temperatures.

Sediment
Some ground disturbing activates 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 PA. According to the soils analysis, amounts of erosion and sediment delivery are expected to be small due to maintaining protective groundcover along with implentation of Best Management Practices (BMP) or Project Design Criteria (PDC) as they are referred to in the PA.

The Proposed Action would re-open approximately 13.7 miles of old existing temporary or decommissioned roads and would construct approximately 1.0 miles of new temporary roads. The reopened temporary roads re-trace the alignment of older overgrown or decommissioned roads. These temporary roads can be reopened with minimal earth movement, without side casting material and would be rehabilitated after project completion. Re-opening these roads and the construction of new temporary roads would pose an overall low risk of introducing sediment to streams because almost all of these roads would be outside of the Riparian Reserves. Of the approximately 13 miles of old existing temporary or decommissioned roads that would be reopened, only 0.6 miles are within Riparian Reserves. None of the new temporary road construction would be within Riparian Reserves.

The 0.6 miles of temporary road proposed to be reopened represents 10 different incursions into Riparian Reserves ranging from approximately 30 feet to 560 feet in length. Three existing stream crossings over intermittent streams would need to be rebuilt and one existing stream crossing over a perennial spring would be reused. One crossing accesses unit 19. The stream channel is low gradient and not incised so it would require minimal fill to regain access. This crossing is approximately 3800 feet upstream of Tony Creek. The other two intermittent channels are crossed by an old road through unit 18. A picture of one of the crossings is shown in the photographs below. The crossings are on a flat bench and the stream channel is not incised so minimal fill would be required to reestablish access. In addition, both of these channels go subsurface in sections prior to entering Tony Creek, approximately 1300 feet below the proposed crossing. It is expected that there would be some turbidity associated with the first flushing flow after construction, but this should be minimal due to the small amount of fill, existing channel roughness and subsurface nature of the channels in unit 18.

An existing water crossing on a decommissioned road would be reused to access unit 27. The old road crosses some perennial springs approximately 3500 feet upstream of listed fish habitat. This crossing was not removed during the original decommissioning work and is diverting flow down the road causing erosion. Reusing this road would allow proper removal of the crossing once the treatment is complete, which would ultimately restore hydrology and reduce surface erosion on the decommissioned road. It is expected that there would be some turbidity associated with the first flushing flow after removing the crossing, but this should be minimal and localized due to the existing channel roughness and subsurface nature of the channel. In addition, erosion control measures described in the PDC section would be employed to reduce and/or eliminate erosion and potential sedimentation. The new temporary roads and re-opened temporary and decommissioned roads would be decommissioned and revegetated immediately following completion of harvest operations to help reduce compaction, increase infiltration rates, minimize surface erosion, and re-establish natural drainage patterns.

Figure 3-8: Existing temporary road that would be reopened in Unit 18. Some vine maple and conifer trees are currently growing in the road bed. The white arrow shows the road alignment.

Figure 3-9: Intermittent stream channel crossing on the proposed reopened temporary road in unit 18. Some channel bed scour can be seen to the right of the hardhat.

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. The following WEPP model runs show the difference in erosion and sediment delivery (shown as sediment leaving buffer in table below) between a 200 foot section of native surface road (road is made from native soil) and a 200 foot section of gravel surface road. All of the model inputs stayed the same except surface material, which was changed from native to gravel surface.

Table 3-27: WEPP model run showing the difference in erosion and sedimentation between a gravel surface road and a native surface road.

Road Surface	Road Prism Erosion	Sediment Leaving Buffer
Native Surface Road	136 lbs.	39 lbs
Gravel Surface Road	86 lbs.	32 lbs.

Results from the WEPP model runs show that in this situation, the native surface road produced 136 pounds of eroded soil while the gravel surface road produced 86 pounds of eroded soil which is a percent reduction in eroded soil. It should be noted that under some circumstances, gravel surfaced roads may produce more runoff and erosion than native surface roads (WEPP manual).

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 associated with paved roads is a potential sediment source as well. Most of the road maintenance work would be brushing out existing vegetation, hazard tree removal and minor blading and spot rocking of the road surface. A short section of the 1600 road fill near unit 15 is proposed to be replaced in an area where spring seepage is causing fill slumping. If left alone, this section of road would likely fail, threatening water quality in perennial springs that are tributary to Tony Creek. There would likely be some sediment generated from this activity during and after implementation until things stabilize, but there would be a low risk of introduction of sediment into streams due to the existence of a flat, benchy area with a high roughness component located between the work area and stream channel. This work would have a beneficial effect to wetlands by improving spring flow movement through the roadfill and onto the ground below the road.

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. Personal observations through more than 25 years as a professional hydrologist and field work completed for this project indicate that most road-related sediment would be trapped and stored in the ditches or on the forest floor below cross drains. Implementation of PDC and BMP 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.

Log hauling has a low risk of increasing the amount of fine sediment in streams due to the following conditions:

- The roads along the haul route have for the most part, well vegetated road ditchlines that allow eroded soil to be stored adjacent to the roads.
- Eighty five percent of the road system is either asphalt or gravel surface which has a lower surface erosion potential than native surface roads.
- Sale administration personnel would restrict log hauling when necessary to minimize water quality degradation. Haul would be stopped if there is rutting of the road surface or a noticeable increase in the turbidity of water draining to the road ditches or at stream crossings.
- If log haul occurs outside the normal operating season, then it is restricted to asphalt surface roads, gravel surface roads that do not cross streams within 1000 feet of listed fish habitat, and/or native surface or temporary roads that are not hydrologically connected to streams. In summary, haul outside of the normal operating season would not occur on road segments that have a higher risk of soil erosion and sediment delivery to major stream systems in the area (see Chapter 2, PDC for more details).

The ability of PDC and BMP to reduce erosion and sediment delivery is documented in a study referenced in the Soil Productivity section (Rashin et. al. 2006). In this study, the authors looked at 21 harvest sites that had a variety of treatments ranging from no buffers to buffers up to 66 meters (216.5 feet) wide. They found that "Of 157 individual erosion features determined to deliver sediment to streams during either the first or second year following timber harvest, 94 percent were located within 10 meters (33 feet) of the stream. Conversely, 74 percent of the 248 erosion features with no evidence of sediment delivery were greater than 10 m from streams. The sediment routing survey results indicate that when erosion is initiated by ground disturbing activities within 10 meters (slope distance) of a stream, delivery of sediment was more likely than not." Other studies also support the effectiveness of mitigating sediment delivery by maintaining a buffered area adjacent to surface water. Lakel and others (2010) looked at the effectiveness of a variety of treated and untreated buffers in trapping sediment adjacent to timber harvest units. They concluded that streamside management zones (buffers) between 25 feet and 100 feet were effective in trapping sediment before it could enter streams. These streamside management zones consisted of both treated and untreated areas. The study also found that thinning within buffers was an appropriate forest management tool, "because the practice did not significantly increase erosion".

Other studies also support the effectiveness of mitigating sediment delivery by maintaining a buffered area adjacent to surface water. Burroughs and King (1989) found that 80 percent of sediment reaching streams from roads in the first year after construction came from the fill slope of the road. They also found that transport distances and obstructions between the fill slopes and streams influenced the amount and likelihood of eroded material reaching these streams. Burroughs and King found that windrowed fill slopes, which would act very similar to unharvested Riparian Reserves in that there would be obstructions to flow, had an average travel distance of 3.8 feet for eroded material, and a maximum travel distance of 33 feet. Similar results were documented by Packer (1967). He found that "the most important factors that affect the distance that sediment moves are the spacing between down slope obstructions and an interaction between this spacing and the kind of obstruction". He found that logs, rocks, and trees or stumps were the second, third, and fourth most effective materials in reducing sediment movement distances below roads. Travel distances were similar to those reported by Burroughs and King.

PDC that include protection buffers of at least 60 feet along perennial streams and at least 30 feet along intermittent streams, keeping large mechanized equipment away from surface water, use of erosion control (e.g., ditchline sediment traps, straw wattles, waterbars) where necessary, and lower impact road maintenance techniques (leaving vegetated buffer strips in ditchlines near streams) would substantially reduce the amount of sediment reaching the streams from this work. Burroughs and King (1989) reported that measures, such as erosion control blankets, could reduce sediment production by 80 to 90 percent. This in conjunction with other measures, such as minimizing the amount of ground disturbance and seeding these areas, would further decrease the chance of short-term direct and indirect sediment production. With the above-mentioned mitigation measures and design criteria, new temporary roads, landings, skid trails, yarding corridors, road maintenance, log hauling and road repair work are expected to have minimal effect on sedimentation.

<u>Road Decommissioning and Road Closures</u>
2.1 miles of road is proposed for decommissioning in the Lava Restoration Project. Approximately 4030 feet of decommissioning is located within the Riparian Reserves. A total of 4 stream crossings would be removed by the decommissioning. The areas most likely to see short-term turbidity are the upper reaches of Tony Creek and a tributary to Bear Creek. There would be some turbidity increase when water is returned to areas where culverts have been removed in stream channels. Based on previous monitoring and personal observations, the majority of turbidity should last several minutes and would return to background levels rapidly. PDC and BMP that are focused on reducing sediment production including operating in the low-water window, isolating the work site from exposure to water, and revegetating disturbed areas after completion of work would minimize the amount of sediment entering surface water.

Decommissioning would result in 0.8 miles of road removed from Riparian Reserves equating to approximately 4.8 acres or Riparian Reserve restoration. This would improve local aquatic conditions including long-term sediment reduction and recovery of riparian vegetation.

Approximately 15.4 miles of road is proposed for year around closure and approximately 7.0 miles of road is proposed for seasonal closure. These activities are expected to result in minimal sedimentation during implementation due to PDC and would reduce overall sedimentation through the life of these roads. The roads are located in the Evans Creek sub-watershed, the Bear Creek sub-watershed and the Tony Creek sub-watershed. The role of traffic in increasing road sediment production is well recognized and has been the subject of several researchers

(Reid and Dunne, 1984; Burroughs and King, 1989; Coker et al., 1993; Ziegler et al., 2001), who report a range from doubled sediment production to 30 times increase in sediment production due to road traffic.

Summary of Indirect/Direct Effects

Most detrimental effects to water quality would be reduced or eliminated through implementation of PDC and BMP in the Proposed Action. The project that has the highest risk of direct/indirect detrimental effects to water quality is stream crossing removal during road decommissioning. This may result in some indirect introduction of sediment which would be limited in scope due to PDC and BMP.

Cumulative Effects

The table below provides a qualitative summary of potential cumulative watershed effects. It shows existing and potential projects, effects from those projects that may result in cumulative effects with the Lava Restoration Project, whether these projects overlap in time and space and an assessment if a measureable cumulative effect is expected. Only projects that overlap in either time or space with the Lava Restoration Project or have a potential cumulative effect are included in the table. Activities in the East Fork Hood River Watershed including planting of burned areas and road closures are expected to have a beneficial effect relating to stream temperature, large wood in stream channels and sediment production. This is due to accelerated reoccupation of riparian areas with conifers by planting and reduction of traffic on roads. This will not be covered in the table below. Findings in this summary are supported by the analysis above which utilizes pertinent research, PDC and applicable management standards and guidelines. Water Quantity is included in this section, as potential increased peak flow from vegetation removal is primarily a cumulative effect at the sub-watershed and larger scale.

Table 3-28: Cumulative Effects for Water Quality and Water Quantity

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
Existing Old Forest Service Timber Harvest Units	Coarse and Fine Sediment	No	Yes	No	Projects are completed. No remaining sediment or stream temperature and water quantity effects due to mitigation measures and design criteria implementation on the original projects, natural recovery, and conformance with existing standards and guidelines on the Lava Restoration Project.
	Stream Temperature	No	Yes	No	
	Water Quantity	Yes	Yes	No	
Forest Service Vegetation Treatment Activities Planned or Underway (Pre-commercial treatments)	Coarse and Fine Sediment	Yes	Yes	No	There may be an overlap in timing of these projects with the Lava Restoration Project; any minor suspended sediment would not be measurable due to implementation of PDC, conformance with existing standards and guidelines on both the existing projects and the Lava Restoration project.

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?
	Stream Temperature	Yes	Yes	No	Some projects are completed so there are no remaining stream temperature effects due to natural recovery. The more recent vegetation treatment projects conform to the Northwest Forest Plan Stream Temperature Sufficiency document. Except for dropping some trees for large wood in streams in six units, the Lava Restoration project would maintain the primary shade zone so there is a low risk of increase in stream temperature from this project.
	Water Quantity	Yes	Yes	No	No cumulative water quantity effects due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines and natural recovery on both the existing projects and the Lava Restoration Project.
Private Land and BPA activities (past timber harvest, power line maintenance activities)	Coarse and Fine Sediment	Yes	Yes	No	Some projects are completed so there are no remaining sediment effects due to natural recovery. Other ongoing projects on adjacent private and BPA land, such as road maintenance and vegetation manipulation, have a chance of some short-term introduction of fine sediment. The primary fine sediment producing activity in the Lava Restoration project is culvert removal during road decommissioning. The highest potential location for sediment mixing is in Tony Creek and the Middle Fork Hood River below the power line corridor and/or private land. It is highly unlikely there would be a measurable cumulative effect since activities would be well downstream (more than 3 miles) from this work in the Lava Restoration project
	Stream Temperature	Yes	Yes	No	Some projects are completed so there are no remaining stream temperature effects due to natural recovery. Except for dropping some trees for large wood in streams in six units, the Lava Restoration project would maintain the primary shade zone so there is a low risk of increase in stream temperature.
	Water Quantity	Yes	Yes	No	No cumulative water quantity effects due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the Lava Restoration Project and natural recovery for some of the projects on private land.
Red Hill Restoration Project	Coarse and Fine Sediment	Yes	Yes - Ladd Ck 7th field HUC only	No	There may be an overlap in timing of this project with the Lava Restoration Project; any minor suspended sediment would not be measurable due to implementation of PDC, conformance with existing standards and guidelines on Lava Restoration and the Red Hill Restoration projects.

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?
	Stream Temperature	Yes	Yes - Ladd Ck 7th field HUC only	No	Except for dropping some trees for large wood in streams in six units, the Lava Restoration project would maintain the primary shade zone so there is a low risk of increase in stream temperature.
	Water Quantity	Yes	Yes - Ladd Ck 7th field HUC only	No	No cumulative water quantity effects due to implementation of PDC, conformance with existing standards and guidelines on the Lava Restoration Project and natural recovery for some of the projects on private land.
Dollar Lake Fire (including Burned Area Rehabilitation projects)	Coarse and Fine Sediment	Yes	Yes - Ladd Ck Coe Branch and Pinnacle Ck 7th field HUC only	No	There may be an overlap in timing of effects from the Dollar Lake Fire and the Lava Restoration project. The primary fine sediment producing activity in the Lava Restoration project is culvert removal during road decommissioning. Culvert removal would not occur in the same 7th field sub-watershed as the Dollar Lake fire burned area, so potential sediment mixing would not occur at this level. The closest sediment mixing opportunity is the confluence of Bear Creek and the Middle Fork Hood River which is 3 miles downstream of the nearest crossing removal site and 4 miles downstream of the nearest burned area from the fire.
	Stream Temperature	Yes	Yes - Ladd Ck, Coe Branch and Pinnacle Ck 7th field HUC only	No	Except for dropping some trees for large wood in streams in six units, the Lava Restoration project would maintain the primary shade zone so there is a low risk of increase in stream temperature.
	Water Quantity	Yes	Yes - Ladd Ck, Coe Branch and Pinnacle Ck 7th field HUC only	No	Tree planting associated with the Lava Restoration project would not increase peak flows in Coe Branch and Pinnacle Creek. There would be some vegetation removal in the Ladd Creek sub-watershed but any increase would not be measurable due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on the Lava Restoration Project.
Past Aquatic Restoration Projects (Road Decommissioning, McGee and West Middle Fork Stream Channel Projects)	Coarse and Fine Sediment	No	Yes	No	Projects are completed. No remaining sediment, stream temperature and water quantity effects due to mitigation measures and design criteria implementation on the original projects, natural recovery, and conformance with existing standards and guidelines on the Lava Restoration project.
	Stream Temperature	No	Yes	No	
	Water Quantity	No	Yes	No	

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?
2006 Debris Flow in the Middle Fork Hood River	Coarse and Fine Sediment	Yes	Yes	No	The 2006 debris flow originating from Mt. Hood deposited large amounts of sediment in the Middle Fork Hood River. This sediment has increased background turbidity and would continue to do so for many years. Any sediment from the Lava Restoration project would not be detectable due to the high natural turbidity rate.
Ongoing road maintenance, including snowplowing	Fine Sediment	Yes	Yes	Possible	Depending on the location and timing of road maintenance not directly associated with the Lava Restoration Project, there could be some overlap and as a result a potential increase in fine sediment in some streams in the action area is possible. The primary fine sediment producing activity in the Lava Restoration project is culvert removal during road decommissioning. Exact locations cannot be determined as specific road maintenance projects have yet to be identified.
Invasive Plant Treatments	Coarse and Fine Sediment	Yes	Yes	No	There may be an overlap in timing of this project with the Lava Restoration project; any minor suspended sediment would not be measurable due to implementation of mitigation measures and design criteria and conformance with existing standards and guidelines in both projects.
	Stream Temperature	Yes	Yes	No	Except for dropping some trees for large wood in streams in six units, the Lava Restoration project would maintain the primary shade zone so there is a low risk of increase in stream temperature.

Summary of Cumulative Effects

Stream Temperature

No detrimental cumulative effects are expected as a result of increased water temperature due to PDC that maintain existing primary shade vegetation adjacent to perennial streams. Additionally, all units that propose Riparian Reserve treatments adjacent to perennial streams have additional conditions that protect existing water temperatures. As described in the direct and indirect effects section, this project is expected to have an immeasurable effect to existing water temperatures.

Sediment

Major detrimental cumulative effects are not expected as a result of sediment introduction. Sediment from culvert removals may mix with sediment generated from road maintenance activities in the Bear Creek sub-watershed if these activities occur at the same time. This risk would be greatest the year following the road decommissioning/culvert removal work associated with the Lava Restoration Project. The cumulative effect is expected to be very small and localized due to the small amount of sediment expected from the Lava Restoration Project.

Water Quantity
A peak flow analysis was completed for this project and is displayed in the Consistency Determination Section below. 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 sub-basins were found to be in compliance with Forest Plan Standard FW-064 so no cumulative effects are anticipated for water quantity.

3.5.4 Consistency Determination

Numerous existing plans provide guidance for projects in the form of Standards and Guidelines (S&G) and recommended Best Management Practices (BMP). These documents include the Mt. Hood National Forest Land and Resource Plan (Forest Plan), the Northwest Forest Plan (NWFP) and associated supporting documents and the Middle Columbia-Hood (Western Hood Subbasin) TMDL. A summary of applicable water quality S&G and BMP's from these documents are displayed below.

Forest Plan Standards and Guidelines (pages Four-53 through 63)
- Standards and Guidelines dealing with BMPs – FW-54,55,56,57,58,59,60
- Standards and Guidelines dealing with analysis considerations – FW-61,62,63,64,65,66,67
- Standards and Guidelines dealing with drinking water protection –FW-72,75,76
- Standards and Guidelines dealing with maintaining good water quality (temperature and sediment) - FW-109,110,111,112,113,114,127,128,129,132,133,134,135,136

Northwest Forest Plan (NWFP) Standards and Guidelines:
- Standards and Guidelines dealing with Key Watersheds (NWFP ROD pg. C-7).
- Standards and Guidelines dealing with Riparian Reserves (NWFP ROD, pg. C-31 through C-38). The primary Standards and Guidelines that pertain to this project are Recreation Management – RM-2.
- Aquatic Conservation Strategy

The Clean Water Act of 1948 (as amended in 1972 and 1987) establishes as federal policy the control of point and non-point pollution and assigns the States the primary responsibility for control of water pollution. Compliance with the Clean Water Act by National Forests in Oregon is achieved under State Law.

West Hood Subbasin TMDL: Continue to follow Forest Plan and Northwest Forest Plan Standards and Guidelines as well as the *Northwest Forest Plan (NWFP) Temperature TMDL Implementation Strategies: Evaluation of the Northwest Forest Plan Aquatic Conservation Strategy (ACS) and Associated Tools* (2005).

In addition to the plans discussed above other documents such as the draft "Forest Service National Core Best Management Practices" (USDAFS, 2012) and the draft "EPA Region 10 Source Water Protection Best Management Practices for US Forest Service, BLM" provide guidance about potential BMP's for this project. Those BMP's would be incorporated where appropriate.

Key Watershed

The NWFP states that "The amount of existing system and nonsystem roads within Key Watersheds should be reduced through decommissioning of roads" (NWFP B-19). Within the West Fork Hood River Tier 1 Key Watershed, 29 miles of roads have been decommissioned to date since the inception of the Northwest Forest Plan. The reduction of road miles from 147 miles to 118 miles would result in an overall reduction of road related sediment through time in the Key Watershed. It is expected that approximately 1.1 miles of new temporary road would be constructed, 2.1 miles of existing temporary roads would be reopened and 0.6 miles of previously decommissioned roads would be reopened to facilitate access for the Red Hill Restoration project. In addition, the Lava Restoration Project would reopen another 150 feet of temporary road in the Ladd Creek sub-watershed. This would temporarily raise the miles of non-system road, but these roads would be rehabilitated within 3 to 5 years of construction. Twelve additional miles of roads are proposed for decommissioning in the Red Hill Restoration project, so total road mileage would decrease to 106 miles in the Key Watershed after implementation of the Red Hill and Lava Restoration projects. The West Fork Hood River is the only key watershed in the Lava Project Area.

Peak Flow Analysis

Forest Plan Standard FW-064 states that "Watershed impact areas at the subbasin or area analysis level should not exceed 25 percent" (pg. Four-53) as part of a cumulative watershed effects analysis. This threshold is set to disperse activities in time and space to "minimize cumulative watershed effects" which in this case is primarily increased peak flow (Forest Plan Standard FW-061, pg. Four-53). These increased peak flows can cause stream channel damage in the form of increased bank erosion, channel bed scour, channel widening, and sedimentation. The watershed impact area for The Lava Restoration Project is reduced to 12.3 percent compared to a pre-project value of 10.8 percent. This value is well below the maximum Watershed Impact Area percentage of 25 percent after implementation, so this project is consistent with this standard.

As outlined in the effects section this project is consistent with applicable law and direction. Major highlights include:

- The inclusion of Best Management Practices (BMP) to meet water quality standards and the Clean Water Act. These BMPs reduce or eliminate potential degradation from increased water temperature and sedimentation.
- Establishment of Riparian Reserves and meeting standards within the Tier 1 Key Watershed.
- Designing prescriptions within Riparian Reserves to contribute to attainment of Aquatic Conservation Strategy Objectives (see the Aquatic Conservation Strategy section for more information).

Executive Order 11990 – Protection of wetlands

As documented above, none of the proposed activities are located in wetlands. The Proposed Action does include some level of entry into Riparian Reserves adjacent to wetlands. As outlined in the Water Quality section, PDC and BMP aimed at reducing or eliminating potential detrimental effects to water quality are included with this project. In addition, vegetation treatment prescriptions are developed to improve and restore more natural tree stands within Riparian Reserves.

Executive Order 11988 – Protection of Floodplains

Due to the steepness of the topography, small stream size and confined nature of streams in this area, floodplain width is fairly limited. The 100-year floodplain on all first order tributaries is estimated to be less than 15 feet wide in general. On West Fork Hood River, the 100-year floodplain is estimated to be generally less than 50 feet wide, while smaller streams such as Bear Creek, Tony Creek and Ladd Creek are about 20 to 30 feet wide. The Middle Fork Hood River floodplain is unusually wide due to the 2006 debris flow. It ranges between 100 and 200 feet wide in places. One activity proposed in floodplain areas is removal of stream crossings associated with road decommissioning. These would be located in a footprint that has already been disturbed and this project includes numerous BMP and PDC aimed at reducing degradation to physical stream channel characteristics. In addition, culvert removal would allow more natural stream and floodplain processes to occur. Another activity that would take place in floodplains of some of the smaller streams is falling wood into stream channels to improve aquatic organism habitat and stream channel function. Both of these activities would improve aquatic and riparian habitat.

3.5.5 Summary of Effects by Alternative

Water temperature would be maintained under the No Action alternative. There would be a low risk of increased water temperature in the Proposed Action due to dropping trees into streams adjacent to perennial streams in six proposed units. The risk of increased stream temperatures is low due to the existence of several site conditions such as groundwater input and wider untouched primary shade zones that reduce the chance of water temperature change. The short-term sedimentation risk would be low for the No Action alternative because sediment delivery to streams in the project area is expected to remain at current levels. The risk would also be low under the Proposed Action alternative with the highest risk associated with culvert removal during road decommissioning. The long-term sedimentation risk would be low to moderate under the No Action alternative with the highest risk associated with Forest Service Road 1600 where sections of cracked road fill pose a threat of sediment introduction into Tony Creek. Under the Proposed Action, the long-term sedimentation risk would be low because road problem areas would be fixed and additional roads would be closed, stormproofed or decommissioned, reducing sediment risk from the road system.

3.6 Fisheries and Aquatic Fauna

More information is available in the project record including the full fisheries analysis file and biological evaluation as part of the Fisheries and Aquatic Fauna Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.6.1 Methodology

The analysis method utilized to determine potential impact to fish, aquatic invertebrates, and their associated habitat are listed below.

- Determine known and suspected locations of federally listed or proposed aquatic species, designated critical habitat, essential fish habitat, Region 6 Regional Forester's sensitive species, survey and manage species, and Mt. Hood National Forest management indicator species in relation to proposed project activities.

- Assess proposed project activities and determine the aquatic habitat elements potentially impacted and the geographic area where effects could occur (i.e., the action area).

- Overlap the species/habitat locations with the action area and determine which species/habitat could be affected by project activities.

- When species/habitat overlaps with action area predict impacts from proposed project activities to individuals and their associated habitat. This analysis relies upon the Soil Productivity and Water Quality Specialist Reports to determine the potential effects to physical resources (i.e., habitat). These specialist reports are available in the project record located at the Hood River Ranger District in Mount Hood/Parkdale, Oregon.

- Potential effects to aquatic fauna and habitat were determined from the following:
  - Direct effects from proposed activities;
  - Potential reductions in stream shade and subsequent increases in water temperature compared to existing levels;
  - Potential increases in erosion and fine sediment input to streams and wetlands compared to existing levels;
  - Potential impacts to existing and future levels of large wood in stream channels and Riparian Reserves, including any impacts to large wood recruitment;
  - Potential impacts to the quantity and quality of pool habitat; and,
  - Cumulative effects associated with ongoing or proposed projects in the action area.

- Where changes to habitat parameters discussed above result from proposed project activities, the potential impacts to aquatic species/habitat were analyzed and then the effects to the biological resource were determined based on professional experience, applicable surveys/studies, and available literature/research.

Assumptions associated with this methodology are listed below.

- Aquatic faunal and habitat survey data utilized is the latest available and utilized standard survey protocols. It is assumed that this information is representative of current conditions unless otherwise noted.
- All Best Management Practices (BMP) and Project Design Criteria/Mitigation Measures (PDC) listed in the PA, Chapter 2 would be fully implemented and effective.
- The areas of impact outlined in the PA, Chapter 2 are the actual areas of disturbance.
- Monitoring effectiveness of PDC and compliance would be a component of project

implementation.

- A large chemical spill (gas, oil, or other material) would not occur during project implementation thus it will not be analyzed.
- All surface water areas have been identified during field surveys work.

3.6.2 Existing Condition

Overview

The project area is located in the Mt. Hood National Forest (Forest) in Hood River County. The 13,800 acre project area is located in portions of five 6th field subwatersheds within two 5th field watersheds (see Figure 3-10). The majority (over 90%) of the project area is located in the Lower and Upper Middle Fork Hood River 6th field watersheds of the East Fork Hood River (EFHR) 5th field watershed. Some road closures are proposed in the Lower and Middle East Fork Hood River 6th field watersheds of the EFHR 5th Field watershed. Finally, two huckleberry enhancement areas are located in the Upper West Fork Hood River 6th field subwatershed of the West Fork Hood River (WFHR) 5th Field Watershed. At a finer scale, proposed activities are primarily located in the following 7th-field subwatersheds: Ladd Creek (the only 7th field watershed within the WFHR portion of the project area), Tony Creek, Middle Fork Hood River, Bear Creek, Coe Branch, and Pinnacle Creek (see Figure 3-6 in the Water Quality Section). The WFHR is designated under the Northwest Forest Plan as a Tier 1 Key Watershed, which has an emphasis on management of anadromous salmonids (USFS and BLM 1994).

Note that some proposed actions are located in other 7th field watersheds but the actions comprise less than one percent of the total watershed area in the project area. Specifically, the log haul route from the huckleberry enhancement units travels through other 7th field watersheds in the WFHR – this will be discussed further in the effects section below. The only proposed action in the Lower and Middle EFHR 6th field watersheds is to administratively change an existing seasonal road closure of Forest Service roads 3511012, 3511620, and 3511621 to year round closures. This action includes replacing an existing gate located outside Riparian Reserves.

The majority of the project area lies within the Upper and Lower Middle Fork Hood River watersheds. Streams in the project area total 116 miles; 82 miles are perennial and 34 miles are intermittent. Most of the drainages are steep in the headwaters and moderately sloped closer to their mouths. The Middle Fork Hood River is fed by two glacial source streams (Eliot Branch and Coe Branch) and several spring fed streams (Clear Branch, Pinnacle, Boomer, Bear, and Tony Creeks). The portion of the Middle Fork Hood River within the Forest is located in a relatively U-shaped valley until it enters the Lava Bed Geological Area where it is much more confined. It is designated as a Wild and Scenic River (Scenic).

Water quality in streams within the project area is generally good, with water temperatures well below Oregon Department of Environmental Quality standards. Eliot Branch and Coe Branch carry substantial amounts of natural bedload and fine sediment that influences habitat conditions in the Middle Fork Hood River downstream from their respective confluences. Other streams in the project area are all spring fed and thus run clear and cold.

A 2011 analysis of watershed condition conducted at the 6th field scale determined overall watershed condition in the Lava project area was either “Functioning at Risk” and “Impaired or Functioning at Unacceptable Risk,” depending on the watershed (Table 3-29).

Table 3-29: Watershed condition ratings for the three 6th field watersheds located within the Lava Restoration project area.

Six Field Watershed Name	Watershed Condition Rating	Watershed Function Rating
Upper West Fork Hood River	1.6	Functioning at Risk
Lower Middle Fork Hood River	2.4	Impaired or Functioning at Unacceptable Risk
Upper Middle Fork Hood River	1.8	Functioning at Risk

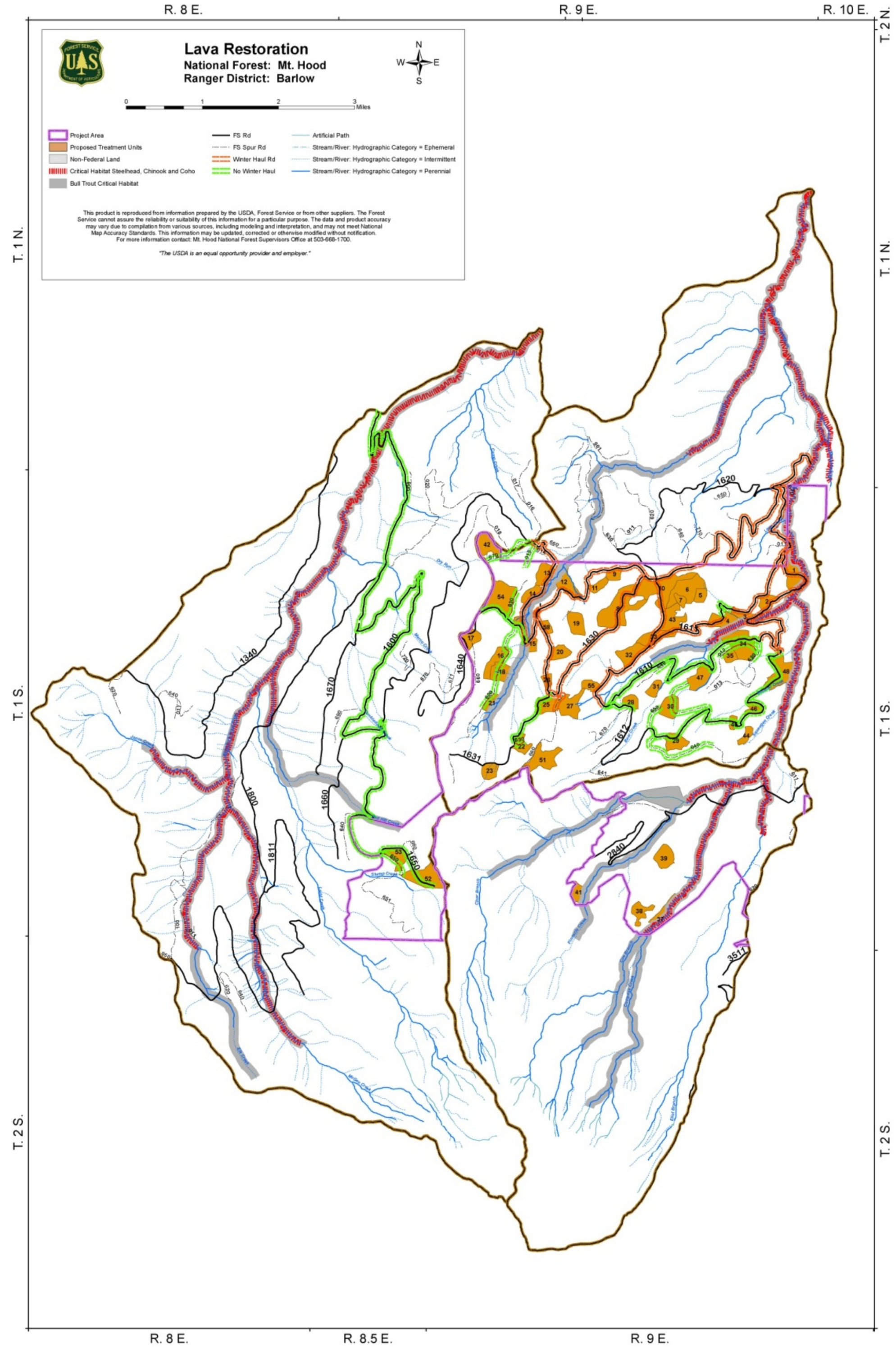


Figure 3-10: Map of the Lava Restoration project area including streams, roads, proposed vegetation treatment units, and designated salmon, steelhead trout, and bull trout critical habitat.

Affected Environment/Action Area

The affected environment, also known as the action area, is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action [50 CFR §402.02]. For the purposes of this analysis, the action area is defined as all areas where ground disturbance would take place for all proposed projects, as well as aquatic habitat areas downstream where potential effects could occur.

This analysis focuses on the following 7th field subwatersheds for site specific analysis (e.g. direct and indirect effects): Ladd Creek, Clear Branch, Pinnacle Creek, Coe Branch, Bear Creek, Tony Creek, and the Middle Fork Hood River (to the confluence with Tony Creek) and the 6th field subwatershed scale is the focus for cumulative effects analysis and compliance with the Northwest Forest Plan (NWFP) Aquatic Conservation Strategy Objectives. Although watershed boundaries make up the extent of the action area the actual expected effects would only be realized in a portion of the watershed.

The action area from the aquatics analysis perspective lies within the 7th field watersheds listed above and also includes the proposed log haul route and associated stream crossings in the greater WFHR watershed: FSR 1650 to 1600 to 1800. The action area does not include the proposed administrative road closures and gate replacement in the East Fork Hood River. The road closures themselves would not result in any ground disturbance and from an aquatics perspective there would be no effect to aquatic species or habitat. Likewise, the gate replacement would also have no effect to aquatic species or habitat since it is located outside any Riparian Reserve and the ground disturbance would be localized to the immediate area around the gate.

The action area encompasses 28,882 acres. This is larger than the project area (13,800 acres) because the action area includes the entire 7th field watershed where proposed actions would occur. In contrast, the project area boundary does not extend far beyond specific treatment areas (such as vegetation treatment units).

Environmental Baseline

The environmental baseline discussion is divided into two main sections: aquatic species distribution and basic life history; and existing habitat conditions, particularly as they relate to designated critical habitat primary constituent elements (PCE) in the action area. Only those species and associated habitat that are found within the action area are discussed and analyzed since there would be no effect/impact to species/habitat outside the action area.

Presence of PETS Aquatic Species within the Action Area

Fish Species Presence / Absence

There are 15.4 miles of designated critical habitat for Lower Columbia River (LCR) steelhead (*Oncorhynchus mykiss*), 9.0 miles for LCR Chinook salmon (*O. tshawytscha*), and 10.9 miles of proposed critical habitat for LCR coho salmon (*O. kisutch*) in the action area (Figure 3-11 - Figure 3-13). In addition, there are about 30 miles of Columbia River bull trout (*Salvelinus confluentus*) designated critical habitat in the action area (Figure 3-14). All of the aforementioned species are listed as threatened under the Endangered Species Act (ESA). Not all critical habitat is occupied by the corresponding listed species – this is discussed in more detail below. Other native fish species present in the action area include resident rainbow trout (*O. mykiss*) and resident cutthroat trout (*O. clarki*).

Both LCR summer and winter steelhead runs are present in the Hood River Basin; only summer steelhead are present in the WFHR and only winter steelhead are present in the MFHR. Summer steelhead presence in the WFHR only overlaps the action area where the proposed log haul route (FSR 1800) crosses Lake Branch and the WFHR. Winter-run steelhead are found in the MFHR, Tony Creek, Bear Creek, Clear Branch, and possibly Coe and Eliot Branches within the action area (Figure 3-11). Adult summer steelhead typically enter the Hood River from July to early October before spawning from March to July the following year, whereas winter steelhead typically enter the Hood River in early December to mid-June before spawning from mid-January to late June. Most juvenile steelhead emigrate as age-2 or age-3 smolts and spend 2 years rearing in the ocean before returning as adults.

Both LCR spring and fall Chinook salmon are present in the Hood River Basin, but only spring Chinook salmon are present in the action area (Figure 3-12). The only overlap with the action area in the WFHR is where FSR 1800 crosses the West Fork itself. Spring Chinook salmon are present in the MFHR, Tony Creek, and Rogers Creek within the action area; presence is suspected in Bear Creek and Clear Branch (Figure 3-12). The native Hood River spring Chinook run is extinct (CTWS and ODFW 1991), but the population was reintroduced in the mid-1990s from Deschutes River stock and supplementation continues to the present. Chinook typically enter the Hood River from April and May and spawning occurs from August through September.

LCR coho salmon presence in the action area is relatively limited. Their overlap with the action area in the WFHR is the same as Chinook salmon. In the MFHR watershed they are present in the MFHR, Tony Creek, Rogers Creek, Bear Creek, and Clear Branch (Figure 3-13).

The Hood River has two core populations of bull trout: one is an isolated population located upstream of Clear Branch Dam in Clear Branch and Pinnacle Creek, and the other is located in the Hood River, MFHR, and tributaries below the Clear Branch Dam (USFWS 2002). Specifically, below Clear Branch Dam bull trout are found in Clear Branch, Coe Branch, likely the lowest reach of Eliot Branch, Bear Creek, and Tony Creek (Figure 3-14). Critical habitat has been designated throughout the MFHR watershed and in the WFHR watershed as well based on suitable habitat conditions (Figure 3-14). The WFHR watershed is unoccupied by bull trout (USFWS 2010) and only the short reach of the WFHR below Punchbowl Falls was historically accessible.

No other ESA listed anadromous fish species that occur elsewhere on the Forest are found in the action area.

<u>Management Indicator Species</u>

Because of their relative sensitivity to change, salmonids were selected as "an indicator species group" for aquatic habitats on the forest. This group of species is especially important for their commercial and game values and because they occupy the spectrum of aquatic habitats on the forest. Their habitat and water quality requirements are restricted enough that it is reasonable to assume that if the life history needs of salmonids are met, the needs of other fish species found on the Forest would be met (see FEIS, III-58). Management Indicator Species (MIS) for the Forest include ESA listed fish species (Chinook salmon, coho salmon, steelhead trout, and bull trout), coastal cutthroat trout, and resident rainbow trout – all are found in the Lava Restoration Project action area. Of these species, resident trout (rainbow and cutthroat) are the most widespread in the action area (Figure 3-15).

A forest-level analysis of the status of these species and their habitat was conducted in March 2011 (project file). The state of Oregon, in concert with the regulatory agencies, manages fish populations while the Forest manages the habitat. For a population to be viable, attributes such as species abundance, productivity, spatial structure, and genetic diversity are needed for the species to maintain its capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment. All of these attributes are affected by habitat and other environmental conditions that influence species behavior and survival.

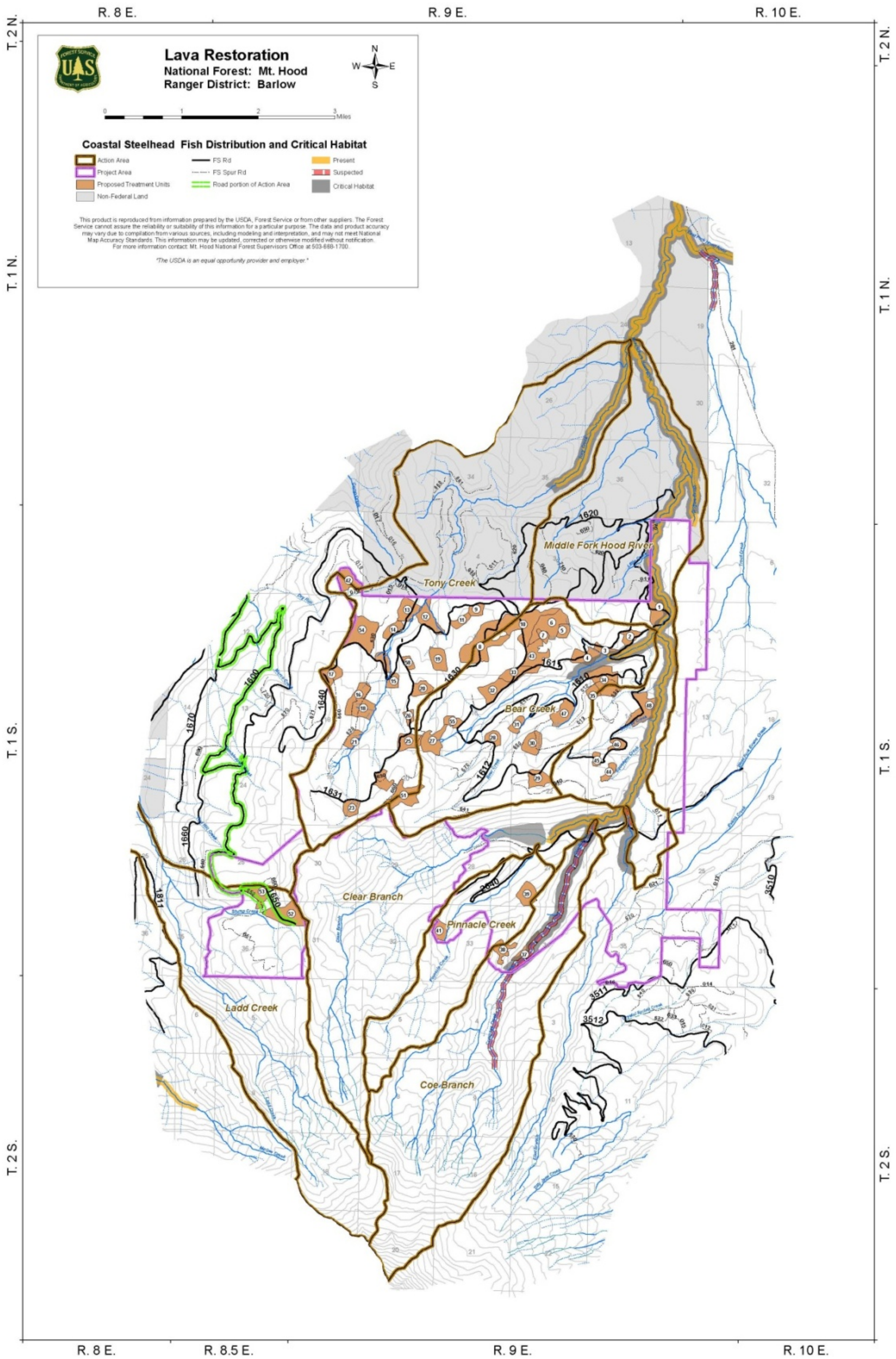


Figure 3-11: Map of known and suspected steelhead trout distribution and designated critical habitat within the Lava Restoration Project action area.

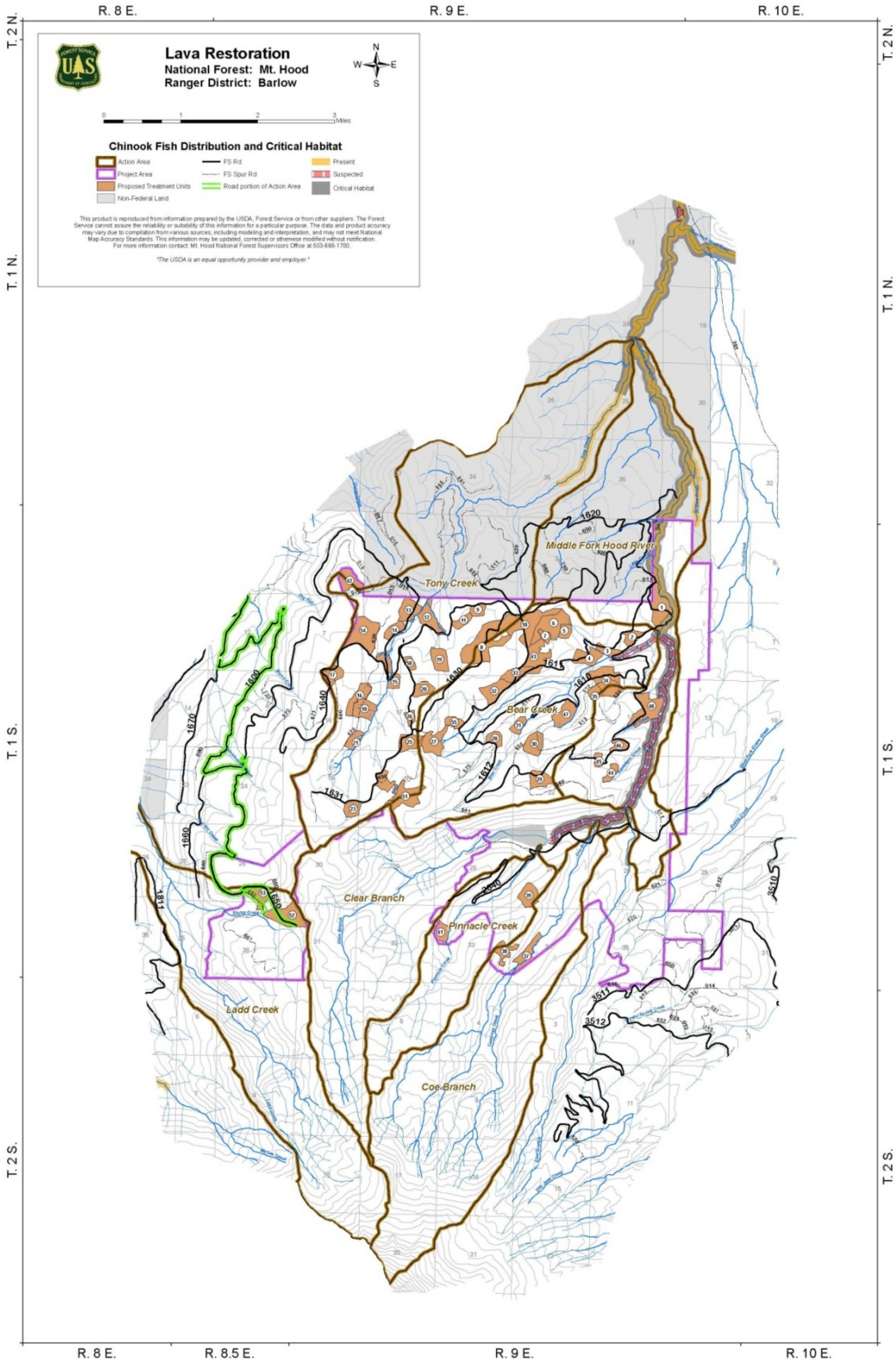


Figure 3-12: Map of known and suspected Chinook salmon distribution and designated critical habitat within the Lava Restoration Project action area.

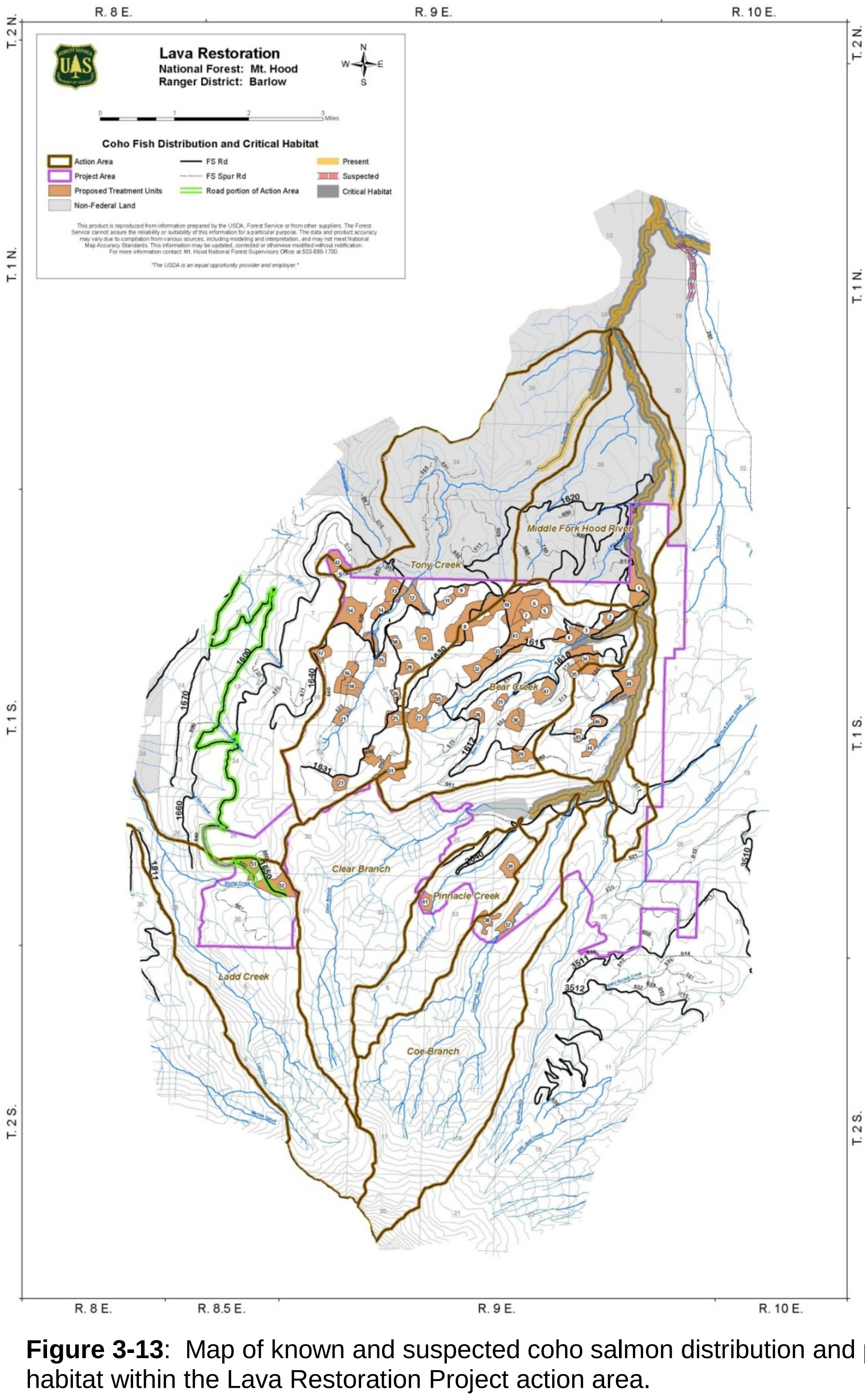


Figure 3-13: Map of known and suspected coho salmon distribution and proposed critical habitat within the Lava Restoration Project action area.

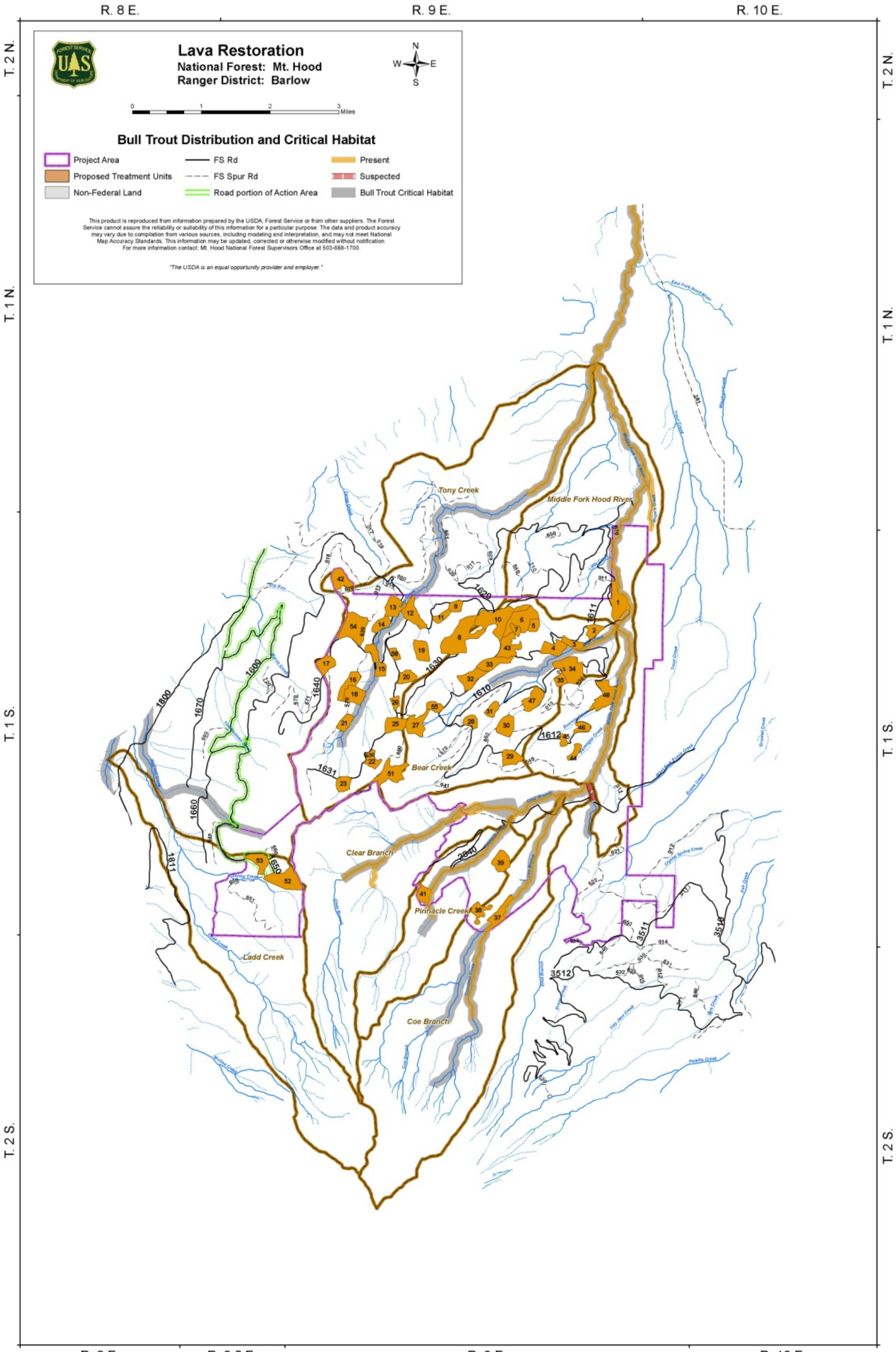


Figure 3-14: Map of known and suspected bull trout distribution and designated critical habitat within the Lava Restoration Project action area.

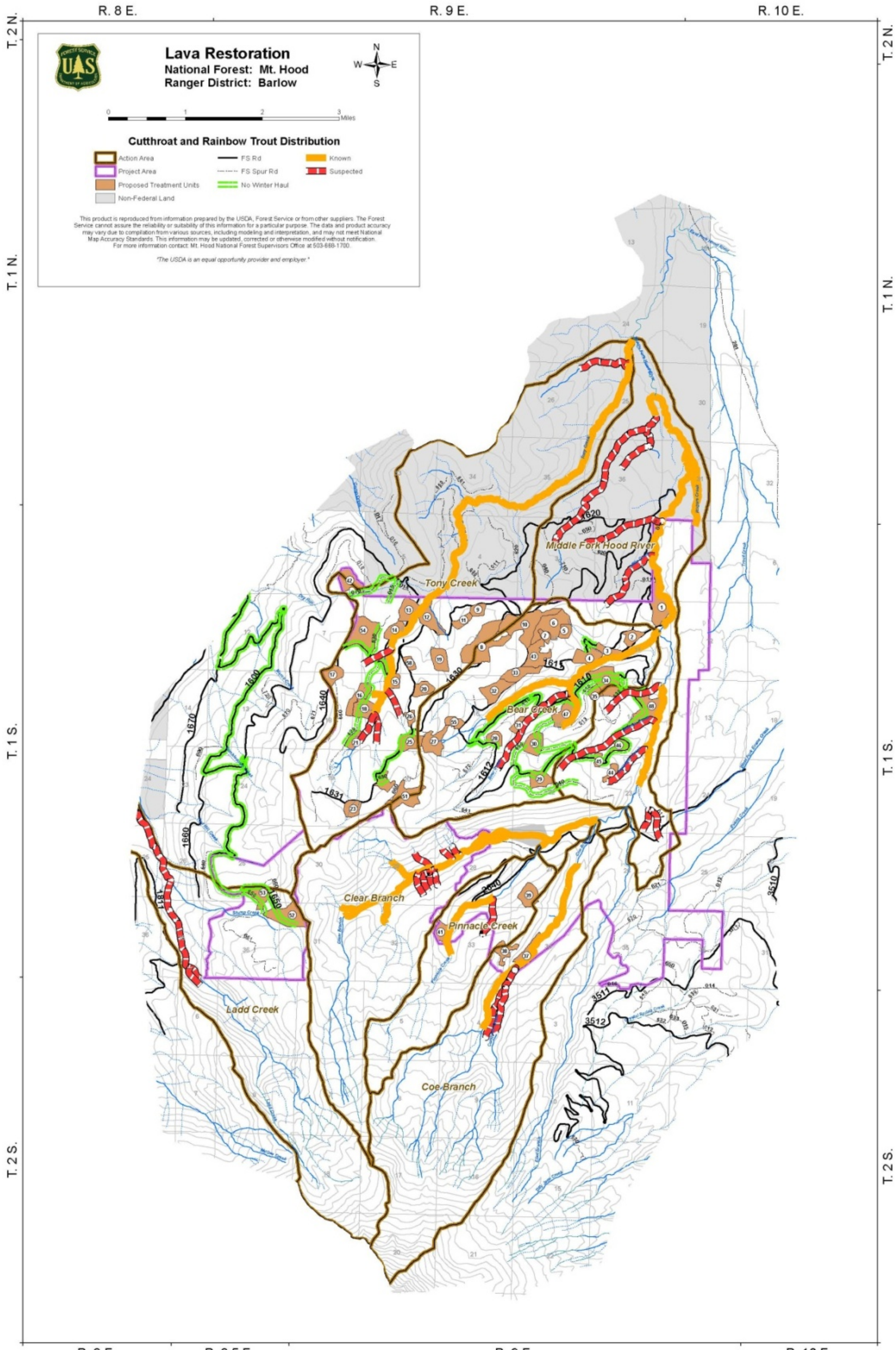


Figure 3-15: Map of known and suspected resident trout distribution within the Lava Restoration Project action area.

The forest-wide analysis also assessed the quantity and quality of habitat available on the forest, and how much habitat was occupied, for each of the salmonid species. The analysis was performed by calculating the linear distance of stream miles of the intersect between widely available National Hydrography Dataset (NHD) and StreamNet fish distribution layers of the geo database on file at the Forest headquarters office. Fish distribution was determined by utilizing the Oregon Department of Fish & Wildlife (ODFW) 1:24000 data for anadromous fish (which matched StreamNet data), U.S. Fish and Wildlife Service data for bull trout, and Forest legacy fish distribution data for resident trout distribution. Results of this analysis are summarized below (Table 3-30).

Table 3-30: A comparison of salmonid management indicator species (MIS) occupied habitat within the Mt. Hood National Forest (total) and the action area. Private land wholly within the Mt. Hood National Forest boundary is included in the "Total Occupied Habitat" column. Steelhead trout is the winter run only.

MIS	Total Occupied Habitat in the Mt. Hood National Forest (mi)	Occupied Habitat in the Action Area (mi)	Percentage of Total Occupied Habitat in the Action Area
Chinook salmon	143	12.3	8.6%
Coho salmon	193	12.9	6.7%
Steelhead trout	303	13.9	4.6%
Bull trout	17.5	17.5	100.0%
Resident trout[1]	1370	54.7	4.0%

<u>Aquatic Macroinvertebrate Presence/Absence</u>
There are three aquatic mollusks and two caddisflies known or suspected to occur on the Forest included on the Region 6 Regional Forester's 2011 Sensitive Species list (Table 3-31). In addition, there are four additional mollusks and three caddisflies considered strategic species by the Regional Forester. Two of the strategic mollusks (Basalt Juga and Columbia duskysnail) were also listed as Survey and Manage Category A species requiring management of known sites and minimizing inadvertent loss of undiscovered sites (USFS and BLM 2001).

Only sensitive species are required to be addressed in a biological evaluation (Forest Service Manual 2670). Distribution, life history, etc. for many strategic species are poorly understood; thus when they are found while conducting surveys for other species, the Forest Service requires recording location(s) in corporate databases established by the agency. For the purposes of this report/biological evaluation, the only two strategic species discussed further are the Columbia duskysnail and Basalt Juga since they are Survey and Manage species as described above.

Table 3-31: Region 6 (R6) special status species either documented (D) or suspected (S) to occur within the Mt. Hood National Forest and within the Lava Restoration Project action area

[1] Because resident rainbow and cutthroat trout are found in many watersheds across the Mt. Hood National Forest and their distribution often overlaps, the MIS analysis lumped their distribution into one category: resident trout. Resident rainbow trout are the most widely distributed salmonid on the forest, occurring in virtually all major watersheds, thus they likely occupy over 90% of the total occupied resident trout habitat displayed in Table 3-32.

(Yes, No, Unknown). The two species in bold are also Survey and Manage species as outlined in Forest Service et al. 2001.

Scientific Name	Common Name	Forest Presence	Action Area Presence
Sensitive Species			
Juga hemphilli dallesensis	Dalles Juga	S	No
Juga hemphilli hemphilli	Barren Juga	D	Yes*
Juga hemphilli maupinensis	Purple-Lipped Juga	S	No
Allomyia scotti	Scott's Apatanian Caddisfly	D	Yes**
Namamyia plutonis	Caddisfly (no common name)	S	Yes*
Strategic Species			
Fluminicola sp. nov. (Pinhead)	Pinhead Pebblesnail	S	Unknown
Juga sp. nov. (Basalt)	**Basalt Juga**	**D**	No
Juga sp. nov. (Brown)	Brown Juga	S	Unknown
***Lyogyrus(Colligyrus)* n. sp. 1**	**Columbia Duskysnail**	**D**	Yes
Lepania cascada	Caddisfly (no common name)	S	Unknown
Moselyana comosa	Caddisfly (no common name)	S	Unknown
Rhyacophila unipunctata	One-Spot Rhyacophilan Caddisfly	D	Unknown

* Not found during any survey, presumed present based on available habitat.

** This species may occur in high elevation headwaters in some of the 7th field watersheds included in the action area; however, given known locations which appear to be in streams above 4,000 feet in elevation, this species would not be found in or below proposed treatment areas.

Dalles Juga: The Dalles Juga has been found in Mill Creek and the central and eastern Columbia River Gorge from Hood River to The Dalles, in Hood River and Wasco Counties, Oregon and Skamania County, Washington (Frest and Johannes 1995). The Dalles Juga is found at low elevation large springs and small-medium streams with a stable gravel substrate and fast-flowing, unpolluted, highly-oxygenated cold water. Relatively few macrophytes or epiphytic algal taxa are present, with Rorippa being the most frequently encountered. The species cannot survive long out of water (Frest and Johannes 1995). Given the fact that known locations are well north and east of the action area and its preference for low elevation habitat the Dalles Juga is not believed to occupy habitat in the action area.

Barren Juga: This species of aquatic mollusk is found in freshwater habitats in small to medium sized highly oxygenated cold water streams at low elevations. The species prefers streams that have moderate velocity level bottoms with stable gravel substrates. The known range of this species is the Columbia River Gorge in Oregon and Washington. They have been found in the Forest and the Columbia River Gorge National Scenic Area. They are also suspected to occur in the Gifford Pinchot National Forest. Although the project area is outside of the known range of the Barren Juga, the habitat description is similar to some locations in the action area (Bear and Tony Creek near mouths) and, therefore, the Barren Juga is assumed to be present.

Purple-lipped Juga: The Purple-lipped Juga snail is endemic to Oregon. It is found in large streams at low elevations. These snails prefer riffle habitat with stable gravel substrates, in cold well oxygenated water. It is more tolerant of silt and slack water than other Juga subspecies. The known range of the species is the Lower Deschutes River drainage, below Pelton Dam, and the Warm Springs River in Wasco and Sherman counties, Oregon. Sites where the species are known to occur are located on the Warm Springs Reservation and Prineville Bureau of Land Management (BLM) in the Deschutes Wild and Scenic River Area. There are few locations on the Forest that match the above preferred habitat description. These locations are in larger rivers likely near the Forest boundary. The Purple-lipped Juga is not believed to occupy streams in the action area.

Scott's Apatanian Caddisfly: Species of *Allomyia* occur in forested mountain areas below the sub-alpine zone in North America. The larvae inhabit small, cold streams and according to Wiggins (1973) *Allomyia scotti* may be associated with moss in their habitats. Scott's Apatanian caddisfly is known to reside in four streams on Mt. Hood: an alpine stream 3.3 miles below Timberline Lodge, 4,200 feet (SW ¼ Sec13 T3S R8E; Wiggins 1973); the South Fork of Iron Creek (Sec15-16 T3S R9E; Anderson 1976); from a stream (likely the creek known as "Green Apple Creek" that is a tributary to White River) at the junction of Highway 35 and Forest Road 48 (SE ¼ Sec16 T3S R9E; ONHP 2005), and in a tributary to the Salmon River (ONHP 2005). The species may occur in other localities on or near Mt. Hood; however, extensive surveys have not been conducted.

The only potential habitat within the project area occurs in the headwaters of Ladd Creek, Pinnacle, Creek, Clear Branch, and Coe Branch. However, if present it would be found well upstream of any activities proposed under this project. Therefore, the Scott's Apatanian caddisfly may occur within high elevation stream reaches of the aforementioned 7th field watersheds within the action area, but no activities would affect individuals or habitat so this species will not be discussed further in this report.

Namamyia plutonis: Little is known about the specific life history characteristics of *Namamyia plutonis* but it is likely that their life history is similar to other caddisflies in general (including *Allomyia scotti*) as described by Spellman (2008). They have been found in small streams in densely forested old growth or mature forest watersheds, and larvae have been found in core samples collected from areas composed of coarse gravel mixed with silt and organic sediments (Anderson 1976). They are known to reside in the Coastal and Cascade Ranges of Oregon and California, including documented occurrences in the Rogue River-Siskiyou, Siuslaw, and Willamette National Forests (Anderson 1976), and a recent occurrence in the Rogue River-Siskiyou National Forest (Borgias and Wisseman 1999).

Namamyia plutonis has never been documented in the Forest, but suitable habitat appears present in the action area. As such they are presumed present in small streams with mature forest characteristics within the action area.

Survey and Manage Aquatic Mollusks

Upon review of the survey and manage direction in the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USFS et al. 2001) most of the proposed vegetation treatment in this project falls within exemption "a" (thinning projects in stands younger than 80 years old) listed in the October 11, 2006, modified injunction Northwest Ecosystem Alliance v. Rey, Case No. 04-844-MJP. In addition, Proposed road decommissioning, including culvert removal, falls within exemption "c" ("Riparian and stream improvement projects where the riparian work is …road or trail decommissioning...") listed in the October 11, 2006, modified injunction Northwest Ecosystem Alliance v. Rey, Case No. 04-844-MJP.

Past surveys were conducted in some action area 7th field watersheds in 1998 (Clear Branch, Pinnacle Creek, and Coe Branch) and in 2003 (Tony Creek). The 1998 surveys were the first ever conducted on the Forest and as such the documentation was not as complete as subsequent surveys. No mollusks of any kind were found in Coe and Eliot Branches nor were any found in mainstem Clear Branch above Laurance Lake. However, snails of an unidentified species were found in Pinnacle Creek and in several small, clear water tributaries to Coe Branch and Clear Branch. These were likely the Columbia duskysnail based on subsequent surveys conducted around the Forest as habitat conditions were similar to sites where this snail was positively identified and because distribution of the Columbia duskysnail has proved ubiquitous across the Forest. No Survey and Manage snails were found in Tony Creek in 2003.

Additional surveys were conducted in the project area in units with suitable habitat for Survey and Manage and sensitive snail species. Streams located in, or adjacent to, units 3, 13, 21, 27, and 47 were surveyed in 2012. The Columbia duskysnail was found in Bear Creek, a tributary to Bear Creek, and Tony Creek associated with units 3, 13, 21, and 27. In addition the Columbia duskysnail was found in a spring adjacent to FSR 1600 in the Tony Creek 7th field watershed during unit reconnaissance conducted as part of the Lava planning process in 2012 (Chris Rossel, fisheries biologist, Mt. Hood National Forest, personal communication, 2013).

Basalt Juga: The Basalt Juga has only been found in one survey on the Forest in North Fork Mill Creek. They have not been found in any other stream or water body surveyed since Forest personnel began surveying in 1998. They are not believed to reside in watersheds other than those that drain into the Columbia River near The Dalles, Oregon, and thus are not present within the action area.

Columbia duskysnail: This species of aquatic mollusk has been found across the Forest during surveys conducted over the past several years (Mt. Hood National Forest, unpublished data). In 2012 Columbia duskysnails were found in the action area in multiple tributaries to Tony Creek and in the headwaters of Bear Creek as described above. Habitat requirements for this species are fairly specific: cold well oxygenated springs, seeps, and small streams, preferring areas without aquatic macrophytes (Furnish and Monthey 1998). Individuals have not been found in larger streams and rivers or glacial streams. Suitable habitat exists elsewhere in the action area and thus the Columbia duskysnail is presumed present in smaller, perennial, non-glacial streams in the action area.

This project complies with the court's survey and management direction in Northwest Ecosystem Alliance v. Rey and is consistent with the survey requirements in the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA and BLM).

Existing Aquatic Habitat Conditions within the Action Area, Including Designated Critical Habitat and Essential Fish Habitat

The project area has been impacted over the past century by timber harvest, road building, floods, fires, fire suppression, irrigation, and recreational activities. All these activities have had an effect on the condition of the quality and quantity of habitat for fish and other aquatic species, including stream channel sediment composition, large wood quantity, pool quality and quantity, and water temperature. Whereas a number of habitat parameters could be affected by proposed project activities, the primary processes that could be impacted by the project include sediment delivery, increased solar loading, and large wood recruitment.

Proposed treatments, unit boundaries, temporary road locations, and PDCs have all been designed to minimize impacts to aquatic habitat across the action area. Some impacts are possible, and the following habitat parameters are the most likely to be impacted: stream shade and subsequently water temperature; substrate fine sediment levels in streams and wetlands; pool quantity and quality; future large wood recruitment potential; and existing in-stream large wood levels. Only these habitat parameters will be discussed below and in the effects sections that follow.

Stream Temperature

Stream temperatures have been collected by the Forest Service at five monitoring locations within or below the project area for several years (see Figure 3-7 in the Water Quality section). Water temperature monitoring has focused on summer conditions since fall, winter, spring and early summer temperatures (spawning and incubation periods) in this watershed are quite cool. Water temperature recorders were generally placed in late spring or early summer, depending on snowmelt, and removed in early fall.

The MFHR had the warmest maximum 7-day average water temperatures of monitored streams during in the action area the 1994-2007 period of record (Table 3-22 in the Water Quality section). However, all monitored streams were quite cool and even though continuous records for each stream are unavailable the data illustrates that cold water prevails in the action area. As outlined in the Water Quality Specialist Report most of these streams are heavily influenced by multiple groundwater and/or glacial sources.

Stream Sediment

Fine sediment deposition in streams can adversely affect fish and fish habitat, particularly for salmonids, by reducing the quantity and/or quality of spawning habitat, reducing food supply by impacting invertebrate habitat, reducing interstitial habitat, thereby decreasing fry survival, and reducing pool quality and quantity. Both past and on-going land use activities can contribute fine sediment in streams. The Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) states that spawning habitat shall maintain less than 20 percent fine sediments less than 1 mm, (FW-096).

Levels of fine sediment were below Forest Plan standards in all streams within the action area except one tributary to Bear Creek and the lowest reach of Coe Branch (Table 3-32). Streams particularly important to fish spawning and rearing (Clear Branch, Pinnacle Creek, Bear Creek, and Tony Creek) had very low levels of fine sediment. Note that stream surveyors combined all sediment less than 2 mm into one category so comparing the values directly with the Forest Plan standard is impossible, but in general levels of fine sediment were low enough that the Forest standard is easily met. All the streams in the action area are located near potential anthropogenic sources of fine sediment, including roads, timber harvest units, and the Bonneville Power Administration (BPA) power line corridor, and those sources could contribute varying amounts of fine sediment depending on the location. In the MFHR, the level of fine sediment is naturally elevated below Eliot and Coe Branches due to their glacial source. Based on personal observation the level of fines in the MFHR appears relatively high, at least in depositional reaches (not unexpected), but not above the range of natural variability given environmental conditions upstream.

Table 3-32: The percent of surface fine sediment measured by Wolman pebble counts in streams within the Lava Restoration Project action area. Pebble counts were not conducted in the Middle Fork Hood River in 2006.

Stream	Year Surveyed	River Miles	Percent fines <6mm	Percent fines <2mm
Bear Creek	2001	0.0 – 2.2	0	0
Bear Creek Trib 3	2001	0.0 – 2.0	18	16
Bear Creek Trib 5 to Trib 3	2001	0.0 – 0.5	28	25
Clear Branch	2006	0.0 – 0.7	2	1
Coe Branch	1998	0.0 – 0.9	38	38
Coe Branch	1998	0.9 – 2.4	13	10
Coe Branch	1998	2.4 – 3.4	18	10
Coe Branch	1998	3.4 – 4.5	4	4
Pinnacle Creek	1999	0.0 – 2.9	10	8
Tony Creek	2012	0.0 – 1.5	3	1
Tony Creek	2012	1.5 – 3.1	7	6
Tony Creek	2012	3.1 – 5.0	4	1
Tony Creek	2012	5.0 – 6.2	6	4
Tony Creek	2012	6.2 – 8.6	7	2

Pool Quantity and Quality

Pool habitat is a critical component of healthy stream habitat for salmonid populations. The Forest Plan requires that pool habitat be maintained or increased resulting from a given project (FW-088) and that streams contain one or more primary pools per 5 to7 channel widths in low gradient streams (less than 3 percent slope) and one per 3 channel widths in steeper channels

(FW-090/091). A primary pool is defined as a pool at least 3 feet deep, which occupies at least half of the low water flow channel. Pool frequency is often related to the occurrence of large wood or other channel obstructions (Montgomery et al. 1995). Pool depth is related to the shear stress and the sediment input. Fine sediment above natural background levels can fill pools and increase bed mobility, resulting in shallower scour depths (Buffington et al. 2002).

Pool frequency in all streams within the action area is below Forest Plan standards (Table 3-33). It should be noted that very few streams across the entire Forest meet the standard and those that do tend to be the larger rivers. This is because the pools per mile standard only applies to primary pools as defined above and pools of this size are not common in the smaller, steeper streams common across the Forest and in the action area. The fact that primary pools are not prevalent does not mean that pool habitat is absent in action area streams as can be seen in the “Total Pools per Mile” column in Table 3-33. There are steam reaches that have been impacted by land management activities, including a reduction of pool forming large wood, across the action area that likely have fewer pools than historically present. Therefore, although the Forest Plan standard is not met in any action area stream, most streams in the action area have at least some reaches within the range of natural conditions given stream size, gradient, and valley type in the action area.

Table 3-33: Pool habitat summary for surveyed streams found within the Lava Restoration Project action area, including total pools per mile; primary pools (pools >=3ft. deep) per mile, and the Forest Plan standard (primary pools). The Forest Plan standard does not apply to the lower four reaches of Tony Creek as they are located below the MHNF boundary.

Stream	Year Surveyed	River Miles	Total Pools per Mile	Primary Pools per Mile	Forest Plan Pools per Mile Standard
Bear Creek	2001	0.0 – 2.2	49	5	110
Bear Creek Trib 3	2001	0.0 – 2.0	54	5	118
Bear Creek Trib 5 to Trib 3	2001	0.0 – 0.5	94	0	184
Clear Branch	2006	0.0 – 0.7	29	3	68
Coe Branch	1998	0.0 – 0.9	16	0	88
Coe Branch	1998	0.9 – 2.4	22	3	73
Coe Branch	1998	2.4 – 3.3	23	4	83
Coe Branch	1998	3.3 – 4.5	15	1	108
Compass Creek	1995	0.0 – 1.1	29	7	111
Compass Creek	1995	1.1 – 1.4	30	13	117
Compass Creek	1995	1.4 – 2.0	21	14	107
Compass Creek	1995	2.0 – 2.8	20	0	117
Eliot Branch	1994	0.0 – 4.1	17	6	94
Eliot Branch	1994	4.1 – 5.5	5	5	62

Middle Fork Hood River	2006	4.9 – 5.6	4	4	46
Middle Fork Hood River	2006	5.6 – 9.8	4	3	52
Pinnacle Creek	1999	0.0 – 2.9	24	3	99
Tony Creek	2012	0.0 – 1.5	20	3	n/a
Tony Creek	2012	1.5 – 3.1	32	11	n/a
Tony Creek	2012	3.1 – 5.0	47	12	n/a
Tony Creek	2012	5.0 – 6.2	45	7	n/a
Tony Creek	2012	6.2 – 8.6	26	4	95

Pool quality is a subjective measure of their "attractiveness" and suitability for fish and other aquatic fauna. Pools of higher quality are deeper and contain some form of cover for fish (i.e. large wood, undercover bank, water turbulence bubbles). Field observations conducted as part of this project indicated pools located in the first order headwater stream with low gradients or glacially influenced streams in the action area had shallow pool depths with fine sediment, sand, or small gravel as the dominate substrate. Minimum diameter channel forming wood sizes were identified in the action area during field surveys and the majority of the first order headwater stream pools were created and maintained by 3 to 4 inch diameter alder wood (both alive and dead).

Pool habitat in the MFHR and Eliot Branch was significantly altered by the 2006 debris torrent. The 2006 flood killed many trees located in the floodprone area of Eliot Branch in the lower 1.5 miles and the same situation occurred in a large depositional zone adjacent to the MFHR immediately below the lava bed. As these trees fall they could help create and maintain pools in these respective streams.

Large Wood Recruitment Potential

The ability of forested stream-side riparian areas to provide a continual source of large wood to the channel and floodplain is dependent on a variety of factors including tree species, tree sizes, stand health, and susceptibility to natural disturbance events such as windthrow, wildfires, or floods. Large wood recruitment potential is not a Forest Plan standard and there is no objective protocol to measure it. Despite the subjective nature surrounding this process the ability of forested riparian stands to provide down wood at present and in the future is an important component of this analysis because silvicultural treatments are proposed in riparian areas as part of this project. The following is a summary of known conditions in the action area.

The EFHR and MFHR Watershed Analysis (USFS 1996) suggested that silvicultural objectives for the two watersheds would "…focus on development of species diversity vertical structure and size class differentiation in the vast young stand components (generally less than 21" diameter) that presently make up the basic forest matrix." In the Silviculture section of the watershed analysis the riparian reserve design cells and interim period management objectives were to "Implement stand maintenance to ensure quality habitat for aquatic and terrestrial species."

The WFHR Watershed Analysis (USFS 1996) did note that past land management in the watershed "…removed much of the in-stream and riparian wood." Authors further stated that "Harvesting and fuel treatments have reduced snags, existing large wood and potential large wood throughout the watershed." This last statement was in the context of wildlife habitat needs, but the implication is that harvest activities, especially through the mid 1900's, reduced the number of large standing trees and this harvest targeted both upland and riparian stands (this is true throughout the action area). As such, the ability of riparian stands in the action area to provide large wood now and in the future varies depending on the area. Most streams have at least sections where relatively large trees are present that could provide down large wood in the future. As described in the Silviculture Specialist Report, many riparian stands are under 80 years old, even aged, overstocked stands resulting in reduced growth rates and smaller trees.

In short, riparian conditions and pathways for recruitment are at various stages of recovery in much of the action area; however, short-term wood recruitment is limited because most trees are not yet of an age and/or size to fall in great numbers on their own.

<u>In-stream Large Wood</u>

Large wood plays an important role in stream ecosystems. Large wood modifies both hydrologic, sediment and nutrient transport by slowing, storing, and redirecting stream water, sediments, and particulate organic matter (Montgomery et al. 2003). Additionally, large wood creates and enhances stream habitat for fish, other vertebrates, and invertebrates by providing physical cover, pools, backwaters, secondary channels, and creating stream flow refugia. Having adequate levels of large woody debris is critical for healthy streams in forested ecosystems.

The Forest Plan has a standard of 106 pieces of suitable large wood per mile of stream (FW-095). For eastside streams, all pieces of large wood should be at least 35 feet long with 80 percent at least 12 inches in mean diameter, and at least 20 percent of large wood pieces should be over 20 inches in mean diameter. None of the surveyed stream reaches in the action area met the standard (Table 3-34) Large woody debris recruitment for the next 0-15 years is expected to increase in some stream reaches in the action area due to flooding described above (Eliot Branch and MFHR) and the Dollar Lake Fire that burned in the headwaters of Clear Branch, Pinnacle Creek, Coe Branch, and Eliot Branch in 2011.

Table 3-34: An in stream large wood summary for surveyed streams in the Lava Restoration Project action area. Wood was counted and summarized differently prior to 1995, thus in the lowest Eliot Branch reach only total pieces per mile is presented.

Stream	Year Surveyed	River Miles	Number of Pieces		Pieces per Mile		
			Medium	Large	Medium	Large	Total
Bear Creek	2001	0.0 – 2.2	63	77	29	35	64
Bear Creek Trib 3	2001	0.0 – 2.0	32	45	16	22	38
Bear Creek Trib 5 to Trib 3	2001	0.0 – 0.5	1	5	2	11	13
Clear Branch	2003	0.0 – 0.6	23	17	35	26	61

Stream	Year Surveyed	River Miles	Number of Pieces		Pieces per Mile		
			Medium	Large	Medium	Large	Total
Coe Branch	1998	0.0 – 0.9	11	2	12	2	14
Coe Branch	1998	0.9 – 2.4	8	38	20	5	25
Coe Branch	1998	2.4 – 3.3	5	26	23	5	28
Coe Branch	1998	3.3 – 4.5	6	6	5	5	10
Compass Creek	1995	0.0 – 1.1	7	26	13	6	19
Compass Creek	1995	1.1 – 1.4	0	0	0	0	0
Compass Creek	1995	1.4 – 2.0	0	0	0	0	0
Compass Creek	1995	2.0 – 2.8	0	0	0	0	0
Eliot Branch	1994	0.0 – 4.1	-	-	-	-	14
Eliot Branch	1994	4.1 – 5.5	0	0	0	0	0
Middle Fork Hood River	2006	4.9 – 5.6	10	1	13	1	14
Middle Fork Hood River	2006	5.6 – 9.8	38	4	9	1	10
Pinnacle Creek	1999	0.0 – 2.9	54	28	18	10	28
Tony Creek	2012	0.0 – 1.5	14	4	9	3	12
Tony Creek	2012	1.5 – 3.1	44	17	27	11	38
Tony Creek	2012	3.1 – 5.0	16	12	9	7	16
Tony Creek	2012	5.0 – 6.2	10	3	8	2	10
Tony Creek	2012	6.2 – 8.6	26	22	11	9	20

Designated Critical Habitat and Essential Fish Habitat

Critical habitat for steelhead trout and Chinook salmon was designated in 2005 by the National Marine Fisheries Service (NMFS) (70 Federal Register 52630, September 2, 2005) and proposed for coho salmon in 2013 (78 Federal Register 2726, January 14, 2013). Critical Habitat for anadromous fish in the WFHR does not overlap the action area except where the propose haul route (FSR 1800) crosses the WFHR and Lake Branch. Designated steelhead critical habitat in the remainder of the action area is similar to occupied distribution in the MFHR, Tony Creek and Clear Branch, but extends farther upstream in Bear Creek, Coe Branch, and Eliot Branch (Figure 3-11). Chinook salmon critical habitat extends upstream of occupied distribution (Figure 3-12) in the MFHR and Clear Branch.

Primary constituent elements (PCE) for steelhead trout and salmon are sites and habitat components that support one or more life stages. Streams in the action area are designated critical habitat for spawning and rearing only, thus only the following PCE pertain to this project and only conditions in the Upper and Lower MFHR 6th field watersheds are discussed.

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.

   Action Area conditions: Water quantity is good to fair depending on the time of year and stream reach. There are three irrigation diversions located in the action area: one each on Eliot Branch, Coe Branch, and Clear Branch that reduce the quantity of water to downstream reaches. Enough water remains in the MFHR that successful spawning, egg incubation, and larval development is likely relatively unaffected. However, conditions in Clear Branch below Clear Branch Dam may be negatively impacted due to withdrawals, especially for steelhead. Water quality, in terms of temperature, fine sediment, chemical contaminants, and nutrient loading is good to excellent in the action area. Fine sediment levels are naturally high in some streams and reaches (Eliot and Coe Branches and the MFHR) due to glacial conditions, and recent wildfires in the upper watershed may contribute more sediment for the next few years until conditions stabilize.

2. (a) Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility.

   Action Area conditions: As described above water quantity has been altered in the MFHR portion of the action area due to irrigation water withdrawals. In addition, past timber harvest (both on and off Forest) has likely resulted in higher peak flows and lower base flows than historic conditions. Despite these alterations and based on personal observations and professional judgment, the amount of water in most water years is more than adequate to form and maintain habitat conditions because flows during fall, winter and spring are less affected than in summer. Existing stream flow provides an amount of rearing habitat adequate to support juvenile growth and mobility, although reaches immediately downstream of diversions are seasonally (summer and fall) impacted by low flows that may limit juvenile movement.

   Floodplain connectivity varies depending on the stream and reach. In general, geomorphic conditions dictate the amount of floodplain connectivity – the steeper streams that dominate the action area have relatively little floodplain connectivity because they lie on steep slopes and are often in well incised drainages. The lower gradient stream sections are better connected to their floodplains, especially in reaches that are under 3 percent gradient and have large wood to collect substrate and help maintain connectivity.

2. (b) Freshwater rearing sites with water quality and forage supporting juvenile development.

   Action Area conditions: Water quality, as described above, is good to excellent. The glacially influenced reaches are within the range of natural variability in terms of fine sediment (including turbidity) and support populations of aquatic macroinvertebrates although not at densities as high as clear water streams. The non-glacially influenced streams have high densities of aquatic macroinvertebrates that provide ample juvenile forage. Increased sedimentation may occur in some streams resulting from the Dollar Lake Fire. Depending on the amount and location this sediment may locally reduce aquatic macroinvertebrate abundance until slope and erosion conditions stabilize and the fine sediment moves through the system.

2. (c) Freshwater rearing sites with natural cover such as shade, submerged and overhanging large wood, logjams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

   Action Area conditions: Cover elements listed above are relatively abundant except beaver dams, side channels and undercut banks. These features are lacking and for the latter two it is because most of the streams are steeper with side channel and undercut bank habitat being less prevalent in steeper streams. The amount of other cover elements varies, but there are no reaches in fish bearing stream reaches devoid of cover. Most stream reaches have a variety of cover types including large wood, boulders, shade, and water depth.

Bull trout critical habitat was designated in 2010 (75 Federal Register 63898, October 18, 2010) in the MFHR, Tony Creek, Bear Creek, Clear Branch, Coe Branch, and Pinnacle Creek within the action area. The WFHR and several tributaries, including Red Hill Creek were also designated, even though habitat is not currently occupied, because it was determined to be necessary for population expansion for the Hood River Population to be recovered (USFWS 2010). Bull trout critical habitat in the WFHR watershed overlaps the action area in two places: in the WFHR at the FSR 1800 crossing and in the headwaters of Red Hill Creek at the FSR 1650 crossing.

The PCE of bull trout critical habitat are derived from studies of bull trout habitat requirements, life history characteristics, and population biology. Streams in the action area are designated critical habitat for foraging, migration and overwintering (Middle Fork Hood River, Tony Creek, Eliot Branch), and spawning and rearing (Bear Creek, Pinnacle Creek, and Clear Branch). , thus only the following PCE pertain to this project: Bull trout PCE, and general action area conditions relating to them, are:

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.

   Action Area conditions: Springs and seeps are abundant in the action area and they occur in all sub-watersheds. Although not measured, there is no information to indicate subsurface connectivity is lacking.

2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

   Action Area conditions: Human-caused migratory barriers are relatively few in the action area and consist mostly of road culverts in or near the headwaters, such as the FSR 1600 crossing at Tony Creek. One notable exception is Clear Branch Dam which is a complete upstream migration barrier and only provides downstream passage when the reservoir spills. MFID is in the process of working with the Forest Service and fisheries agencies to design both up and downstream passage at the dam but it would be several years before any such passage improvements are constructed.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
   Action Area conditions: See 2. (b) in the steelhead trout and Chinook salmon PCE. Resident and anadromous salmonids are also present and would constitute a fish forage base.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.
   Action Area conditions: See 2. (c) above in the steelhead trout and Chinook salmon PCE.

5. Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.
   Action Area conditions: As described in the Water Quality section 7-day maximum water temperatures in action area streams within the MFHR watershed were all below 15 ^{0}C. Springs are abundant in the action area, both within the WFHR and MFHR watersheds, and help provide abundant thermal refugia.

6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions.
   Action Area conditions: Based on available data (Table 3-32) most streams have clean substrate with minimal fine sediment. Although not measured as part of the Forest stream survey protocol, it is the professional judgment of the author that embeddedness is low, except in glacially influenced reaches, and spawning sized substrate is relatively abundant. Some reaches devoid of large wood or other roughness elements have suitable spawning substrate but it may not be stored and sorted in usable patches.

7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.
   Action Area conditions: The historic hydrograph is unavailable for many streams in the action area but Pinnacle Creek, Bear Creek, and streams in the WFHR watershed have flow regimes considered natural in that peaks, high flows and low flows are commensurate with expected levels and timing. Past land management, particularly timber harvest, has likely affected peak and base flow timing and magnitude to some degree, but overall, the hydrograph is within expected values. There are no water withdrawals from the above streams in the action area.

Middle Fork Irrigation District (MFID) operates three diversions, one each in Eliot, Coe, and Clear Branches, to supply water to upper Hood River Valley irrigators and to generate hydropower. As such, the hydrograph in all three of these streams, and the MFHR downstream, has been altered. Records are most complete for Clear Branch and in this stream the biggest impact is very low summer flows below Clear Branch Dam in summer and early fall and a hydrograph that poorly mimics the natural state. However, bull trout are present in all streams affected by water withdrawals so a population is being supported, albeit a small one. Other environmental factors play into bull trout population persistence below Clear Branch Dam.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.
   Action Area conditions: Within the Forest contaminants and human source nutrient levels are at low levels. There are no human sources of contaminants in this portion of the action area. Further downstream in the lower MFHR and Tony Creek 7th field watersheds there is may be some increase in nutrients and/or contaminants due to agricultural practices off-Forest.

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.
   Action Area conditions: There are no interbreeding or competitive non-native species in the action area although some are present elsewhere in the West Fork Hood River 5th field watershed.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a Federal fisheries management plan – in this case, Chinook and coho salmon. Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all proposed actions that may adversely affect EFH. Adverse effects include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH.

Pacific salmon (Chinook and coho) EFH was designated in 1999, but the actual identification of stream reaches considered to be EFH was left to the action agencies, such as the US Forest Service. Within the MFHR, EFH is coincident with designated Chinook salmon and proposed coho salmon critical habitat.

10. A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations.
    Action Area conditions: The historic hydrograph range is unavailable for the Upper West Fork Hood River, but the existing flow regime is considered natural in that

peaks, high flows and low flows are commensurate with expected levels and timing. Past land management, particularly timber harvest, has likely affected peak and base flow timing and magnitude to some degree, but overall, the hydrograph is within expected values. There are no irrigation or other diversions in the action area.

11. Springs, seeps, groundwater sources, and subsurface connectivity to contribute to water quality and quantity.
    Action Area conditions: Springs and seeps are abundant in the action area and they occur in all sub-watersheds. Although not measured, there is no information to indicate subsurface connectivity is lacking.

12. Migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, over-wintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.
    Action Area conditions: Migratory barriers are few and those that are present in the action area are road culverts located in the headwaters. The notable example is Forest Service Road (FSR) 1800 in McGee Creek. This site is scheduled for replacement in 2013 or 2014, pending funding. Below the action area Punchbowl Falls and Moving Falls may impede upstream migration, but are not considered complete blockages due to ladders or varying flow conditions.

13. An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
    Action Area conditions: See 2. (b) above for steelhead trout and Chinook salmon PCE. Resident and anadromous salmonids are also present and would constitute a fish forage base.

14. Few or no predatory, interbreeding or competitive non-native species present.
    Action Area conditions: There are no interbreeding or competitive non-native species in the action area although some are present elsewhere in the West Fork Hood River 5th field watershed.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a Federal fisheries management plan – in this case, Chinook and coho salmon. Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all proposed actions that may adversely affect EFH. Adverse effects include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH.

Pacific salmon (Chinook and coho) EFH was designated in 1999, but the actual identification of stream reaches considered to be EFH was left to the action agencies, such as the US Forest Service. Within the West Fork Hood River, EFH is coincident with designated Chinook salmon and proposed coho salmon critical habitat.

3.6.3 Effects Analysis

No Action – Direct and Indirect Effects

None of the proposed activities would be implemented if this alternative were chosen. In the near term habitat conditions for aquatic fauna would remain essentially unchanged from existing conditions unless natural events, such as floods or fire, occurred. The risk, however, that these types of events could lead to degraded habitat conditions would increase.

Stream Temperature

As outlined in the Water Quality Specialist Report stream temperatures would remain at current levels due to no shade reduction. Water temperatures would remain cool and well within the preferred range for salmonids and other indigenous aquatic fauna, including macroinvertebrates.

Stream Sediment

Because no ground disturbing actions would occur, the existing condition in regards to fine sediment levels would remain. Current sources of fine sediment include roads, the BPA power line corridor and natural sources would remain unchanged. Since roads proposed for closure/decommissioning would remain unchanged, there would be an increased risk of erosion and thus increased levels of fine sediment input to area streams in the headwater and/or tributary areas of Tony and Bear Creeks, and MFHR.

Although road maintenance would occur as budgets and priorities allow the overall level of maintenance would be less than if the Proposed Action were implemented (see Transportation section for more details). In some areas, this could result in an increased risk of erosion and fine sediment input over time. The likelihood of this occurring is difficult to estimate because log hauling would not occur and the act of maintenance in and of itself can cause a spike in erosion and thus fine sediment.

In summary, the risk of increased erosion and thus sediment input to streams from roads, both those proposed for closure/decommissioning and other roads requiring maintenance would be increased under the No Action alternative. However, since other proposed activities that could also increase erosion, including logging operations and log hauling, would not occur the overall impact in the action area from a sediment perspective under the No Action alternative would be negligible. Some areas would experience increased erosion and sedimentation resulting from natural and anthropogenic sources and others would experience less.

Pool Quantity and Quality

The amount and quality of pool habitat would be unaltered under the No Action alternative in the short-term (next 10 to 20 years). Beyond that time a slight decrease in pool quantity would be expected in the larger streams over time given reductions in larger down wood and reduced wood inputs. However, in smaller streams there could actually be an increase in wood created pool habitat as more small trees fall. These conditions would manifest themselves over decades given the anticipated riparian stand response without treatment.

Large Wood Recruitment Potential

If proposed silvicultural treatments did not occur, forested riparian stands would have smaller diameter trees, shorter trees (at least for the first 50 years), and many more trees per acre (Table 3-35). Snags per acre would remain low but over time the untreated condition would produce slightly more snag habitat than the treated scenario. The difference between untreated and proposed treatment conditions, except in trees per acre, is relatively slight. However, smaller trees would not last as long once on-the-ground as they would decay faster and break apart more readily.

Table 3-35: Modeled riparian stand characteristics comparing the No Action (NA) and Proposed Action (PA) alternatives. Stands 51 and 54 are excluded from the analysis because they are in the stand reinitiation stage with many more trees per acre than other stands in the project area. QMD is a measure of tree diameter.

Years After Treatment	Trees per Acre		Height (ft.)		QMD (in.)		Snags >20 in. Diameter Per Acre*	
	NA	PA	NA	PA	NA	PA	NA	PA
0	1860	1860	77	77	6.1	6.1	0.1	0.1
10	1752	427	85	87	6.5	8.1	0.1	0.1
20	1506	418	93	94	7.0	8.7	0.1	0.1
30	1344	410	101	103	7.5	9.4	0.1	0.1
40	1223	462	108	109	8.0	9.4	0.3	0.1
50	1101	447	113	115	8.6	10.0	0.6	0.3
60	1103	477	117	117	8.5	10.2	1.1	0.5
70	965	458	118	118	9.2	10.8	2.0	0.9
80	970	443	119	119	9.1	11.3	3.4	1.8
90	857	419	119	119	9.8	12.0	4.8	2.9
100	770	395	120	120	10.4	12.6	5.8	4.1

* Snag densities are not as high in the Proposed Action as healthier growing conditions are being maintained resulting in longer lived trees that are less susceptible to insect and disease.

To summarize, without treatment there would be more trees in Riparian Reserves that could provide more down wood and, over time, snags. However, this apparent benefit would be offset by increased susceptibility to disease, windthrow, fire, density related mortality, and other ecological change agents. Even though there could be an increase in the amount of down wood this wood would generally be smaller in diameter and thus would decay faster both in and out of stream channels. The down trees would increase fuel loading that would in turn increase the risk of stand replacing fire in riparian areas with the potential for hotter, more destructive burns. Fewer trees would grow to a larger size that would last longer once on-the-ground and in larger streams provide more stable habitat creating characteristics. There would also be a trade-off in the health of the riparian stand, as discussed in the Silviculture Specialist Report, which would increase the likelihood of disease, susceptibility to fire and other natural events, and result in stand composition and structure outside the desired future condition.

In-stream Large Wood
There would be no change in the amount of in-stream and floodplain large wood if the No Action alternative were selected. No activities would occur that would directly reduce the amount of large wood. Based on riparian stand modeling conducted as part of this analysis (see below) not treating the riparian stands would, over time, result in smaller trees that would eventually fall into streams and/or floodplains. Many streams in the action area are small and thus smaller sized large wood provides habitat and channel stability benefits as described above. In larger streams within the action area, however, smaller large wood would not provide the same benefit and would not remain in the system as long as larger wood.

Proposed Action – Direct and Indirect Effects

Direct Effects
Direct effects are those that occur during project implementation, in this case restoration actions such as road maintenance, logging, log hauling, and road decommissioning. To directly impact aquatic species/habitat, the activity needs to be in close proximity to the water body where they reside, often within the water body itself. From an aquatic perspective, direct effects most often result in disturbance to aquatic organisms – forcing movement or a flight response. Depending on the activity, it is possible that individuals can be injured or killed; this case is almost always a result of people or equipment working directly in water. Direct habitat effects are possible, but depend on the activity. For example, removal of vegetation directly adjacent to a stream can immediately reduce shade thus reducing available cover for fish. The only components of the Proposed Action that have a risk of direct effects on aquatic organisms or habitats are tree falling and culvert removal or replacement.

Tree falling: Minimum protection buffers of 60-feet for perennial streams and wetlands and minimum protection buffers of 30-feet for intermittent streams are in place in part to protect aquatic organisms and habitat from the direct effects of logging activities. There are 21 units that border one or more streams in the Lava Restoration Project area (Table 3-36). Of these 21 units, 13 are adjacent to LFH although only four of these units (1, 3, 4, and 48) are occupied by ESA listed fish species. Project Design Criteria/Mitigation Measures (PDC) include directional tree falling away from protection buffers and leaving any portion of a tree that falls within a protection buffer in place. An exception is in eight units where there would be trees felled into the stream channel to increase the amount of in stream LWD (see below and Table 3-36). Despite this PDC, directional falling is not always possible and trees occasionally fall within the protection buffer. Depending on the location and tree size the falling tree could hit a stream channel, or wetland and at the least disturb aquatic animals, and at worst result in injury or death. The latter possibilities are remote and the risk is low.

Intentional tree falling into streams to increase the amount of instream and floodplain LWD is proposed in eight units (units 3, 4, 12, 13, 14, 15, 30, and 47). Unit 4 would only have trees felled into an intermittent channel, even though the unit borders Bear Creek. The intermittent channel would be dry and uninhabited by aquatic animals when trees are felled. Only unit 3 is adjacent to occupied Listed Fish Habitat (LFH) in Bear Creek, the other units lie adjacent to Tony Creek, which is designated bull trout critical habitat but it is unoccupied, and an unnamed tributary to Bear Creek (unit 47). Tree falling into perennial stream channels could result in movement, injury, or death of individual fish and/or aquatic invertebrates. The risk is low for each individual tree felled but the cumulative risk is higher since an estimated 196-588 trees would be felled. This range is based on 1-3 trees felled per 100 feet of stream multiplied by the total stream distance (intermittent and perennial) in the above 8 units. Therefore, there is some risk that listed fish species in Bear Creek could be harmed by tree felling to increase LWD levels, and other salmonids and aquatic macro-invertebrates could be harmed in all perennial streams.

Table 3-36: Plantation thin treatment units with proposed Riparian Reserve treatments in the Lava Restoration Project.

Unit	Total Acres	Riparian Reserve Acres	Treated Riparian Reserve Acres	Distance to Fish Bearing Stream (mi)	Distance to LFH (mi)	Site Potential Tree Height (ft)	Primary Shade Height (ft)	Proposed Tree Falling into Stream Channel	Spring Influence	Minimum Protection Buffer - Perennial (ft)[a]	Minimum Protection Buffer - Intermittent (ft)[a]
1	57	12.4	6.1	Adjacent	Adjacent	140	60	No	High	140	n/a
3	22	3.9	6.8	Adjacent	Adjacent	160	55	Yes (Int. channel and Bear Cr. east of FSR 1610)	High	100	30
4	38	7.9	6.1	Adjacent	Adjacent	160	55	Yes (Int. channel)	Low	100	30
5	16	0.8	0.6	0.4	0.4	140	50	No	Low	n/a	30
6	69	2.4	1.8	0.5	0.5	140	50	No	Low	n/a	30
12	47	21.0	13.0	Adjacent	Adjacent	140	55	Yes	High	60	n/a
13	41	8.4	6.1	Adjacent	Adjacent	140	55	Yes	High	60	n/a
14	25	5.4	5.1	Adjacent	Adjacent	140	55	Yes	High	60	n/a
15	51	15.0	13.3	Adjacent	Adjacent	140	50	Yes (Tony Cr.)	High	60 and 150	30
16	35	16.0	2.8	0.2	0.2	140	NA	No	Low	n/a	30
18	43	17.8	10.8	Adjacent	Adjacent	140	33	No	High	100	30 & follow slope break
19	36	1.5	1.5	0.7	0.7			No			
21	23	13.3	9.0	Adjacent	Adjacent	140	33	No	High	60	30
23	26	10.2	7.5	0.4	0.4	140	NA	No	Low	n/a	30
27	46	2.8	2.2	1.1	1.1	140	28	No	High	60	n/a
30	39	6.3	4.3	0.7	0.8	140	50	Yes	High	60	30
31	19	6.2	3.4	0.8	0.8	140	55	No	High	60 and 150 (150 on steep slope area Bear Creek)	n/a
42	42	3.3	3.3	1.3	1.3	140	50	No	Medium	60	n/a

Unit	Total Acres	Riparian Reserve Acres	Treated Riparian Reserve Acres	Distance to Fish Bearing Stream (mi)	Distance to LFH (mi)	Site Potential Tree Height (ft)	Primary Shade Height (ft)	Proposed Tree Falling into Stream Channel	Spring Influence	Minimum Protection Buffer - Perennial (ft)[a]	Minimum Protection Buffer - Intermittent (ft)[a]
44	15	1.0	1.0	0.3	0.3	140	55	No	Medium	n/a	30
46	18	1.6	1.5	0.3	0.3	140	50	No	High	n/a	30
47	43	12.3	9.6	0.2	0.2	140	55	Yes	High	60	30
48	71	22.3	13.3	Adjacent	Adjacent	140	60	Yes	High	60 to 150	n/a
		191.8	129.1								

[a] Minimum distance from stream channel bank. Actual protection buffer widths may exceed these values due to slope breaks or other site conditions.

Culvert removal/replacement: Culvert removal and/or replacement involves in-stream work (except for drainage relief culverts) with large equipment, usually an excavator or backhoe, and past experience indicates aquatic organisms could be disturbed and forced to move at the least, and injury or death is a real possibility. One culvert replacement is planned on FSR 1600 in unit 15. This is a small culvert that routes perennial flow from a seep/spring complex that provides habitat for aquatic macroinvertebrates, including the Columbia duskysnail that was found at the site (Chris Rossel, fisheries biologist, Mt. Hood National Forest, personal communication, 2013). A drainage relief culvert is also proposed for replacement near unit 15 on FSR 1600 but this culvert is for road drainage only – it does not drain into a stream channel.

Four culverts, two of which contain perennial streams, would be removed when FSRs 1640620 and 1612670 are decommissioned. Fish are not present in any of the streams crossed by these roads, but aquatic macroinvertebrates are present in the two perennial streams. Because aquatic macroinvertebrates are relatively immobile, especially mollusks, it is likely such organisms would be injured or killed during construction if they are present at the site. This impact would occur at the site scale and not across the entire range of any aquatic macroinvertebrate species thus the effects would be localized.

Direct effects from sediment deposition during culvert removal/replacement are unlikely, especially for juvenile and adult fish given that none of the streams directly affected are fish bearing. Smothering of aquatic macroinvertebrates, especially snails or other relatively immobile creatures, is possible and could occur immediately below the culvert removal/construction sites. The potential increase in insect drift resulting from increased sedimentation (Waters 1995) would alleviate to some degree the incidence of smothering for caddisflies and other insects, but it is unknown whether snails also drift as insects do in response to habitat perturbation. The sediment that could smother individuals would settle relatively rapidly and not extend a great distance down the channel.

Indirect Effects

Indirect effects are those that can result after project implementation and/or as a result of implementation. For example, in the vegetation removal scenario mentioned above in the Direct Effects section the indirect effect associated with shade reduction could be an increase in water temperature. The magnitude of such an effect, if it occurred, would depend on the amount of vegetation removed, location and elevation of the stream, amount of stream flow, etc.

Stream Temperature

Stream temperature plays a critical role in determining metabolic rates, physiological function, and life-history of aquatic organisms as well as ecological processes such as nutrient cycling and productivity (Allen and Castillo, 2007). Aquatic species are restricted to temperature ranges that limit their distribution and available habitat. For salmonid species, there is a well-established connection between temperature and growth rate. Warmer temperatures increase feeding activity and rates of digestion, but also increase respiratory rates and energetic costs (Allen and Castillo, 2007). The Ultimate Upper Incipient Lethal Temperature (UUILT) of most salmonids falls within the range 21 to 26°C; however, multiple exposures to sub-lethal temperatures can lead to mortality (McCollough 1999). However, growth and development can be limited long before temperature approach lethal conditions. For Chinook salmon, ideal growing conditions are found to be 10.0 to 15.6°C, and the bounds for positive growth are 4.5°C and 19.1°C (McCollough 1999).

Water temperatures recorded in streams within the action area were well below the UUILT for salmonids and were also within ideal growing conditions for Chinook salmon (Table 3-22), which is similar to ideal temperatures for most other salmonids. As explained in Water Quality Specialist Report, the protection buffers stipulated for perennial streams are sufficient to maintain existing shade levels, and thus, no increase in water temperature is anticipated in any stream in the action area as a result of proposed silvicultural treatments. Furthermore, no skyline yarding corridors are proposed to cross or be located within the primary shade zone of any perennial streams. As a result, the corridors would have no effect on stream temperature.

Brushing along roads is part of the proposed road maintenance package. If brushing occurs near stream crossings, some shade producing vegetation could be removed. Brushing targets smaller vegetation (deciduous shrubs primarily and in some cases small coniferous trees) that provides little shade, and the larger trees that provide most of the shade would be untouched. Although shade could be slightly reduced at some stream crossings, particularly those where the stream is oriented more west to east, the actual shade reduction would be minimal. Hazard tree falling associated with brushing (see Table 2-6) would have little effect on shade because most trees would be located outside of the primary shade zone. Given existing cool water temperatures, abundant spring and groundwater sources, and the fact that larger shade producing trees would be retained, any shade reduction at road crossings would not measurably increase water temperatures over existing levels.

Stream Sediment

Fine sediment deposited on the stream bottom can impact aquatic organisms depending on the location of the sediment source in relation to aquatic life, amount of sedimentation, and timing of sedimentation. Indirect effects are possible if sediment fills pools and reduces interstitial living space in the substrates, decreases food availability, and covers fish spawning areas thereby reducing spawning success. All of these elements will be discussed below.

Turbidity

Increases in turbidity could affect fish by reducing feeding, stimulating movement out of the area, respiratory impairment, increasing stress, and reducing tolerance to disease (Waters 1995). Sigler et al. (1984) found steelhead trout and coho salmon growth rates decreased in turbid water with as little as 25 NTU (nephelometric turbidity units) measured turbidity over test periods ranging from 14 to 31 days. Visual impairment is likely the most common reason for reduced feeding rates and thus reduced growth rates. They also noted there was more fish emigration from tanks with turbid water compared to tanks with clear water. They speculated that salmonids emerging from the gravel would likely emigrate quickly if turbid conditions were encountered. In fact, Waters (1995) states that behavioral avoidance of turbid water may be one of the most important sub-lethal effects of turbidity. Direct mortality as a result of increased turbidity levels is possible but unlikely. Sigler et al. (1984) reported some mortality of very young coho and steelhead fry and turbidities ranging from 500 to 1500 mg/L (milligrams per liter); however, McLeay et al. (1983) found little mortality of arctic grayling under yearlings subject to prolonged exposure to concentrations around 1000 mg/L.

The effect of increased turbidity on aquatic macroinvertebrates is likely similar to those described for fish, at least for aquatic insects, but most of the literature focused on fine sediment deposition rather than suspended sediment. Waters (1995) postulates that prolonged episodes of turbidity may result in insect drift stimulation (i.e., emigration) that can reduce food supplies. The level of turbidity would have to be very high for long periods of time however. Waters admits that in streams with such a high turbidity load there could be as much or more affect on macroinvertebrates from deposited sediment. Effects on mollusks are not well documented, but given that preferred habitat characteristics include clean water it is assumed that long periods of high turbidity could be detrimental. Aldridge et al. (1987) found that feeding was impaired for three species of clams in laboratory experiments when sediment was added frequently to simulate suspended solids churned up by dredging. Given their lack of mobility, it is conceivable that snails could respond in a similar manner.

With the exception of Ladd Creek, Coe Branch, Eliot Branch, and the MFHR, streams in the action area are spring fed and generally quite clear. Naturally turbid conditions would only occur during high water periods. Given their glacial source Coe Branch, Eliot Branch, and Ladd Creek are naturally turbid in summer and fall, and they have a large impact on lower valley streams in this regard. Native aquatic animals have evolved around these conditions; altering distribution and habitat use if necessary. For example, the Columbia duskysnail has never been found in glacially influenced streams on the Forest based on surveys conducted to date; however, they are present in the action area in clear springs feeding Coe Branch (Mt. Hood National Forest, unpublished data) and likely in other clear water tributaries as well. Chinook salmon spawning has been documented in the MFHR and WFHR despite normal turbid conditions in the fall.

Few activities outlined in the Proposed Action would result in an increase in turbidity because actions would occur well away from water, including silvicultural treatments. Culvert replacement and removal in perennial streams could increase turbidity for short periods. Road maintenance, especially blading and ditch cleaning could increase turbidity in streams, but only after the first substantial precipitation event as that is when disturbed soil would be mobilized downstream and potentially into stream channels. In either case, the turbid conditions would last a relatively short period of time and would dissipate further downstream as particulate matter settles. As described in the Water Quality Specialist Report various PDC and BMPs are in place to minimize the amount of sediment entering surface water resulting from these activities, including dewatering of streams during culvert removal/replacement. Tree falling into streams to increase LWD would result in very minor turbidity increases at each site where a tree strikes the channel bottom.

Increased turbidity resulting from the activities described above would be limited both in space and time because of the small amounts of fine sediment introduced at each site. Turbidity monitoring in streams below instream construction activities indicated turbidity increases were not be detectable 0.5 to 1 mile downstream of the worksite (Bengt Coffin, hydrologist, Gifford Pinchot National Forest, personal communication, 2009). Increased turbidity resulting from road maintenance and culvert removal is expected to follow this finding. Turbidity also decreases in larger streams as the sediment is diluted so as the sediment is transported downstream the turbidity would decrease. If any turbid water were to reach the MFHR the increase would be immeasurable against background levels due to the high sediment load originating in both Coe Branch and Eliot Branch during the in-water work window.

There could be a short-term effect to fish and aquatic macroinvertebrates from increased turbidity in Tony Creek and one perennial tributary to Tony Creek when the proposed drainage culvert is replaced as part of road maintenance/reconstruction. There would be no effect to fish from increased turbidity levels resulting from road decommissioning because none of the streams where culverts would be removed are fish bearing streams, the turbid conditions would not continue as far downstream as fish bearing streams, or the increased volume of larger streams lower in the watershed would quickly dilute the suspended sediment. The first “flush” after road maintenance could increase turbidity in fish bearing streams for a short period, but the level of turbidity would likely be quite low given the small amount of suspended sediment. Impacts to feeding could occur, but unless the turbidity event was prolonged this would be a slight effect that could be mitigated to some degree by fish moving out of the area. Given the location of potential sediment producing actions and the low levels of turbidity expected the impact on fish from increased turbidity would be negligible. The impact on aquatic invertebrates would be minimal although slightly impaired feeding and possibly respiration is possible, especially immediately below culvert removal sites.

Sedimentation

The soil erosion and delivery potential of proposed activities is detailed in the Soil Productivity and Water Quality sections. PDC and BMPs are in place to greatly minimize, if not eliminate, the chance of increased sedimentation in action area streams and other water bodies resulting from proposed activities. Potential source of increased sedimentation in action area streams could result from road maintenance, log hauling, culvert removal/replacement, and road decommissioning.

The deposition of fine sediment on the streambed could negatively impact habitat conditions and subsequent survival and/or production for both fish and aquatic macroinvertebrates (Waters 1995). The effect of fine sediment deposition on macroinvertebrate production, survival, and species composition is relatively well documented. Bjornn et al. (1974 and 1977) found riffles with the most sediment contained the lowest abundance of insects in Idaho streams, but small amounts of sediment added to riffles in streams did not greatly affect abundance or drift. In laboratory studies they concluded that embeddedness levels more than one third around cobbles decreased insect abundance by over 50 percent, especially riffle inhabiting taxa (e.g., stoneflies, mayflies, and caddisflies), which are most important as salmonid food. Other laboratory studies have supported these results (McCelland and Brusven 1980). The reduction in abundance associated with fine sediment appears to be related to respiration (Rutherford and Mackay 1986) and possibly the loss or reduction of organic detritus, which is a source of food for macroinvertebrates (Culp et al. 1983). Most studies have focused on aquatic insects as these are more important as fish food, but it is likely that impacts to aquatic mollusks are similar.

Indirect effects of fine sediment deposition on fish and fish habitat, particularly salmonids, relates primarily to the following: reduction in the quantity and/or quality of spawning habitat for fish, reduction in food supply, reduction in fry survival in riffles, and reductions in interstitial living space. The relationship between spawning success and fine sediment levels has been addressed in detail over the last 40+ years. Suffice it to say that the more fine sediment in spawning areas the lower the spawning success. Most research correlates the amount of fine sediment 0.84 mm or less with embryo survival (McNeil and Ahnell 1964; Hall 1986; Tagart 1984; Reiser and White 1988) and it is commonly accepted that when fines less than 0.8 mm exceed 20 percent then substantial embryo mortality could be expected (Waters 1995). In many cases fine sediment increases are temporary, occur at times of the year other than spawning or egg incubation, and may be tempered by the act of spawning itself. When adults digs redds they clear much of the fine sediment from the area (Sheridan and McNeil 1968; Everest et al. 1987; Bjornn and Reiser 1991) and increase the chances for egg and embryo survival.

Reduction in food supply for salmonids, particularly riffle-dwelling insects, can be significantly impacted by surface and embedded sediment as described above. Reduction in food would lead to increases in competition, increased stress, decreased growth rates, and emigration from the area. The degree to which the above would occur depends on a variety of factors including the amount of sediment, overall productivity of a stream or reach and other water quality factors, such as temperature or pollution, fish species present, and fish abundance prior to the sediment disturbance.

Salmonid fry spend some time throughout the year, much of it during the winter, living in the interstitial spaces between rocks, primarily cobble. Their survival can be reduced if the spaces between cobbles are filled with fine sediment because the actual living space is reduced and they are unable to utilize this protective habitat. Bustard and Narver (1975) found that sedimented substrates reduced winter survival of juvenile cutthroat trout. Similarly, Hillman et al. (1987) observed that age-0 Chinook salmon moved in the fall from areas where summer habitat was heavily sedimented. Experimental additions of clean cobble the following year resulted in a fivefold increase in winter fry densities.

Roads where log hauling would occur are generally located outside Riparian Reserves and, with five exceptions, do not cross LFH/EFH (Table 3-37). The first exception is FSR 1650 which crosses the headwaters of Red Hill Creek, which is bull trout designated critical habitat. However, Red Hill Creek at the FSR 1650 crossing is in fact an ephemeral draw with no evidence of annual deposition or scour and thus it is not a stream as defined in the NWFP[2]. South of FSR 1650 the terrian is flat (gradient 0-2 percent) and there is no definable channel nor is there riparian dependent vegetation present. There is evidence of seasonal standing water and a culvert is present under FSR 1650. North of FSR 1650 the gradient begins to steepen and the valley becomes more confined and a definable channel forms with evidence of annual scour and deposition about 800-feet below the road crossing (the above information is based on field surveys conducted by Forest personnel on 10/5/2011, 8/22/2012, and 7/23/2013). In short, the bull trout citical habitat PCE do not apply to this area.

[2] When the U. S. Fish and Wildlife Service designated bull trout critical habitat they used the best information available to determine perennial and intermittent streams. In this area, as in many others, field verification of headwater streams did not occurred. Field review conducted as part of the Red Hill Restoration Project and Lava Restoration Project confirmed that this “stream” had no water and there was no evidence of annual deposition or scour which would have indicated intermittent flow, thus it is not a stream.

The other exceptions are FSR 1800 (crossing the WFHR and Lake Branch, which is designated critical habitat for bull trout and steelhead trout), FSR 1600 (Tony Creek and the MFHR), and FSR 1610 (Bear Creek) (Table 3-37). All of these roads are paved where they cross the above creeks and the possibility that log hauling would result in enough sediment to impact aquatic species or habitat is negligible.

Road maintenance has a higher likelihood of some sediment contribution to nearby streams compared to log hauling. Large amounts of sediment input are unlikely (Water Quality Specialist Report), but some increase in fine sediment could occur, especially during the first few precipitation events following the maintenance. Of course the highest liklihood of erosion and sediment introduction would be associated with native surface roads, followed by aggregate roads and then paved roads. Ditch cleaning, culvert cleaning and blading are the activities most likely to result in some sediment introduction.

The roads, or road segments, where maintenance and/or haul activities would result in the highest risk of erosion and subsequent sediment introduction to area streams include the 1600, 160015, 1610, 1611, 1612, 1612630, 1640, 1640620, 1640630, and 1650. FSRs 1600 and 1610 are paved roads and it is unlikely maintenance would result in measurable sediment due to the small area maintained with direct drainage into streams at road crossings. Other roads or road segments with proposed maintenance activities on aggregate surfaces, such as FSR 1612 and FSR 1640620, are located outside riparian reserves and would follow all PDC's to reduce fine sediment transport from the project work site. In all cases, PDCs would ensure that a minimal amount of sediment would reach streams and that the chance for such sediment introduction would be of a short duration.

Table 3-37: Lava Restoration Project proposed haul road maintenance and haul road distances to listed fish habitat (LFH)/essential fish habitat (EFH). Road surfaces are coded as follows: P – paved, A – aggregate, I – pit-run aggregate, and N – native material. BT = Bull trout, ST = Steelhead trout, CH = Chinook salmon, CO = Coho salmon.

Haul Road Number	Miles of Haul	Road Surface Type	Number of Crossings Over:				Nearest Distance from Crossing to LFH/EFH (mi)	Road Length Within 100 ft. of LFH/EFH	ESA Listed Fish or Critical Habitat Present at Closest Point to Road
			LFH/EFH		Other Peren.	Inter.			
			Bridge	Culvert					
1600000	14.1	P	1	1	11	4	0.0	420	BT, ST, CH, CO
1600015	0.4	N	0	0	0	1	0.6		
1600670	0.7	A	0	0	0	0			
1610000	9.6	P/A	0	1	10	0	0.0	200	BT, ST, CH
1610012	0.6	N	0	0	0	0			
1610630	0.3	A	0	0	0	0			
1610640	0.3	N	0	0	0	0			
1611000	3.0	P	0	0	0	1	0.4	0	BT, ST
1612000	3.9	A	0	0	1	2	0.4	0	BT, ST, CH, CO
1612630	1.0	A	0	0	1	0	1.2	0	BT, ST, CH, CO
1612640	1.1	I	0	0	0	0			
1612650	0.3	A	0	0	0	0			
1630000	3.5	A	0	0	0	0			
1630660	0.3	N	0	0	0	0			
1631000	1.1	A	0	0	0	0			
1631630	0.3	A	0	0	0	0			
1640000	0.9	P/A	0	0	0	1	0.3	0	BT
1640620	1.3	A	0	0	1	2	0.25	0	BT

Haul Road Number	Miles of Haul	Road Surface Type	Number of Crossings Over:				Nearest Distance from Crossing to LFH/EFH (mi)	Road Length Within 100 ft. of LFH/EFH	ESA Listed Fish or Critical Habitat Present at Closest Point to Road
			LFH/EFH		Other Peren.	Inter.			
			Bridge	Culvert					
1640630	0.4	A	0	0	0	0			
1650000	3.8	A	0	1*	0	1	0.0	820	BT
1650650	0.5	A	0	0	0	0			
1800000	3.4	P	2	0	3	3	0.0	260	BT, ST, CH, CO

* The “stream” crossed by this road is in fact an ephemeral draw with no evidence of annual deposition or scour and thus it is not a stream as defined in the NWFP. It is mapped as designated critical habitat for bull trout but the definable stream channel does not begin until about 800 feet below FSR 1650.

As mentioned above, none of the culvert removal/replacements would occur in known fish bearing streams. The closest to a known fish bearing stream reach, which is also unoccupied bull trout critical habitat, is 450 feet below the proposed culvert replacement on FSR 1600 (Table 3-38). The distance to listed fish habitat from proposed culvert removal/replacements ranges from 450 feet to over 1 mile.

Table 3-38: Summary of culvert removal and/or replacement projects proposed in the Lava Restoration Project. The culvert under FSR 1600 is the only replacement project proposed; the remaining culverts would all be removed as part of road decommissioning. Any drainage relief culverts present that do not drain directly into a stream would also be removed during road decommissioning but are not listed below.

FSR	Stream Name	Perennial or Intermittent	Distance to Fish Bearing Stream (ft.)*	Distance to LFH (ft.)
1600	Tony Cr. tributary	P	450	450
1600	None (road drainage relief)	N/A	N/A	N/A
1640620	Tony Cr. tributary	I	1320	1320
1640620	Tony Cr. tributary	I	1000	1000
1612670	Bear Cr. tributary	I	2500	5140
1612670	Bear Cr. tributary	I	4225	6865

* Throughout this document fish bearing streams include stream segments where fish presence is suspected as well as those where presence is confirmed.

Given the location of potential sediment producing activities in relation to aquatic macroinvertebrate populations, which are located in all perennial streams, there is much greater potential for impacts to macroinvertebrates than to fish. Stream reaches directly below sediment sources are the most susceptible to impact. Small amounts of fine sediment, such as is expected from road maintenance and log hauling, would likely have little effect on macroinvertebrate abundance given the findings in natural streams described by Bjornn et al. (1974 and 1977). Below the culvert removal/replacement sites, however, the larger amounts of sediment could bury individuals and/or significantly affect respiration causing drift or possibly death directly below those sites. In streams where large amounts of fine sediment have been deposited both by natural and anthropogenic sources recolonization from upstream has occurred rapidly once conditions improved (Cline et al. 1982; DeWalt and Olive 1988; Tsui and McCart 1981). Therefore, even if aquatic macroinvertebrates are buried and killed, recolonization from above would occur so the impact, in terms of population numbers as a whole, would be site-specific and short-term.

The small amount of fine sediment making its way to fish bearing stream reaches and/or most LFH/EFH would be immeasurable against background levels, primarily due to the distance between potential sediment producing activities and those stream areas. Short duration pulses of sediment directly following precipitation events could slightly fill pools but not to the degree that rearing space would be reduced. Similarly, there could be some sediment deposition on riffles and spawning habitat (pool tails) but the amount would be negligible. No negative effect to spawning is anticipated; some localized impact to macroinvertebrate levels could occur and thus the amount of forage could be slightly reduced for a short time until upstream drift rebuilds the population.

Road maintenance and subsequent log hauling on the FSR 1650 could result in a small amount of fine sediment entering the ephemeral draw that is designated bull trout critical habitat. Since the habitat is unoccupied there would be no impact to bull trout themselves. Given the lack of a definable channel to route such sediment downstream where the true stream forms there would no impact to bull trout critical habitat PCEs.

Note that road maintenance would reduce erosion and potential sediment introduction as compared to unmaintained roads (see Table 3-27). Thus the overall effect of road maintenance as well as road closure and decommissioning is beneficial despite the potential short-term impacts.

Tree falling to increase instream and floodplain LWD would have very little impact on fine sediment levels in any stream where trees are felled. Each tree felled may or may not strike the channel bottom or even the streambanks depending on the location. Even if a tree hits the channel or banks the amount of sediment dislodged would be minimal and localized. Any increase in fine sediment would be immeasurable against existing background levels and would have a negligible impact on aquatic species or habitat.

Pool Quantity and Quality

The Proposed Action would have little detrimental effect on pool habitat quantity and quality in the short-term and may lead to long-term improvement due to the potential to reduce erosion, primarily from road related restoration projects, and thus sedimentation. The decrease in potential large wood resulting from silviculture treatments in Riparian Reserves (see below) could result in fewer pieces of large wood in the small, steep tributaries to larger fish bearing streams. As existing pool forming wood decays there could be gap in time where fewer trees are falling into channels to replace this wood. As a result, there could be some decrease in pool habitat in these small, steep tributaries. The impact potential pool reduction could have on macroinvertebrates is likely minimal for two reasons:

- Pools make up a low percentage of the total habitat in these streams already due to steep gradients and relatively confined of the streams, thus a slight decrease in pool habitat would not change existing conditions to a great degree; and,
- Most aquatic insects live in faster water habitats and thus pools are not their preferred habitat.

The exception could be aquatic mollusks although targeted studies to determine their habitat preferences have not occurred. Some decrease in suitable habitat for the Columbia duskysnail could result from a reduction in pool habitat.

Reductions in pool habitat quantity in fish bearing streams due to reductions in LWD input would be minimal because most of the proposed riparian thinning would not occur near fish bearing streams. Only 13 units lie within Riparian Reserves adjacent to fish bearing reaches in the MFHR, Bear Creek, and Tony Creek (Table 3-36). The reduction in pool habitat would result in a loss of slow water rearing habitat that could cause fish to crowd into fewer pools. This in turn could result in increased competition for space and possibly food thus decreasing the overall population size during the time period pool habitat is reduced. A decrease in large wood downstream from non-fish bearing stream reaches where silviculture treatment occurs is unlikely because the primary large wood contributing mechanism is tree fall from adjacent stands, not floods or debris flows (see below).

While large increases in fine sediment to a stream can reduce pool volume and thus pool quality, this is unexpected following proposed activities as described above in the Sediment section. Both the quantity and quality of pool habitat in the action area is expected to be maintained or increased in the future from the long-term improvements in large wood recruitment potential and erosion risk reduction.

The addition of LWD to some stream channels resulting from tree falling directly into said channels could slightly increase pool habitat in the action area, particularly in those section of Tony Creek where trees would be felled. The increase would depend on where trees fall, how much falls within the channel, and their ability to capture and store sediment and/or promote scour.

Large Wood Recruitment Potential
Riparian silviculture has the greatest potential to reduce the amount down large wood due to the removal of woody material and reduction of recruitment potential. Thinning removes wood volume from the stand and reduces exclusion-phase mortality, which can contribute wood to the stream. Along small streams, relatively small diameter pieces of woody debris can contribute to pool formation (Beechie and Sibley 1997). In recovering riparian areas, small trees in close proximity to the stream can help provide geomorphic and biotic benefits in the short-term, especially during the stem-exclusion phase (Beechie et al. 2000). As the source distance increases, the likelihood of the tree entering the stream decreases and becomes dependent also on the size of the tree (Meleason et al. 2002; Spies et al. 2013). For stands less than 80 years old, modeling has predicted that 90 percent of the trees that contribute large wood to streams are within 14 meters (approximately 45 feet) of the streams edge when fall direction is random (Meleason et al. 2002). If all stand ages and types are considered then 95 percent of total instream wood comes from distances of 82 to 148 feet (Spies et al. 2013); shorter distances come from younger stands, longer distances from older stands. The amount of wood recruitment varies greatly and depends on forest conditions and geomorphology.

Removal of trees would influence future wood supply immediately adjacent to those tributary channels where harvest is proposed in the Riparian Reserve (Table 3-36), at least where treatment is within the site potential tree height distance, for a period estimated at about 40 years (Table 3-35). Debris torrents and material migrating to stream reaches downstream are not a prevalent habitat forming process in most streams within the action area due to the low occurrence of slides and debris flows in the sub-watershed. The exceptions are Eliot and Coe Branches which are glacially fed and subject to debris flows; however, no treatments are planned along these streams that would affect future LWD recruitment. These two streams would continue to provide wood to the MFHR if and when debris flows occur. In the remainder of the project area the major mechanism of LWD contribution to the MFHR and other tributaries is stream adjacent recruitment.

Tree falling would occur within Riparian Reserves of 21 proposed units in the action area (Table 3-36). About a third (8) of these Riparian Reserve treatment areas are located adjacent to non-fish bearing streams, some of which are intermittent. All of the units adjacent to fish bearing stream reaches (Table 3-36) would have a minimum 60-foot no touch buffer. There would be some decrease in large wood recruitment potential in these streams as a result of riparian thinning until the stands begin to fill in (approximately 40 years from the date of harvest). In the long-term, the remaining trees grow larger than if treatment did not occur (Table 3-35) and the overall health and diversity of the stands would improve. Under this scenario, when trees did fall, they would be larger and thus last longer on-the-ground.

Tree falling would occur within one site potential tree height of LFH/EFH in 13 units (Table 3-36). Only four of the units are adjacent to occupied LFH as described above. There is a very small likelihood of diminished in-stream wood supply to LFH/EFH from Riparian Reserve thinning in the action area, not only due to a lack of transport capability, but also due to the small stem diameter, short tree height, and small area of thinning within the Riparian Reserve adjacent to tributary channels (Table 3-36).

To summarize, a total of 192 Riparian Reserve acres lie within 22 units with either proposed plantation or sapling thinning (Table 3-36). Of the 192 Riparian Reserve acres within proposed units only 129 acres would actually be treated – the remaining 63 acres lie within protection buffers[3]. Within the action area the total Riparian Reserve area is 5,101 acres. Therefore, Riparian Reserve acres within units make up a small portion of the action area and treated units:

- Riparian Reserve acres (5,101) make up slightly less than 18% of the entire action area (28,882 acres).
- Riparian Reserve acres within proposed thinning units (192 acres) make up only 0.7% of the entire action area; Riparian Reserve acres proposed for treatment (129 acres) make up only 0.4% of the action area.
- Riparian Reserve acres proposed for treatment make up only 8% of the total area proposed for treatment in the Lava Restoration project area (1,908 acres).

For the young stands proposed for treatment in this thinning project, encouraging rapid growth for trees that are farther away from the stream would increase their chance of falling into the stream or floodplain and provide better habitat value once they do fall. The Proposed Action includes minimum protection buffers of 30 feet on intermittent and 60 feet on perennial streams for short-term contribution of large wood to the stream and floodplain. Releasing those trees farther outside the protection buffer would maximize growth and increase the chance that a falling tree would be tall enough to fall within the stream channel.

In-stream Large Wood

[3] Note that in the eight units where trees would be felled into adjacent stream channels those trees would largely be located in protection buffers.

Because large wood potential would be minimally affected across the action area, even in proposed units adjacent to perennial streams, there would be little to no effect on in-stream large wood levels by proposed thinning. In those units with riparian thinning proposed in the SIZ there could be a slight reduction in the amount of large wood for several decades. The actual reduction in large wood, if it occurs at all, is difficult to predict. Natural events such as wind storms could result in large amounts of down large wood even in thinned units. In addition, protection buffers would provide a sustained source of large wood (Meleason et al. 2002; Spies et al. 2013) for the foreseeable future.

The slight reduction in large wood in upstream reaches is not expected to translate to a reduction in large wood downstream in larger streams, including streams with LFH/EFH. Since debris flows are not a common mechanism for large wood recruitment in most action area streams (except Eliot and Coe Branches), wood transport to downstream reaches would only occur during infrequent floods or even less frequent debris flows. Therefore, potential reductions in large wood within LFH/EFH are not expected to be measureable because very few riparian acres would be treated in the action area and coupled with limited transport mechanisms the reduction in LWD would be negligible.

The probability that Riparian Reserve thinning would negatively affect habitat building, sediment storage capacity or floodplain processes that rely on large wood in action area streams, especially downstream LFH/EFH reaches is very low. An accelerated rate of stem development and tree height in treated stands is expected to contribute a greater diversity of large wood particularly adding to larger diameter components, but the small overall area of treatment in Riparian Reserves is not expected to contribute significantly to future in-stream wood quantity in LFH for the same reason.

In those streams where trees would be felled into the channel to increase LWD, especially Tony Creek, there would be an increase in the amount of in-channel and floodplain large wood. This increase would result in LWD levels that would better approximate the Forest Plan standard and provide LWD habitat building components that would be in place until trees begin to fall naturally into area streams.

<u>Cumulative Effects</u>

Cumulative effects include the effects of past, present and reasonably foreseeable future State, tribal, local or private actions that overlap in time and space within the Action Area (i.e., affected environment) of the Federal action subject to consultations (50 CFR 402.02). The "reasonably foreseeable" clause is a key factor in assessing and applying cumulative effects and could include actions that are permitted, imminent, have an obligation of venture, or have initiated contracts (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998). Past and present impacts are incorporated as part of the environmental baseline and discussed here in the effects discussion.

Only those proposed projects in the Lava Restoration Project that have direct or indirect effects are included in the cumulative effects analysis (if the action has no direct/indirect effects there is nothing to cumulate). The spatial context for the following cumulative effects analysis is the action area as described previously. Project/activities occurring outside this area may have an effect on aquatic species/habitat, but would not add to those effects from projects proposed in this PA. The temporal context depends on the existing or future project/activity. If there is an overlap in time from an effects perspective then it is included.

Cumulative effects from an aquatic species and habitat perspective overlap considerably with water quality cumulative effects because most of the attributes analyzed by the hydrologist are directly related to aquatic habitat conditions. As such, this analysis builds upon the Water Quality cumulative effects analysis with an attempt, in this summary, not to duplicate that analysis. Therefore, if there is no cumulative effect identified in the Water Quality Specialist Report then that attribute is not discussed here. For example, although existing Forest Service timber harvest units overlap in space with proposed activities outlined in this PA there is no measureable cumulative effect from a sediment, stream temperature, or water quantity perspective thus there is no effect on aquatic habitat or species and no further discussion is needed (see Table 3-28 in the Water Quality section).

The analysis summary outlined in Table 3-39 below follows the same format as Table 3-28 in the Water Quality section. The one addition is a column that describes potential effects to aquatic species and/or habitat. Those activities that were identified in the Water Quality Specialist Report as having a possible cumulative effect have been copied into the table below and a description of potential species/habitat effects has been added.

Table 3-39: A summary of cumulative effects on aquatic species and habitat resulting from proposed projects in the Lava Restoration Projects PA and known/expected projects elsewhere in or near the action area.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Existing Old Forest Service Timber Harvest Units	Large Wood Recruitment Potential	No	Yes	Possible	Projects completed. Although most previous timber harvest occurred decades ago riparian stands were treated more aggressively in many areas than current practices and thus the amount of standing wood remaining was less than would be in proposed units. These areas are still recovering (trees are still growing) and those less 40 years old in particular have yet to grow to a size where they would contribute meaningfully to riparian/stream habitat even if they were to fall. The thinning proposed in this PA would increase the riparian area that would not contribute as much large wood compared to a non-treatment scenario.	Minimal cumulative effect throughout action area because the reduction in large wood recruitment potential resulting from proposed projects would be quite small (less than 1 percent of Riparian Reserves affected). Given location of proposed units and lack of transport mechanisms downstream the effects would be localized. This reduction in large wood **potential** would not directly affect aquatic fauna or habitat; indirect effects could result in localized reductions in in-stream large wood and pool habitat quality and quantity.

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
	In-stream Large Wood	No	Yes	Possible	Projects completed. Removing large wood from stream channels was a common practice into the 1970's thus the amount of large wood in many streams within the action area have less large wood than historic conditions. None of the actions proposed in this PA would directly reduce existing levels of large wood in any stream. Indirect effects, associated with slight reductions on large wood recruitment potential, could result in localized areas with less large wood recruitment and thus less in-stream wood for the next 50 years or more. There would be an increase in large wood resulting from tree falling in the channel in eight units as described above.	Minimal cumulative effect due to relatively little thinning in Riparian Reserves proposed in the action area. In some streams, localized areas could have less in-stream large wood until trees in treated stands begin to fall. Transport capability in these streams is lacking so inputs of large wood from upstream are unlikely. A reduction of in-stream large wood could result in fewer pools and some reduction in channel stability because one of the major roughness elements that forms and maintains habitat is large wood. Some impact possible to salmonids in terms of rearing habitat, as described above. A negligible impact to aquatic macroinvertebrate populations as a whole, but some localized habitat degradation possible.
Forest Service Vegetation Treatment Activities Planned or	Large Wood Recruitment Potential	Yes	Yes	No	There may be an overlap in timing of these projects with the Lava Restoration Project; however, PDCs in	None

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Underway (Pre-commercial treatments)	In-stream Large Wood	Yes	Yes	No	the pre-commercial thinning environmental analysis require that a no-cut buffer be established along all streams and that the buffer be site-specific based on predominant tree height (if trees are 30 feet tall the buffer would be 30 feet). As such, any trees that could fall into the channel in the near future would not be cut. Remaining trees outside the buffer would grow faster and contribute large wood sooner than if thinning did not occur. Since the potential for tree fall would remain the same, this pool habitat forming element would be unaffected and thus the amount of pool habitat would remain the same.	
Private Land and BPA activities (past timber harvest, power line maintenance activities)	Pool Quantity and Quality	Yes	Yes	No	Some projects are completed, but others ongoing. Given the small amount of fine sediment resulting from project activities expected there is no cumulative impact expected to pool habitat from a sediment perspective. Past and ongoing timber harvest in many private land areas has reduced the amount of large wood, a key pool forming component in this area, so the slight reduction in pool habitat that could occur as a result of projects proposed in this PA would add to large wood dependent pool reduction elsewhere.	Relatively minimal affect throughout the action area. Most impact would continue to be on private land where more intensive timber harvest has occurred with subsequently less large wood to form pools. Fewer pools results in less rearing area for salmonids that could result in localized areas of higher crowing and increased competition. This could lead to reduced fitness in some individuals. Rearing area reductions would be concentrated in reaches next to areas where intensive timber harvest has occurred. Impacts to aquatic macroinvertebrates negligible.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
	Large Wood Recruitment Potential	Yes	Yes	Possible	Timber harvest on private land has occurred for decades and is ongoing. In general, stream protection buffers on private lands are relatively narrow and as such the potential large wood recruitment in these areas has been reduced. These areas are in various stages of recovery in terms of tree growth but in many areas the trees have yet to grow to a size where they would contribute meaningfully to riparian/stream habitat even if they were to fall. The thinning proposed in this PA would increase the SIZ area that would not contribute as much large wood compared to a non-treatment scenario.	Minimal cumulative effect throughout action area because the reduction in large wood recruitment potential resulting from proposed projects would be quite small (less than 1 percent of Riparian Reserves affected). Given location of proposed units and lack of transport mechanisms downstream the effects would be localized. This reduction in large wood **potential** would not directly affect aquatic fauna or habitat; indirect effects could result in localized reductions in in-stream large wood and pool habitat quality and quantity.
	In-stream Large Wood	Yes	Yes	Possible	Removing large wood from stream channels was a common practice into the 1970's thus the amount of large wood in many streams within the action area have less large wood than historic conditions. None of the actions proposed in this PA would directly reduce existing levels of large wood in any stream. Indirect effects, associated with slight reductions on large wood recruitment potential, could result in localized areas with less large wood recruitment and thus less in-stream wood for the next 50 years or more. There would be an increase in large wood resulting from tree falling in the channel in eight units as described above.	Minimal cumulative effect due to relatively little thinning in Riparian Reserves proposed in the action area. In some streams, localized areas could have less in-stream large wood until trees in treated stands begin to fall. Transport capability in these streams is lacking so inputs of large wood from upstream are unlikely. A reduction of in-stream large wood could result in fewer pools and some reduction in channel stability because one of the major roughness elements that forms and maintains habitat is large wood. Some impact possible to salmonids in terms of rearing habitat, as described above. A negligible impact to aquatic macroinvertebrate populations as a whole, but some localized habitat degradation possible.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Red Hill Restoration Project	Pool Quantity and Quality	Yes	Yes - Ladd Cr 7th field HUC only	No	There may be an overlap in timing of this project with the Lava Restoration Project; any minor suspended or streambed sediment would not be measurable due to implementation of PDC, conformance with existing standards and guidelines on Lava Restoration and the Red Hill Restoration projects.	None
	Large Wood Recruitment Potential	Yes	Yes - Ladd Cr 7th field HUC only	No	Neither of the units located in the upper Ladd Creek 7th field watershed are located in the Stump Creek Riparian Reserve; thus there would be no effect on large wood recruitment potential	None
	In-stream Large Wood	Yes	Yes - Ladd Cr 7th field HUC only	No	See above.	None
Dollar Lake Fire (including Burned Area Rehabilitation projects)	Pool Quality and Quantity	Yes	Yes - Ladd Cr, Coe Branch and Pinnacle Cr 7th field HUC only	No	There may be an overlap in timing of effects from the Dollar Lake Fire and the Lava Restoration project. The primary fine sediment producing activity in the Lava Restoration project is culvert removal during road decommissioning. Culvert removal would not occur in the same 7th field sub-watershed as the Dollar Lake fire burned area, so potential sediment mixing would not occur at this level. The closest sediment mixing opportunity is the confluence of Bear Creek and the Middle Fork Hood River which is 3 miles downstream of the nearest crossing removal site and 4 miles downstream of the nearest burned area from the fire.	None

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
	Large Wood Recruitment Potential	Yes	Yes - Ladd Cr, Coe Branch and Pinnacle Cr 7th field HUC only	No	The burned riparian areas in the headwaters of Coe Branch, Pinnacle Creek, and Ladd Creek would experience increased wood recruitment over the next 10-30 years as dead trees fall in the channel. After that period it would be a long time before replacement trees grow to a size where they would begin to fall in naturally in large numbers. In Ladd Creek there would be no cumulative effect because the two units proposed for silviculture treatment are not located in Riparian Reserves. In Pinnacle Creek it is unlikely fire killed trees would be transported downstream as it is a stable, spring fed system with little transport capability. In Coe Branch fallen trees could be transported downstream to the Middle Fork Hood River during a debris flow or flood but since the the other streams in the project area with proposed treatment have little wood transport mechanism to the MFHR there is no cumulative effect.	None
	In-stream Large Wood	Yes	Yes - Ladd Cr, Coe Branch and Pinnacle Cr 7th field HUC only	Yes	Trees falling into streams within the action area due to the Dollar Lake Fire would add to trees felled as proposed in the Lava Restoration Project. This would result in an overall increase in LWD in the action area but the increases would be site specific.	Localized beneficial effect where trees felled for LWD and due to Dollar Lake fire. Increased habitat complexity resulting in better spawning and rearing habitat in those sections of stream where wood added.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
2006 Debris Flow in the Middle Fork Hood River	Pool Quality and Quantity	Yes	Yes	No	The 2006 debris flow originating from Mt. Hood deposited large amounts of sediment in the Middle Fork Hood River. This sediment likely filled some pools and would be present in the system for many years. However, any sediment from the Lava Restoration project would not be detectable in the MFHR due to the high natural sediment load.	None
	Large Wood Recruitment Potential	Yes	Yes	Possible	The 2006 debris flow increased the large wood recruitment potential in Eliot Branch as a result of tree kill due to sediment deposition. These trees would eventually make their way into the MFHR when floods or debris flows occur. This increase somewhat offsets the reduced large wood recruitment potential in other streams where silviculture treatments in riparian areas would occur.	Minimal effect overall because there is little spatial overlap between the treatment areas in Bear and Tony Creeks and the flood zones in Eliot Branch and MFHR. Positive effect in Eliot and MFHR, slight negative effect as described above in Bear and Tony Creeks.
	In-stream Large Wood	Yes	Yes	Possible	See above. Tree falling into channels as proposed would increase LWD in those streams adjacent to the eight units. This would increase LWD overall in the action area.	Localized beneficial effect where trees felled for LWD – Tony and Bear watersheds.

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
Ongoing road maintenance, including snowplowing	Fine Sediment	Yes	Yes	Possible	Depending on the location and timing of road maintenance not directly associated with the Lava Restoration Project, there could be some overlap and as a result a potential increase in fine sediment in some streams in the action area is possible. The primary fine sediment producing activity in the Lava Restoration project is culvert removal during road decommissioning. Exact locations cannot be determined as specific road maintenance projects have yet to be identified.	The small amount of sediment generated from proposed activities in the Lava Restoration project would add to that described here within the action area. Given the negligible amounts of fine sediment generated from Lava Restoration activities the cumulative amount of sediment effect would be slightly increased. The impact to aquatic species and habitat would be negligible in terms of spawning, rearing, and feeding effects.
	Pool Quality and Quantity	Yes	Yes	No	See above.	Effect negligible because the small amount of fine sediment would not result in a measurable decrease in pool quantity or quality.

Cumulative Effects Summary

Stream Temperature
No detrimental cumulative effects are expected as a result of increased water temperature due to PDC that maintain existing primary shade vegetation adjacent to streams. As described in the Water Quality Specialist Report, this project would maintain existing water temperatures. The few trees felled to increase stream and floodplain LWD in eight units would not decrease shade enough to increase water temperature. As such, there are no temperature related cumulative effects on aquatic species or habitat.

Sediment
The only cumulative effects that may occur in regards to sediment introduction are associated with ongoing road maintenance. The amount of sediment generated from ongoing road maintenance in the action area would be quite small, as would potential sediment generated from proposed activities in the Lave Restoration Project. As such the cumulative effect is expected to be very small and localized due to the small amount of sediment expected.

Pool Quantity and Quality
The chance that there could be some reduction in pool volume resulting from increased fine sediment levels is negligible given the very small amount of sedimentation expected and the fact that relatively large amounts of sediment are required to measurably decrease pool volume. Slight reductions in pool quantity could occur in some areas resulting from decreased amounts of pool forming large wood resulting from Lava Restoration Project thinning coupled with past timber harvest. However, this would be offset from tree falling to increase LWD in those stream segments adjacent to units where this occurs. Regardless, the increase or decrease in pool habitat over time would be relatively minor, thus the potential impacts to aquatic species would be negligible.

Large Wood Recruitment Potential
Large wood recruitment potential has been reduced throughout the action area by past timber harvest, both on federal and private land. Actions proposed in the Lava Restoration Project would slightly increase the area within Riparian Reserves where large wood recruitment potential would be reduced. In those stream sections where trees would be felled to increase the amount of in-stream and floodplain LWD this potential would be mitigated to some extent. LWD addition in other stream segments in the action area, as well as increased wood recruitment from the 2006 debris flow event, also mitigates the slight reduction in potential from thinning activities. Over time, increased tree growth of remaining trees, coupled with a return of trees per acre to pretreatment levels, would increase large wood recruitment potential.

The reduction in large wood recruitment could result in localized areas with less in-stream and floodplain large wood (except the eight units where trees would be felled into streams to increase LWD). Because wood transport mechanisms in the action area are limited the impact on downstream reaches would be negligible, especially since most of the large wood addition projects have occurred in downstream reaches.

In-Stream Large Wood

The amount of in-stream large wood is low in many streams and reaches, in part due to past land management including stream clean out. No proposed project actions would directly result in further reductions of in-stream large wood, but tree falling into stream channels in some units, as described above, would increase the amount of in-stream LWD. Several restoration projects in action area streams have increased levels of in-stream and floodplain large wood and in those areas wood levels are meeting Forest Plan standards. The potential reduction in large wood potential could result in some reaches adjacent to treated stands to have less in-stream large wood until remaining trees begin to fall naturally.

3.6.4 Effects Determination

Because there would be no federal action if No Action was chosen there would be no effect to PETS species or habitat, although some habitat conditions would continue to degrade under this scenario – particularly riparian forest stand health. Activities proposed in the Proposed Action could impact PETS species that reside in the action area, as well as habitat conditions (Table 3-40). Depending on the species and/or habitat direct, indirect, and cumulative effects are possible. PDCs would greatly minimize potential effects, but not eliminate them altogether.

Potential effects center on potential disturbance, locally increased sedimentation, and potential reductions in large wood recruitment potential and in-stream levels. Potential direct effects to fish would be associated with tree falling into stream channels associated with thinning. The risk that falling trees would hit aquatic organisms and result in injury or death is quite low, but not zero. Aquatic macroinvertebrates may also be directly affected by culvert removal/replacement. Culvert removals/replacement could force drift or bury aquatic macroinvertebrates due to the expected sediment pulse during parts of the construction process and when the stream is re-watered.

Indirect and cumulative negative effects center on slight increases in fine sediment and localized reductions in future levels of large wood. In localized areas associated with road decommissioning (culvert removal), culvert replacement (one site), road maintenance, and log hauling, there is the possibility of increased levels of fine sediment. In any given location, the increase is expected to be quite small, even associated with culvert replacement/removal. However, sediment deposition could impact aquatic macroinvertebrate feeding and survival. This, in turn, could lead to slight reductions in salmonid food supply. There would be no impact to salmonid survival or reproductive success resulting from fine sediment increases because the amount of sediment would be very low and localized.

Except for tree falling in channels in eight units, proposed projects would have no immediate impact on in-stream levels of large wood. However, thinning conducted in Riparian Reserves may reduce the large wood recruitment potential in adjacent stream segments until remaining trees begin to fall naturally and replace those that were harvested. This future reduction in large wood could locally reduce the amount of pool habitat and the other benefits associated with in-stream large wood (gravel collection, floodplain connection, etc.). These impacts would occur primarily in headwater streams where harvest is proposed because large wood transport to downstream reaches, including those that contain ESA-listed fish, is not expected due to the fluvial geomorphology of the area.

The anticipated impacts summarized above could have some localized effects to ESA listed fish and or habitat to stream reaches containing ESA-listed fish. Tree falling into stream reaches that are occupied by ESA-listed fish species (only unit 3) **may affect, and is likely to adversely affect** Columbia River bull trout and Lower Columbia River steelhead trout. This action is covered under the following biological opinions: *Endangered Species Act – Section 7 Programmatic Consultation Conference and Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Reinitiation of Aquatic Restoration Activities in States of Oregon and Washington (ARBO II) NMFS Consultation Number: NWR-2013-9664*, and *Endangered Species Act – Section 7 Consultation, Programmatic Biological Opinion for Aquatic Restoration Activities in the States of Oregon, Washington, and portions of California, Idaho and Nevada (ARBO II) [FWS reference: 01EOFW00-2013-F-0090]*. Other actions, such as reductions in large wood potential and small increases in fine sediment from road maintenance **may affect, but are not likely to adversely affect** ESA-listed fish species and designated/proposed critical in the action area**.** Essential Fish Habitat for Chinook and coho salmon would be **adversely affected**.

Table 3-40: The Lava Restoration Project effects determination summary for ESA listed species, designated critical habitat, and Region 6 Regional Forester's Sensitive Species.

	Listing & Critical Habitat Date	**Suitable Habitat Present**	**Species Present**	**Effects of Actions**	
				No Action	Proposed Action
Endangered Species Act Listing by ESU/DPS – All Threatened					
Lower Columbia River steelhead & CH (*Oncorhynchus mykiss*)	1/06 9/05	Y	Y	NE	LAA* NLAA
Lower Columbia River chinook & CH (*Oncorhynchus tshawytscha*)	6/05 9/05	Y	Y	NE	NLAA
Columbia River Bull Trout & CH (*Salvelinus confluentus*)	6/98 11/10	Y	N	NE	LAA* NLAA
Middle Columbia River steelhead & CH (*Oncorhynchus mykiss*)	1/06 9/05	N	N	NE	NE
Upper Willamette River chinook & CH (*Oncorhynchus tshawytscha*)	6/05 9/05	N	N	NE	NE
Lower Columbia River coho[4] *(Oncorhynchus kisutch)*	6/05	N	N	NE	NLAA
Forest Service Region 6 Regional Forester's Sensitive Species					

[4] Critical habitat for this species has not been designated on Federal lands.

Barren Juga *(Juga hemphilli hemphilli)*	1/08	Y	Unk	NI	MIIH
Purple-lipped Juga *(Juga hemphilli maupinensis)*	1/08	N	N	NI	NI
Dalles Juga (*Juga hemphilli dallesensis*)	12/11	N	N	NI	NI
Scott's Apatanian Caddisfly *(Allomyia scotti)*	1/08	Y	Unk	NI	NI
Caddisfly (*Namamyia plutonis*)	12/11	Y	Unk	NI	MIIH

* Likely to adversely affect only for tree falling into stream in unit 3.

Endangered Species Act Abbreviations/ Acronyms:	
NE	No effect
LAA	May affect, likely to adversely affect
NLAA	May affect, not likely to adversely affect
Regional Forester's Sensitive Species List Abbreviations/ Acronyms:	
Unk	Species presence unknown but suspected
NI	No impact
MIIH	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

Proposed project activities, especially culvert removals**, may impact, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species** for Barren Juga and *Namamyia plutonis* individuals or habitat. The Columbia duskysnail, a survey and manage Category A species, may also be affected similarly to those aquatic macroinvertebrates described above. However, population viability would be maintained as potential impacts would be site-specific and the Columbia duskysnail has a wide distribution across the Forest.

Although MIS resident trout may be impacted by some project activities the impacts would be minimal and localized. This project potentially impacts less than 4 percent of occupied resident trout habitat across the forest (Table 3-30), thus impacts to habitat would be insignificant at the forest scale and therefore the PA is consistent with the Forest Plan. Given their limited distribution compared to resident trout, more winter steelhead trout, coho salmon and Chinook salmon habitat could be affected by project activities (Table 3-30). However, due to proposed activity locations along with PDCs and BMPs the actual area of impact would be far less than the total occupied habitat within the action area. Bull trout could be most affected by project activities given their localized distribution within the Middle Fork Hood River and specifically the action area. As described for the above species, however, the actual area of impact would be much less than the total occupied habitat area in the action thus the effects would be relatively minimal. For all salmonid species the Proposed Action **may impact individuals or habitat, but would not threaten species viability**.

3.6.5 Consistency Determination

The Lava Restoration Project is consistent with all applicable fish/aquatic related federal laws, plans, and guidelines as outlined below.

Law, Regulation & Policy

Numerous existing plans provide guidance for projects in the form of Standards and Guidelines and recommended Best Management Practices (BMP). These documents include the Forest Plan and the NWFP. There is substantial overlap between aquatics and water quality in terms of applicable standards and guidelines; therefore, those listed below are directly related to fisheries, management indicator species, or other aquatic special status species. See the Water Quality section for other pertinent standards and guidelines.

Forest Plan Standards and Guidelines (pages Four-64, Four-69, Four-257, 258):

- Fisheries: FW-137, 138, 139, 145, 147
- Threatened, Endangered and Sensitive Plants and Animals: FW-174, 175, 176
- B7 General Riparian Area: B7-028, 030, 031, 032, 033, 037, 038, 059

Northwest Forest Plan Standards and Guidelines:

- See Water Quality Specialist Report

In addition to the above, the Forest Service is required to assess and disclose the effects of any federal action on ESA listed species, candidate species, and Regional Forester's Special Status species, as outlined in the Endangered Species Act of 1973 and National Forest Management Act of 1976. Lastly, the Magnuson-Stevens Fishery Conservation and Management Act of 1976 requires the Forest Service to assess and disclose the affects to Essential Fish Habitat.

Desired Future Condition

The desired future condition for streams and associated riparian areas within the Lava Restoration Projects Project Area is summarized in several sources as outlined below:

The NWFP Aquatic Conservation Strategy (ACS) was developed "…to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands." Within this strategy are nine ACS objectives that give direction regarding the maintenance and/or restoration of aquatic processes key to watershed health. These objectives can be considered desired future conditions from an aquatic perspective for the project area.

Finally, the Forest Plan presents desired future conditions for all management areas, including General Riparian Areas. The list of DFCs can be found on page Four-254 in the LMRP, and the General Riparian Area management goal is to:

> "Achieve and maintain riparian and aquatic habitat conditions for the sustained, long-term production of fish, selected wildlife and plant species, and high quality water for the full spectrum of the Forest's riparian and aquatic areas. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices."

3.6.6 Summary of Effects by Alternative

In the No Action alternative, none of the proposed projects would be implemented and there would be no immediate effect to aquatic habitat or species. However, the risk that natural events such as flooding or fire would result in degraded habitat conditions is greater. An increased risk of increased fine sediment input to area streams would be due primarily to roads not maintained and decommissioned, and thus, the chance for erosion and subsequent sedimentation would be greater. Not thinning forest stands, including Riparian Reserve stands, would result in increased susceptibility to disease and fire due to overstocking and large amounts of small down wood over time that increases the fuel loading. Although increased levels of down wood in the short-term would likely occur, the small size of the down material would decay quickly and not provide the same habitat benefit as larger wood, especially in larger streams.

The Proposed Action would result in short-term disturbance that could result in localized increases in fine sediment (road decommissioning, road maintenance, and log hauling) and some increase and decrease in in-stream large wood (tree falling into channels and Riparian Reserve thinning, respectively) and localized decreases in large wood recruitment potential (Riparian Reserve thinning). These effects would be minimal and not result in an irreversible or irretrievable loss of aquatic habitat or species. In fact, the amount of erosion and subsequent sedimentation into streams would be reduced due to road treatments, Riparian Reserve forest conditions would improve leading to increased growth rates, less susceptibility to disease and fire, and larger down wood over time compared to the No Action scenario. Due to the project design, including PDCs, cumulative effects would be minimal.

3.7 Aquatic Conservation Strategy

In order for a project to proceed, “a decision maker must find that the proposed management activity is consistent with the Aquatic Conservation Strategy objectives” (ROD B-10) from the Northwest Forest Plan Record of Decision. The nine objectives are listed on page B-11 of the ROD. Portions of the effects analysis in this document focus on key parameters or indicators that make up elements of the nine Aquatic Conservation Strategy objectives, to determine if the project would restore, maintain, or degrade these indicators. Once this determination is made, the indicators are examined together with the Range of Natural Variability to ascertain whether the project is consistent with the objectives. A description of the range of natural variability of the “important physical and biological components” (ROD B-10) is necessary for determining whether a project “meets” or “does not prevent attainment” of the Aquatic Conservation Strategy objectives (ROD B-10). Relevant portions of the range of natural variability from the Watershed Analysis are included in the Existing Conditions section of this report. In general, natural sediment loads are high in this area and sediment tends to move unevenly, in pulses through the aquatic system. In addition, stream temperatures are cool due to numerous groundwater inputs.

The following table displays specific indicators that comprise the Aquatic Conservation Strategy (ACS) objectives and the effects section that covers this indicator in the Preliminary Assessment. Also, refer to the Fisheries Biological Assessment for additional effects descriptions.

Table 3-41: ACS Objective Indicators in the PA

Indicators	Analysis Found in the Effects Section of the PA
Water Temperature	Water Quality, Fisheries
Sediment	Soil Productivity, Water Quality, Fisheries
Chem. Contaminants	Water Quality, Fisheries
Physical Barriers	Water Quality, Fisheries
Substrate	Fisheries
Large Woody Debris	Fisheries
Pool Frequency	Fisheries
Pool Quality	Fisheries
Off-Channel Habitat	Fisheries
Refugia	Fisheries
Width/Depth Ratio	Fisheries
Streambank Condition	Water Quality, Fisheries
Floodplain Connectivity	Water Quality, Fisheries
Peak/base Flows	Water Quality
Drainage Network Increase	Water Quality
Riparian Reserves	Water Quality, Fisheries

The following table displays the individual indicators and the effect the alternatives have on those indicators at the 5th, 6th and 7th field watershed scale. Fifth field watersheds are generally large in size (40,000 acres to 250,000 acres), while 6th and 7th field watersheds are smaller (5,000 acres to 40,000 acres and 2,000 acres to 5,000 acres respectively).

Table 3-42: ACS Objective Indicators for each Alternative. The abbreviations in the table are defined as: R="Restore" which means the action(s) would result in acceleration of the recovery rate of that indicator; M="Maintain" which means that the function of an indicator does not change by implementing the action(s) or recovery would continue at its current rate; and, D="Degrade" which means changing the function of an indicator for the worse.

Indicators	Effects of the Actions by Alternative	
	No Action	Proposed Action
Water Quality: Temperature	M	M
Sediment	M	M

Indicators	Effects of the Actions by Alternative	
	No Action	**Proposed Action**
Chemical Contamination	M	M
Habitat Access: Physical Barriers	M	Slight Restore over Long-term
Habitat Elements: Substrate	M	M
Large Woody Debris	Slight Degrade over Long- term	Slight Restore over the Short and Long-term
Pool Frequency	M	Slight Restore over the Short and Long-term
Pool Quality	M	M
Off-channel Habitat	M	M
Refugia	M	M
Channel Conditions and Dynamics: Width/Depth Ratio	M	Slight Restore over the Short and Long-term
Streambank Condition	M	M
Floodplain Connectivity	M	M
Flow/Hydrology: Peak/Base Flows	M	M
Drainage Network Increase	M	Slight Restore over Long-term
Watershed Conditions: Riparian Reserves	M	Restore over Long-term

The following summarizes the Individual Indicator Table and associated ACS Objectives:

- The proposed project would decommission roads to restore this area to a more natural sediment regime as well as some benefits to floodplain connectivity and decreasing the drainage network associated with the roads. These projects may cause some minor short-term sediment introduction in order to implement them. Benefits would likely be noticeable at the site scale and possibly the 7th field sub-watershed scale. Some restoration in all nine of the ACS Objectives would take place with road decommissioning.
- The proposed project would treat vegetation in Riparian Reserves to restore them to a more natural vegetation state. This would result in more natural function of the riparian area. In addition, some trees would be dropped into streams that are currently lacking in-channel woody material to improve aquatic habitat quality and stream channel function.

Benefits from implementation of the Proposed Action would be noticeable at the site scale and possibly the 7th field sub-watershed scale and include restoration of large woody debris and some adjacent stream channel width to depth ratios. This would most likely result in some recovery in all of the ACS Objectives.

- Indicators other than those described in the bullet above would be maintained as outlined in the effects analysis above.

3.8 Wildlife

More information is available in the project record including the full wildlife analysis file, and biological evaluation as part of the Wildlife Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

Three species of wildlife and critical habitat classified as threatened, endangered or proposed may be found on or adjacent to the Hood River Ranger District. There are eighteen Forest Service Region 6 Sensitive species (2011), seven Survey and Manage species, and seven Management Indicator species that may also be found on the District. The status of species in the project area is listed in Table 3-43. Species that are not present or do not have habitat within the project boundary would not be discussed further in this biological evaluation.

Table 3-43: The status of Threatened, Endangered, and Proposed Species; Forest Service Region 6 Sensitive Species; Survey and Manage Species; and Management Indicator Species in the Project Area

Species	Habitat	Presence
Federally Threatened, Endangered or Proposed		
Northern spotted owl (*Strix occidentalis caurina*)	yes	unknown
Canada lynx (*Lynx canadensis*)	no	-
Northern spotted owl critical habitat	yes	yes
R6 Sensitive Species		
Bald eagle (*Haliatus leucocephalus*)	no	-
Peregrine falcon (*Falco peregrinus anatum*)	no	-
Bufflehead (*Bucephala albeola*)	no	-
Harlequin duck (*Histrionicus histrionicus*)	yes	yes
White-headed woodpecker (*Picoides albolarvatus*)	no	-
Lewis' woodpecker (*Melanerpes lewis*)	no	-
Cope's giant salamander (*Dicomptodon copei*)	no	-
Cascade torrent salamander (*Rhyocotriton cascadae*)	no	-
Oregon spotted frog (*Rana pretiosa*)	no	-
Townsend's big-eared bat (*Corynorhinus townsendii*)	no	-
Fringed myotis (*Myotis thysanodes*)	no	-
Wolverine (*Gulo gulo luteus*)	no	-
Pacific fisher (*Martes pennanti*)	no	-
Western bumblebee (*Bombus occidentalis*)	yes	unknown
Beller's ground beetle (*Agonum belleri*)	no	-
California Shield-backed bug (*Vanduzeenia borealis californica*)	no	-

Species	Habitat	Presence
Johnson's hairstreak (*Callophyrs johnsoni*)	no	-
Mardon skipper (*Polites mardon*)	no	-
Survey and Manage		
Great gray owl *(Strix nebulosa)*	no	-
Larch Mountain salamander *(Plethodon larselii)*	yes	yes
Dalles sideband *(Monadenia fidelis minor)*	yes	yes
Crater Lake tightcoil *(Pristiloma arcticum crateris)*	no	-
Evening fieldslug *(Deroceras hesperium)*	no	-
Puget Oregonian *(Cryptomastix devia)*	no	-
Columbia Oregonian *(Cryptomastix hendersoni)*	no	-
Management Indicator Species		
Mule Deer (*Odocoileus hemionus*) and Elk (*Cervus elaphus nelsoni*)	yes	yes
Pileated Woodpecker *(Dryocopus pileatus)*	yes	yes
American Marten *(Martes americana)*	yes	yes
Wild Turkey *(Meleagris gallopavo)*	no	no
Western Gray Squirrel *(Sciurus griseus griseus)*	no	no
Snag and Down Log Associated Species	yes	yes
Neotropical Migratory Birds	yes	yes

3.8.1 Threatened, Endangered and Proposed Species

3.8.1.1 Northern spotted owl

Methodology

Disturbance

The U.S. Fish and Wildlife Service (USFWS) has concluded that noise, smoke, and human presence can result in a disruption of breeding, feeding or sheltering behavior of the northern spotted owl (spotted owl) such that it creates the potential for injury to individuals (i.e., incidental take in the form of harassment). For a significant disruption of spotted owl behavior to occur as a result of disturbance caused by the Proposed Action, the disturbance and spotted owl(s) must be in close proximity to one another. Human presence on-the-ground is not expected to cause a significant disruption of behavior because spotted owls do not seem to be startled in those situations.

A spotted owl that may be disturbed at a roost site is presumably capable of moving away from the disturbance without a substantial disruption of its behavior. Since spotted owls forage primarily at night, projects that occur during the day are not likely to disrupt its foraging behavior. The potential for effects is mainly associated with breeding behavior at active nest sites.

In the late breeding period, potential effects from disturbance decline because juvenile spotted owls are increasingly more capable of moving as the nesting season progresses. To ensure that more than 86 percent of juvenile spotted owls in the Oregon Eastern Cascades Physiographic

Province are able to move away from disturbance without increasing their risk of predation or harm, the critical breeding period is considered to be March 1 through July 15. After July 15, it is estimated that most fledgling spotted owls are capable of sustained flight and can move away from most harmful disturbances.

The USFWS has based disruption distances on interpretation of the best available information. The proposed actions for this project that generate noise above ambient levels would be the use of heavy equipment and chainsaw use. Disruption distances of 35 yards for heavy equipment use and 65 yards for chainsaws have been set by the USFWS.

Home Range and Core Area

Since there are few recent surveys for spotted owls that show the locations of active nest sites on the Forest, historical spotted owl information is used. Historical nest sites are used because studies show that nests are used for many years and when a site has been found to be unoccupied during surveys, it can be subsequently utilized by a different pair of owl's years later. In addition to historic sites, predicted nest sites would be used to analyze the effects of the proposed project on spotted owls. The predicted sites are used for areas with incomplete or no spotted owl survey information. The purpose of using predicted sites is to estimate spotted owl numbers and distribution within unsurveyed habitat for purposes of assessing the effects of a proposed project on spotted owls. These predicted sites are based on factors known to influence the carrying capacity of a given area for spotted owls.

While it is usually the alteration or removal of suitable habitat that potentially results in adverse impacts to a territorial pair of spotted owls, the loss or degradation of dispersal habitat may also result in short-term impacts. The USFWS has guidelines for how much removal of suitable habitat would result in take. For the Willamette Province, the home range is a 1.2 mile radius circle (2,955 acres) centered on a historic nest site. Incidental take would be presumed to occur when suitable habitat is removed from a home range and if suitable habitat is less than 40 percent of the home range. A core area has been defined as the area within a home range that receives disproportionately high use (503 acres or 0.5 mile radius circle from the historic nest). Incidental take would be presumed to occur when suitable habitat is removed from a core area and if suitable habitat is less than 50 percent of the core area.

Existing Condition

The northern spotted owl is listed as a threatened species under the Endangered Species Act, as a Regional Forester Sensitive Species for Region 6, and as a Management Indicator Species under the National Forest Management Act.

Habitat

Spotted owls generally rely on older forested habitats that contain the structures and characteristics required for nesting, roosting, foraging, and dispersal. These characteristics of older forests include a multi-layered, multi-species canopy dominated by large overstory trees; moderate to high canopy closure; a high incidence of trees with large cavities and other types of deformities; numerous large snags; an abundance of large, dead wood on the ground; and open space within and below the upper canopy for spotted owls to fly (Thomas et al. 1990). Forested stands with high canopy closure also provide thermal cover, as well as protection from predation.

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).

Management and Population Trends

The Revised Recovery Plan for the Northern Spotted Owl (U.S. Fish and Wildlife Service 2011) has developed a habitat modeling tool that will aid in the development of future land management plans by Federal land managers, and the consideration of management options by State, Tribal or private land owners.

Given the continued decline of the species, the apparent increase in severity of the threat from barred owls, and information indicating a recent loss of genetic diversity for the species, the Revised Recovery Plan also recommends retaining more occupied spotted owl sites and unoccupied, high value spotted owl habitat on all lands. Vegetation management actions that may have short-term impacts, but are potentially beneficial to occupied spotted owl sites in the long-term meet the goals of ecosystem conservation. Such actions may include silvicultural treatments that promote ecological restoration and are expected to reduce future losses of spotted owl habitat and improve overall forest ecosystem resilience to climate change, which should result in more habitat retained on the landscape for longer periods of time.

In the more disturbance-prone provinces on the east side of the Cascade Mountains, agencies are working to develop strategies that incorporate the dynamic natural disturbance regime in a manner that provides for long-term ecological sustainability through the restoration of ecological processes while conserving spotted owl habitat over the long-term.

The Revised Recovery Plan also identifies competition from the barred owl as an important threat to the spotted owl. Since barred owls are more aggressive and more habitat generalists but also use the same habitats and prey as spotted owls they are believed to be out competing spotted owls for habitat and food (USFWS 2011, Wiens 2012). Within the Oregon demographic study areas, there has been a steady increase in the number of barred owls as measured by the proportion of spotted owl sites with barred owls detected, with as many as 60 percent of the spotted owl sites having barred owls detected (Forsman et al. 2011).

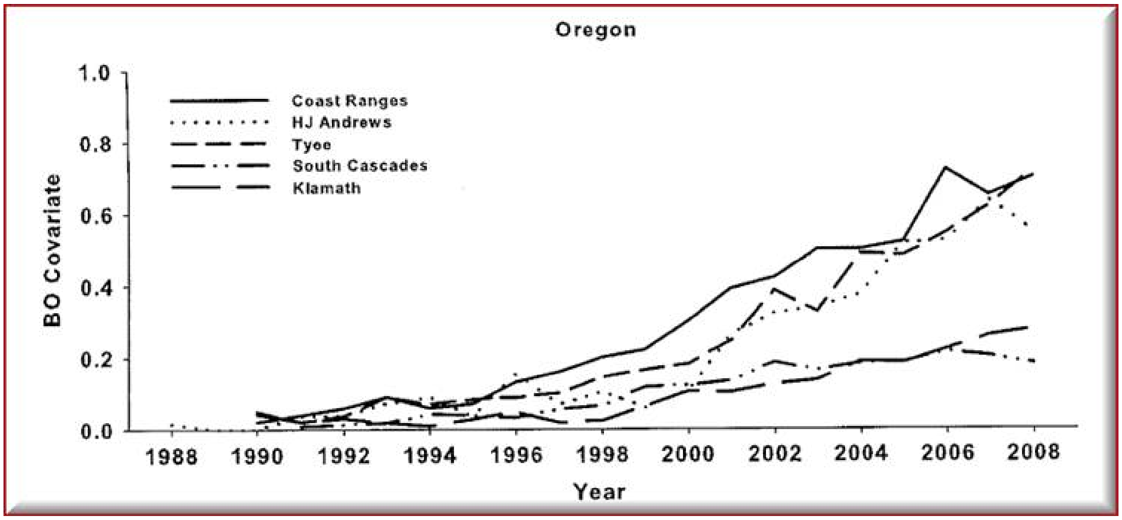


Figure 3-16: Annual Proportion of Spotted Owl Territories with Barred Owl Detections

Dugger et al. (2011) modeled extinction and colonization rates for spotted owl pairs in the South Cascade Demographic Study area where barred owls were detected on some home ranges. They found that extinction rates for spotted owls increased with decreasing amounts of old forest in the core area, and that the effect was 2-3 times greater when barred owls were detected. They found that colonization rates for spotted owls decreased as the distance between patches of old forest increased (i.e. increased habitat loss and fragmentation) and that barred owl presence similarly decreased the rate of colonization of spotted owl pairs. They concluded that conserving large blocks of contiguous old-forest habitat was important for reducing interference competition between the two owl species. They mapped old-forest habitat as generally >100 years of age with trees DBH >35 cm (K. Dugger, personal communication, 2012). Wiens (2012) also found that the relative probability of a location being selected by spotted owls was reduced if the location was in close proximity to the core-use area of a barred owl.

<u>Analysis Area</u>

The analysis area for the effects to spotted owls includes 13,800 acres, most of which falls within the Middle Fork Hood River Watershed with a smaller portion within the East Fork and West Fork Hood River Watersheds. There are 3 spotted owl home ranges that overlap proposed treatment units. These treatment units within the home ranges are in dispersal habitat and total 1,212 acres (Figure 3-17).

Previously, the proposed treatment areas contained stands of large mature Douglas-fir, noble fir, and western red cedar. Today, the entire area contains second growth stands of Douglas-fir with inclusions of western hemlock, true fir, scattered western red cedar, and alder dominated riparian communities. These second growth stands were the result of timber harvesting in the past followed by planting (see Vegetation Resources section for more details).

Approximately 1,908 acres are proposed for treatments. Most of these units are second-growth stands that range in age from approximately 35 to 99 years old. Approximately 1,617 acres are providing dispersal-only habitat for spotted owls. The remaining 291 acres are considered non-habitat for the spotted owl. These stands are still young, generally less than 40 years and have average diameters less than 11-inches in diameter. The sizes of trees in these stands are considered too small to support dispersing spotted owls. None of the units are considered suitable habitat (nesting, roosting or foraging). They lack a multi-storied structure, large diameter trees and appropriate levels of snags and down wood required for suitable habitat.

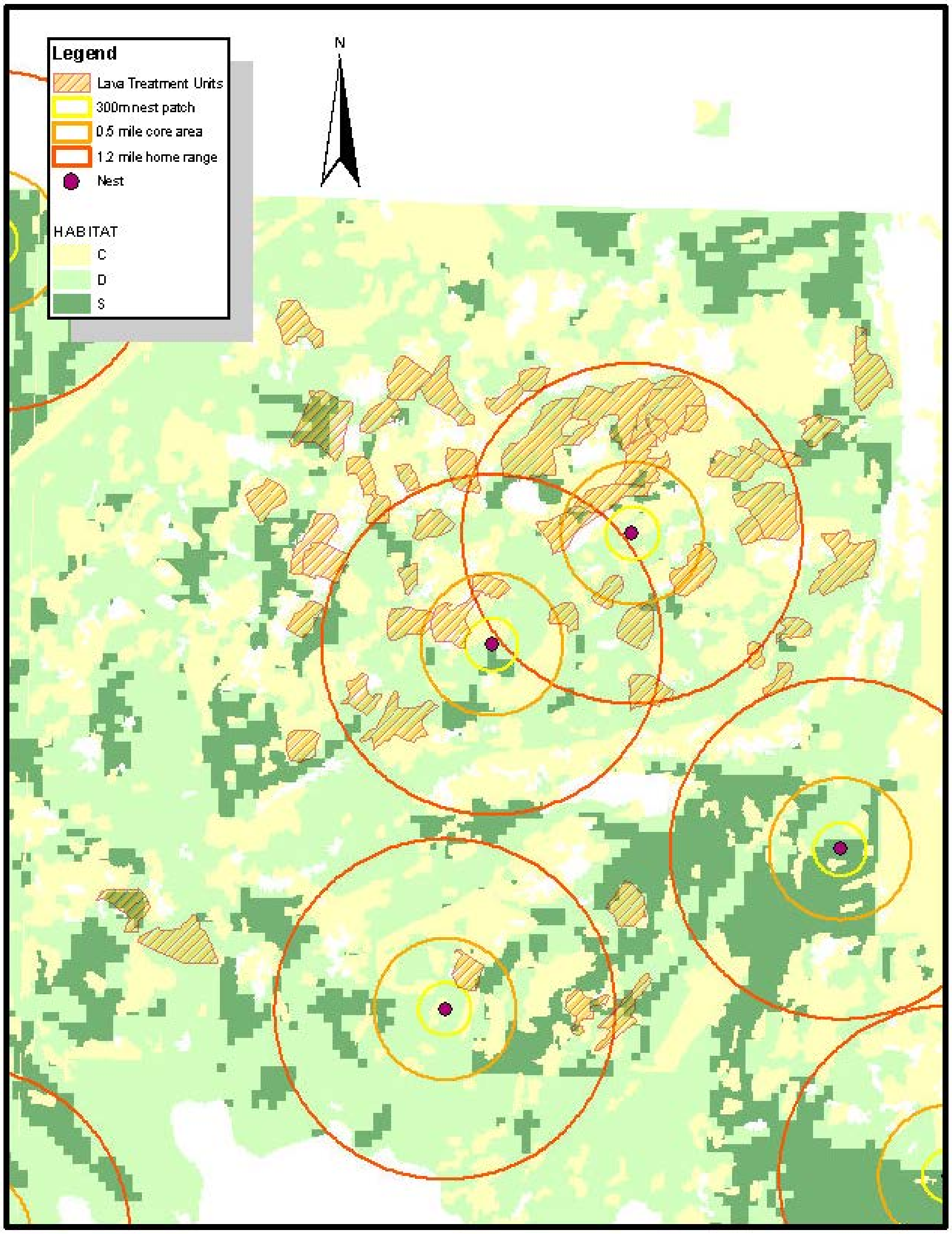


Figure 3-17: Spotted Owl Habitat and Treatment Units

Effects Analysis

No Action – Direct and Indirect Effects
There would be no short-term effects to spotted owl 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 would start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood. Where these developments eventually occur, they would improve the dispersal habitat.

The quality of dispersal habitat would improve only slightly in some stands while improving much more in others. The stands that are currently considered non-habitat for the 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 to 100 years for these stands to develop into suitable habitat. Refer to the Vegetation Resources section for further discussion of tree response under the No Action Alternative. With no action, there would be no sound related disturbance to owls.

Proposed Action – Direct and Indirect Effects

Habitat Impacts
There would be no effects to spotted owls from road decommissioning and road closures. The proposed treatments include a thinning prescription 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. This would increase the rate that dispersal and suitable habitat would be available for spotted owl.

Structural diversity is a combination of several stand characteristic which would include, but would not be limited to, number of canopy layers, down wood, and snags. Most of the stands under the Proposed Action are currently highly stocked even-aged stands. The stands have very little growth and lack the snags and downed wood needed for nesting and foraging owl habitat. In addition, the stands have low tree diversity, are single-canopied, even-aged stands, or have trees that are insufficient in size to provide quality snags or downed wood. Thinning can have both immediate effects on forest diversity and long-term effects restoring native plant communities as understory species are released and provide a seed source for future recruitment.

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 snag and downed wood. Thinning may have a short-term negative effect on downed wood quantity, but tree response to thinning is expected to result in increased growth, which would speed the ability of the stands to provide the size of snags and down wood needed to meet the Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) standards (FW-215, FW-216, FW-219 through FW-223).

The proposed harvest treatments and fuel wood removal would temporarily impact approximately 1,617 acres of dispersal habitat. This habitat would be impacted by reducing the canopy cover from approximately 70 percent to 40 percent or greater as well as the loss of some down wood, shrubs and snags, which provide habitat for prey species. 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 10 to 15 years after harvest.

There are 3 home ranges that overlap with the proposed treatment units. These units total 396 acres of dispersal habitat, 70 acres in the core area, and 326 acres in the home range. This home range is currently below the threshold of 40 percent suitable habitat, but is above the threshold of 50 percent suitable habitat within the core area. The proposed treatments would not reduce the amount of suitable habitat within either the core area or home range.

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.

Barred Owls

There is concern that timber harvest and other silvicultural activities may directly or indirectly affect the interaction between barred owls and spotted owls and increase the competitive advantage for barred owls. The main areas of concern that may be related to the proposed action are: logging may expand the range of barred owls; and silvicultural treatments that thin forests and create early seral habitat, or create edge habitat, may favor barred owls over spotted owls.

Across their range barred owls are known to use a wide variety of forest types and it has been suggested they are habitat generalists that may benefit from timber harvest activities such as clearcutting and thinning (Hamer et al. 1989, Iverson 1993). However, a detailed review for the spotted owl recovery plan found much evidence that barred owls prefer old-growth and older forest habitat in the Pacific Northwest (USFWS 2011). While a suggestion has been made that timber harvest activities may favor barred owls, an alternative hypothesis is that barred owls have a wider range of habitat use in the northern part of the spotted owl's range, and the spotted owl has a narrower one. But in the more southerly part of the spotted owl's range, the spotted owl seems to have a broader range of habitat use than does the barred owl (Courtney et al 2004). Therefore, timber harvest may have the effect of leading to a competitive advantage for barred owls in some areas, but not in others (Courtney et al 2004, Dugger et al. 2011).

In some portions of the spotted owl's range, barred owl populations are increasing while spotted owls are declining, to some degree independently of forest management history in the area (Courtney et al 2004). For example, barred owls are increasing while spotted owls are declining throughout the Olympic peninsula in both industrial and national forest, but also in the National Park in areas that have never been harvested (Anthony et al. 2003). On the Gifford Pinchot

National Forest (Washington), the density and impact of barred owls appears higher in areas without timber harvest (Pearson and Livezey 2003).

Wiens (2012) conducted a detailed study of the interaction between barred and spotted owls in the moist temperate forests of western Oregon by radio tracking 29 spotted owls and 28 barred owls in 36 neighboring territories over a 2-year period. He found that both owl species had similar use of young, mid-seral, and mature forests and that both species avoided areas within 135 meters of forest/non-forest edges. Both species avoided open areas and young forests less than 60 years of age and used mature conifer forests (60-120 years of age) proportional to their availability within the landscape (second order selection).

Because barred owls can prey on a wider range of species than spotted owls, there has been speculation that thinning may increase prey favored by barred owls. The Young Stand Study on the Willamette National Forest found that commercial thinning of mid-seral stands would significantly increase the abundance of deer mice and Townsends chipmunks (McComb et al 2013). Wiens (2012) found that these two species comprised about 5% of the prey biomass for spotted owls compared to 3% for barred owls in an area of western Oregon. Therefore, the small mammal species that have been found to increase most after thinning are not one that are selectively favored by barred owls more than spotted owls.

Based on these studies, the silvicultural treatments proposed in the Lava Project Area would not expand the range of barred owls and would not create habitat favored by barred owls over spotted owls.

Sound Disturbance

The sound from project activities would not adversely affect the breeding behavior of spotted owls during their critical breeding period because no heavy equipment, chainsaw use, or helicopter use would occur within the 35 to 120 yard disruption distances. Some activities would take place during the critical nesting season between March 1 and July 15, but these activities would be beyond the disruption distance of an actively nesting spotted owl pair or beyond the disruption distance from the nest patch of a predicted site.

ESA Effects Determination

Because dispersal habitat would be maintained and because timing restrictions would reduce impacts from sound, the proposed project **may affect, but is not likely to adversely affect**, spotted owls.

<u>Cumulative Effects</u>

The activities analyzed in the cumulative effects for spotted owl are within the East Fork, West Fork, and Middle Fork Hood River Watersheds and include the construction of the Bonneville Power Administration (BPA) Powerline, past timber harvests on Federal and private lands, and actions within the Red Hill and Lake Branch project areas.

The cumulative effects to dispersal habitat would be insignificant because dispersal habitat is not the limiting factor for owls in these watersheds. In this analysis area, the limiting factor for spotted owl occupancy is the lack of suitable habitat. The proposed project, the Red Hill project area, and the Lake Branch project areas would not directly impact suitable habitat or the connectivity between suitable blocks of habitat.

Based on the analysis above for barred owl, the cumulative effects to spotted owl would be the same as those discussed under the effects from the proposed project. The BPA Powerline and timber harvest would not expand the range of barred owls and would not create habitat favored by barred owls over spotted owls.

Consistency Determination

The effects to spotted owls for this project would be included in a programmatic informal consultation to be submitted to the U.S. Fish and Wildlife Service. A signed Letter of Concurrence would be received before a final decision is signed for this project.

This project is consistent with the Northwest Forest Plan and with the Revised Northern Spotted Owl Recovery Plan (U.S. Fish and Wildlife Service 2011) for habitat management in dry forests:

- Known spotted owl activity centers within the project area would be protected (ROD Standards and Guidelines pp C-10). One hundred acres of the best spotted owl habitat would be retained as close to the nest site or owl activity center as possible for all known spotted owl activity centers (as of January 1, 1994) located on federal lands.

The Following Mt. Hood National Forest Land and Resource Management Plan Standards and Guidelines that apply to the Proposed Action alternatives and would be met:

- FW-174: Habitat for threatened, endangered, and sensitive species has been identified and managed in accordance with the ESA (1973), the Oregon ESA (1987), and FSM 2670.
- FW-175: Habitat for threatened, endangered and sensitive species shall be protected and/or improved.
- FW -176: A Biological Evaluation has been prepared.
- FW 177 & 178: Consultation with the USFWS shall occur on each program activity or project that the Forest Service determines may affect threatened or endangered species. Consultation shall be completed before any decision is made on the proposed project.

3.8.1.2 Northern Spotted Owl Critical Habitat

Methodology

Critical habitat (CH) includes those specific areas within the geographical area occupied by the species at the time it was listed and on which are found those physical or biological features essential to the conservation of the species, and which may require special management considerations or protection. For the spotted owl, these features are defined as primary constituent elements (PCEs) which include particular forest types that are used or likely to be used by spotted owls for nesting, roosting, foraging, or dispersing habitat. The effects to CH are analyzed based on the impacts to the individual PCEs. The PCEs for the spotted owl were defined in the Final Rule, Federal Register Vol. 77, No. 233 December 4, 2012. They are listed as:

1. Forest types that support the spotted owl across its geographic range. This PCE is essential to the conservation of the species because it provides the biotic communities that are known to be necessary for the spotted owl.
   a. Includes - Sitka spruce, western hemlock, mixed conifer, mixed evergreen, grand fir, Pacific silver fir, Douglas-fir, white fir, Shasta red fir, redwood/Douglas-fir, and the moist end of ponderosa pine.
   b. Coniferous zones at elevations up to 6000'.
   c. This PCE must be in concert with at least one other PCE to be critical habitat.

2. Habitat for nesting and roosting. Nesting habitat is essential to provide structural features for nesting, protection from adverse weather conditions, and cover to reduce predation risks. Roosting habitat is essential to provide for thermoregulation, shelter, and cover to reduce predation risk while resting or foraging.
   a. These habitats must provide:
      i. Sufficient foraging habitat to meet home range needs of territorial pairs throughout the year.
      ii. Nesting and roosting habitat (see definition above)

3. Foraging habitat is essential to provide a food supply for survival and reproduction.
   a. Varies widely across the range in accordance with ecological conditions and disturbance regimes that influence vegetation structure and prey species distributions
   b. East Cascades foraging habitat
      i. Stands of nesting or roosting habitat
      ii. Stands of Douglas-fir or white fir/Douglas-fir mix
      iii. Mean tree size >16.5"dbh
      iv. Increased density of large trees (>26" dbh) and increased basal area
      v. Large accumulations of fallen trees and other woody debris
      vi. Sufficient space below canopy to fly

4. Habitat to support the transience and colonization phases of dispersal.
   a. Would optimally be composed of nesting, roosting or foraging habitat but may also be composed of other forest types that occur between larger blocks of nesting, roosting, and foraging habitat
      i. Where nesting, roosting, and foraging habitat is insufficient to support dispersal, dispersal habitat may be provided by:
         1. Habitat supporting the transience phase of dispersal
            a. Stands with adequate tree size and canopy cover to provide protection from avian predators and minimal foraging opportunities

b. May include but is not limited to trees at least 11” dbh and a minimum of 40% canopy cover AND
c. Younger and less diverse forest stands than foraging habitat like even-aged, pole-sized stands if they contain some roosting structures and foraging habitat to allow for temporary resting and feeding during the transience phase
2. Habitat supporting the colonization phase of dispersal
a. Equivalent to nesting, roosting, and foraging habitat but may be smaller in area than that needed to support nesting pairs

The Final CH Rule has a section entitled “Determining Whether an Action is Likely to Adversely Affect CH” (77 FR 71939). For this analysis the stand scale was utilized to assess effects for all four PCEs. This scale of analysis is consistent with the current method recommended by the Willamette Province Level 1 Team for addressing effects to CH for consultation.

PCE 1 is the forest types that support spotted owls. This criterion was used to identify CH affected by the Proposed Action. PCEs 2, 3, and 4 (nesting/roosting, foraging, and dispersal habitat) were specifically considered with respect to the Proposed Action to determine if they were removed, reduced, maintained or enhanced at a stand level.

The analysis of impacts has both a temporal scale (would the actions delay or accelerate the development of the PCEs in the stand following treatment) and a qualitative scale (would the life history needs of the spotted owl be better or worse with respect to the PCEs as a result of the treatment).

In addition to the above scales, the effects to the PCEs are evaluated at the scales of the CH subunit, CH unit, and the range of the spotted owl. However, if the Proposed Action does not have substantial effects at a smaller scale they would not have substantial effects at increasingly larger scales and would therefore not be analyzed. For example, if the proposed action maintains the PCEs in a manner that meets the life history needs of the spotted owl at the stand scale, then it would not have substantial adverse impacts at the subunit scale.

Existing Condition

A total of 9,577,969 acres in 11 units and 60 subunits were designated as CH for the spotted owl. The 11 units identified as CH are: (1) North Coast Olympics, (2) Oregon Coast Ranges, (3) Redwood Coast, (4) West Cascades North, (5) West Cascades Central, (6) West Cascades South, (7) East Cascades North, (8) East Cascades South, (9) Klamath West, (10) Klamath East, and (11) Interior California Coast Ranges. The proposed project falls within unit 6: West Cascades South (WCS) and includes a total of 1,355,198 acres in six subunits. The proposed project falls within subunit 1.

The WCS-1 subunit consists of approximately 92,586 acres in Multnomah, Hood River, and Clackamas Counties, Oregon, and is comprised of only Federal lands managed by the BLM and the U.S. Forest Service under the Northwest Forest Plan (USDA and USDI 1994). Special management considerations or protections are required in this subunit to address threats from current and past timber harvest and competition with barred owls. This subunit is expected to function primarily for demographic support to the overall population, as well as connectivity between subunits and other CH units.

Approximately 88 percent of WCS-1 was covered by verified spotted owl home ranges at the time of listing. When combined with likely occupancy of suitable habitat and occupancy by nonterritorial owls and dispersing subadults, this subunit was considered to have been largely occupied at the time of listing. In addition, there may be some smaller areas of younger forest within the habitat mosaic of this subunit that were unoccupied at the time of listing. The CH Rule determined that all of the unoccupied and occupied areas in this subunit are essential for the conservation of the species to meet the recovery criterion that calls for the continued maintenance and recruitment of spotted owl habitat (USFWS 2011).

Most of the stands under the Proposed Action are currently highly stocked even-aged stands. The stands have very little growth and lack the snags and downed wood needed for nesting and foraging owl habitat. In addition, the stands have low tree diversity, are single-canopied, even-aged stands, or have trees that are insufficient in size to provide quality snags or downed wood.

Analysis Area

The analysis area for the effects to spotted owl CH includes 13,800 acres, most of which falls within the Middle Fork Hood River Watershed with a smaller portion within the East Fork and West Fork Hood River Watersheds. There are 3,172 acres of CH in the planning area and 261 acres of the proposed treatment units within CH. Of the 3,172 acres, approximately 876 acres are in suitable nesting habitat, 1608 acres are in dispersal habitat, and 688 acres are considered non-habitat. All of the 261 acres of CH within proposed units are currently functioning as dispersal habitat.

Effects Analysis

No Action – Direct and Indirect Effects

There would be no short-term effects to spotted owl critical habitat 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 would start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood. Where these developments eventually occur, they would improve the dispersal habitat. The quality of dispersal habitat would improve only slightly in some stands while improving much more in others.

In the long-term, the stands that are currently considered non-habitat for 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 to100 years for these stands to develop into suitable habitat. Refer to the

Silviculture Specialist Report for further discussion of tree response under the No Action Alternative.

Proposed Action – Direct and Indirect Effects

Special management considerations or protections may be required in the east Cascades to address the effects of past activities such as timber harvest, livestock grazing, fire suppression, and fire exclusion, that have substantially altered the landscape, modifying the patterns of vegetation and fuels, and subsequent disturbance regimes to the degree that contemporary landscapes no longer function as they did historically (Hessburg *et al.* 2000, Hessburg and Agee 2003, Hessburg *et al.* 2005, Skinner *et al.* 2006, and Fontaine and Kennedy 2012). This has affected not only the existing forest and disturbance regimes, but the quality, amount, and distribution of spotted owl habitat on the landscape (Buchanan 2009, Healey *et al.* 2008).

In order to preserve the essential physical or biological features the CH Rule states that forests should be managed in a way that promotes spotted owl conservation, responds to climate change, and restores dry forest ecological structure, composition and processes, including wildfire and other disturbances (USFWS 2011). The following restoration principles apply to the management that may be required in this dry forest region:

1. Conserve older stands that contain the conditions to support spotted owl occupancy or high-value spotted owl habitat as described in Recovery Actions 10 and 32. On Federal lands this recommendation applies to all land-use allocations.
2. Emphasize vegetation management treatments outside of spotted owl territories or highly suitable habitat;
3. Design and implement restoration treatments at the landscape level;
4. Retain and restore key structural components, including large and old trees, large snags, and downed logs;
5. Retain and restore heterogeneity within stands;
6. Retain and restore heterogeneity among stands;
7. Manage roads to address fire risk; and
8. Consider vegetation management objectives when managing wildfires, where appropriate.

These principles may result in treatments that have a variety of effects on spotted owl habitat in the short and long term. Some restoration treatments may have an immediate neutral or beneficial effect on existing spotted owl habitat (e.g., roads management, some prescribed fire prescriptions). Other treatments, however, may involve reductions in stand densities, canopy cover, or ladder fuels (understory vegetation that has the potential to carry up into a crown fire) and thus affect the physical or biological features (PCEs) needed by the species.

There would be no effects to spotted owl CH from road decommissioning and road closures. The proposed treatments include a thinning prescription that would improve the growth rate of the stands. Larger trees would ultimately be provided in the second-growth stands in a faster timeframe than they would with no thinning. This would increase the rate that dispersal and suitable habitat would be available for spotted owl.

At the temporal scale the Proposed Action would aid in the development of structural diversity as the treatments are designed to accelerate development of the PCEs in the stand and the life history needs of the spotted owl would be improved with respect to the PCEs. The average canopy retained in the proposed units would remain at or above 40% with the exception of the small gaps. These gaps along with skips (no trees cut) would provide greater horizontal and vertical diversity in the future stand.

At the qualitative scale the proposed harvest treatments would temporarily impact approximately 1,617 acres of dispersal habitat, 261 of which are in CH. This habitat would be impacted by reducing the canopy cover and the loss of some down wood, shrubs and snags, which provide habitat for prey species. Although the dispersal habitat within these units would be reduced in quality, it would still function as dispersal habitat. It is estimated that these units would again provide quality dispersal habitat approximately 10 to 15 years after harvest.

The proposed Action would maintain the PCEs in a manner that meets the life history needs of the spotted owl at the stand scale. Therefore, the proposed treatments would also meet the life history needs of the spotted owl at the subunit and unit scale. The subunit and unit would continue to function as demographic support to the overall population, as well as connectivity between other CH units and subunits.

ESA Effects Determination

Because the impacts to PCEs would be short-term; treatments are expected to improve habitat components within the PCEs in the long-term; and because CH in the project area would continue to support the life history needs of dispersing spotted owls, the Proposed Action **may affect, but is not likely to adversely affect**, spotted owl CH.

Consistency Determination

The Proposed Action is consistent with the Final Rule for CH which states that forests should be managed in a way that promotes spotted owl conservation, responds to climate change, and restores dry forest ecological structure, composition and processes by:

1. Emphasizing vegetation management treatments outside of spotted owl territories or highly suitable habitat.
2. Retaining and restoring key structural components, including large and old trees, large snags, and downed logs.
3. Retaining and restoring heterogeneity within stands.
4. Retaining and restoring heterogeneity among stands.

The special management considerations or protections required in WSC subunit 1 to address threats from competition with barred owls are discussed above (See Direct and Indirect Effects to Spotted Owl).

Programmatic consultation
The effects to spotted owl CH for this project would be included in a programmatic informal consultation to be submitted to the U.S. Fish and Wildlife Service. A signed Letter of Concurrence would be received before a final decision is signed for this project.

The Following Mt. Hood National Forest Land and Resource Management Plan Standards and Guidelines that apply to the Proposed Action alternatives and would be met:

- FW-174: Habitat for threatened, endangered, and sensitive species has been identified and managed in accordance with the ESA (1973), the Oregon ESA (1987), and FSM 2670.
- FW-175: Habitat for threatened, endangered and sensitive species shall be protected and/or improved.

Conclusion
In order to preserve the essential physical or biological features in CH, the Rule states that forests should be managed in a way that promotes spotted owl conservation, responds to climate change, and restores dry forest ecological structure, composition and processes, including wildfire and other disturbances. The Proposed Action would preserve these biological features and provide benefits to spotted owls by accelerating the development of large conifers and aiding in structural diversity within the stand. The PDC's for CH under the Proposed Action would be maintained and enhanced over the long-term.

3.8.2 Region 6 Sensitive Species

3.8.2.1 Harlequin Duck

Methodology
All Region 6 sensitive species within the project area must be analyzed in a biological evaluation. The only sensitive species within the project area are the harlequin duck and the western bumblebee. Information on these species from the Interagency Special Status / Sensitive Species Program (ISSSSP) as well as other research was reviewed and summarized below to determine how harlequin ducks and western bumblebees use the project area and the impacts that this project would have on these species.

Existing Condition
This species has a holarctic range. Breeding occurs in Eurasia and two disjunct regions in North America (Natureserve 2007). The North American Pacific population breeds from western Alaska, northern Yukon, northern British Columbia, and southern Alberta south to Oregon, Idaho, Wyoming, and east of the Continental Divide in Montana (perhaps historically in California and Colorado) (Natureserve 2007).

In the western portion of the United States, Cassirer et al. (1996) made the following estimates of the number of breeding pairs:

- Washington = 399
- Oregon = 72
- Idaho = 70
- Montana = 209
- Wyoming = 58

The same authors concluded that the numbers in the U.S. Rocky Mountain have remained stable from 1989 to the mid-1990s (Cassirer et al. 1996). Harlequin ducks have disappeared from former breeding sites in Idaho and Montana (Wiggins 2005). Wintering populations in eastern North America are currently much smaller than historical (late 1800s) numbers, but populations grew in last part of 20th century (Cornell 2003).

Life History

The harlequin duck is a bird of turbulent waters, breeding on fast-flowing streams and wintering along rocky coastlines in the surf (Cornell 2003). These small ducks are expert swimmers. They ride rapids, diving and probing among the bottom stones of swift rivers and streams (Street 1999). They are often seen in compact flocks during the non-breeding season. Females and paired males show strong affinity to their wintering sites (Cooke et al. 2000, Robertson et al. 2000).

The harlequin duck is a short-distance migrant that moves to breeding streams from Pacific coastal areas (Cooper and Wright, 1998). Harlequin ducks migrate northward and inland in spring, arriving at their breeding areas in the intermountain western U.S. late-April through mid-May, with males departing for west coast molting areas soon after females begin incubating (Spahr et al. 1991). Breeding females move to the coast later depending on breeding success and whether or not females abandon young. Nonbreeding females also remain on rivers through the incubation period. Successful females and juveniles arrive on the coast in mid to late September. Some coastal breeding populations are probably nonmigratory (Cooper and Wright, 1998). Young accompany their mothers to coastal molting or wintering areas in the late summer (Regehr et al. 2001).

In Oregon, records of arrival on inland streams can be found from the first week of March, including a few reports of pairs (Dowlan 1996). A pair was on Lost Creek in the McKenzie drainage in January, 1992, and an unspecified number of ducks was reported from the McKenzie in late February, 1991. Pairs are seen on breeding streams in greatest numbers between the second week of April and the end of May, though a few records of pairs can be found through June. Some of these late observations appear to represent late-nesting or non-nesting pairs (Dowlan 1996).

Harlequins nest along fast-moving rivers and mountain streams on rocky islands or banks. Streams are usually braided with many riffles and rapids (Cassirer et al. 1993). They require relatively undisturbed, low gradient, meandering mountain streams with dense shrubby riparian areas (greater than 50% streamside shrub cover), and woody debris for nesting and brood rearing; also need mid-stream boulders or log jams and overhanging vegetation for cover and loafing; indicator of high water quality (Spahr et al. 1991). As described by Wiggins (2005), breeding habitat characteristics that appear to be preferred across the range of harlequin ducks include:

- wide riparian vegetative zones
- clear, clean water of low acidity
- braided or multi-channel streams with islands for nesting and roosting
- rocky substrate
- a stream gradient of 1 to 7 percent, with some calm pool areas

Harlequin ducks typically nest on the ground in well-concealed locations, usually on mid-stream islands (Wiggins 2005) although successful nest sites have also been located in tree cavities or cliff ledges which afford safety from high water (Street 1999). Occasionally harlequin ducks may nest up to 45m away from a stream (EUG BLM), but nests are typically located close (within 10m) to water and have some degree of vertical cover close to the nest (Bruner 1997, Robertson and Goudie 1999). Nests may also be situated at the base of trees, on piles of woody debris, under fallen logs, or on sheltered banks (Robertson and Goudie 1999). They will sometimes nest beside mountain lakes and lake outlets (Natureserve 2007).

They tend to breed in the same area in successive years (NatureServe 2007). The male defends the female until incubation begins, then the pair bond ends (NatureServe 2007). The female harlequin lays her eggs in a mass of down; after the eggs are laid, the male migrates to the coast to molt (Street 1999). Female harlequin ducks perform all of the incubation of the eggs, as well as the brooding and protection of the hatchlings; males provide no paternal care (Wiggins 2005).

In Oregon, the majority of nesting attempts appear to be initiated by the second week of May, though a few hens are brooding in late April, and some may initiate as late as early June (Dowlan 1996). Incubation has been reported as anywhere from 27-32 days (Gaugh et al. 1998, NatureServe 2007, Street 1999). Harlequin ducks typically lay a single clutch per season (Gaugh et al. 1998, Street 1999). It is not known whether replacement clutches are laid if the first clutch/brood is lost (Robertson and Goudie 1999). The female is extremely sensitive and can be very intolerant to disturbance while incubating (Street 1999).

Nestlings are precocial and covered in down, and are able to leave the nest soon after hatching (Cornell 2003, NatureServe 2007, and Wiggins 2005). Young are able to feed immediately after hatching but do not dive regularly for several weeks (Kuchel 1977). After the chicks hatch the female moves her young to backwater and slow-moving channels (Street 1999). When they are old enough, females may accompany their broods to their wintering grounds at the coast (Regehr et al. 2001), although some females leave when the young are less than 2 weeks old, and others after the young are capable of flight (Hendricks and Reichel 1998).

Brood size at fledging is usually two to five young (Cassirer et al. 1996, NatureServe 2007). Compared to other ducks, productivity is relatively low (Spahr et al. 1991) and highly variable from year to year (NatureServe 2007).

The harlequin duck dives for food in strong currents or fast-flowing streams, looking for prey on or near the bottom. Their diet is almost exclusively aquatic invertebrates, but also insects and a few small fish. Freshwater invertebrates are the most common prey in mountain rivers. On their wintering grounds, harlequin ducks feed almost exclusively by diving in nearshore areas, typically within 15 m of the shoreline (Goudie and Ankney 1986) using their bills to pry mollusks such as snails, limpets and mussels from the rocks during the winter months (Street 1999).

Threats

Relative to other species of ducks, they occur at low population densities and exhibit high breeding site fidelity, low reproductive rates, and delayed reproduction. All of these traits contribute to making harlequin duck populations particularly slow to recover from habitat degradation or loss (Wiggins 2005).

The primary factors thought to be responsible for local declines in the number of harlequin ducks are the degradation of breeding streams, such as damming, and human disturbance (such as rafting and other river-associated recreation) during the breeding season. In many areas, the vast majority of harlequin ducks breed on National Forest System lands, thus human recreation use of breeding streams during the summer months has the potential to cause stream abandonment or to decrease reproductive success (Wiggins 2005).

Activities such as logging, road-building, and mining may increase sedimentation along breeding streams that may affect its food source. These activities also increase disturbance to nesting birds, and facilitate easier human access to remote breeding sites.

Analysis Area

The analysis area is comprised of the Middle Fork Hood River as well as additional large stream segments that fall within the project area boundary including all uplands within 45 meters of these rivers and streams. Harlequin ducks have been documented in the Middle Fork Hood River Watershed within the project area boundary.

Effects Analysis

No Action – Direct and Indirect Effects

There would be no short-term effects to harlequin ducks under this alternative. In 20 to 30 years, the stands would start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood. No trees would be placed in the streams to improve habitat.

Proposed Action – Direct and Indirect Effects

Impacts to habitat, including those that could destroy, alter, degrade or reduce the food supply, as well as destruction of nest sites, could adversely affect harlequin ducks. Since harlequin ducks feed on prey at the bottom of streams, the placement of large woody debris in streams and rivers could temporarily increase sedimentation along breeding streams and may affect the availability of food. Because harlequin ducks inhabit areas with swift moving water, it is expected that the sediment created by felling trees into streams to increase large woody debris would be very minor at each site where a tree strikes the channel bottom only slightly decreasing the ability of the ducks to forage in the immediate area.

Because activities would take place during the nesting season, there may be impacts to nests by placement of logs directly on nests or by causing females to abandon the area because of disturbance in close proximity to nesting sites. Since the majority of nests in Oregon are initiated by the second week of May, and chicks are mobile within days of hatching (after 30 days of incubation), it is likely that both young and adults would be able to move away from the area during project implementation because tree felling activities into the streams would take place after July 15. This disturbance would impact a given nesting site for no more than one season and individuals would be able to return the following year.

The riparian stands that are being proposed for treatment are currently highly stocked even-aged stands. The stands have very little growth and lack snags and downed wood suitable for riparian and wildlife needs. In addition, the stands have low tree diversity, are single-canopied, even-aged stands, or have trees that are insufficient in size to provide quality snags or downed wood. Habitat for harlequin duck would be improved over the long-term by increasing the rate at which large trees would be recruited on the landscape and could later fall and become large woody debris for nesting and brood rearing which could increase the number of nesting pairs in the project area.

The temporary impacts to prey species from large wood placement and disturbance to nesting sites from project activities **may impact individuals, but is not likely to impact populations, nor contribute to a potential loss of viability of this species**. These impacts would be temporary and habitat would be improved in the long-term.

Consistency Determination

The Following Mt. Hood National Forest Land and Resource Management Plan Standards and Guidelines that apply to the Proposed Action alternatives and would be met:

- FW-174: Habitat for threatened, endangered, and sensitive species has been identified and managed in accordance with the ESA (1973), the Oregon ESA (1987), and FSM 2670.
- FW-175: Habitat for threatened, endangered and sensitive species shall be protected and/or improved.

3.8.2.2 Western Bumblebee

Methodology
All Region 6 sensitive species within the project area must be analyzed in a biological evaluation. The only sensitive species within the project area is the western bumblebee. Information on the species from the Interagency Special Status / Sensitive Species Program (ISSSSP) as well as other research was reviewed and summarized below to determine how the species uses the project area and the impacts that this project would have on a species.

Existing Condition
The western bumblebee was widespread and common throughout the western United States and western Canada before 1998 (Xerces Society 2009). The former range of U.S. states included: northern California, Oregon, Washington, Alaska, Idaho, Montana, western Nebraska, western North Dakota, western South Dakota, Wyoming, Utah, Colorado, northern Arizona, and New Mexico. Since 1998, populations of this bumblebee have declined drastically throughout parts of its former range. In Alaska, east of the Cascades and in the Canadian and U.S. Rocky Mountains, viable populations still exist. Populations of the western bumblebee in central California, Oregon, Washington and southern British Columbia have mostly disappeared. It is difficult to accurately assess the magnitude of these declines since most of this bee's historic range has not been sampled systematically.

Life History
According to Goulsen (2003a), bumblebee colonies are annual. In the late winter or early spring, the queen emerges from hibernation and then selects a nest site, which is often a pre-existing hole, such as an abandoned rodent hole. She then supplies the nest with pollen as well as nectar, which she stores in a wax pot formed by wax secreted by specialized glands. The queen then starts her new colony by laying between 8 and 16 eggs in her first batch, which she then incubates until hatching. The young feed upon the food mass provided by the queen and subsequent feedings are provided by the queen regurgitating food from her crop. After feeding has been completed, the young pupate in cocoons spun from silk. The queen ceases to forage within a few days of the workers' emergence and then focuses upon increasing the colony's population. Male bumblebees develop from unfertilized eggs and females develop from fertilized eggs. According to Thorp et al. (1983), around the time that the number of workers equal or outnumber the brood to be fed, some unfertilized eggs have been laid, which would develop into males, while fertilized eggs become new queens. Young queens may assist with some household activities before leaving the hive to mate with the male drones. After mating, the queen then digs a hole in which she would hibernate through the winter. The rest of the colony including the old queen, workers and males die out.

Bumblebees would visit a range of different plant species and are important generalist pollinators of a wide variety of flowering plants and crops (Goulsen 2003a; Heinrich 2004). 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).

Threats

There are several threats which face bumblebees and are leading to their decline. The following threats and conservation considerations are from a status review, co-authored by Robbin Thorp, Elaine Evans, and Scott Hoffman (Thorp et al. 2008).

Agriculture and urban development alter landscapes and habitat required by bumblebees while grazing livestock poses a threat since the animals remove flowering food sources, disturb nest sites and alter the vegetation community. Foraging bumblebees are directly threatened by insecticide applications when used in agricultural settings. Massive bumblebee kills have occurred as a result of insecticide application on Forest Service managed public lands intended for the control of spruce budworm. Bumblebees can be indirectly harmed when the flowers that they normally use for foraging are removed by the application of broad-spectrum herbicides. When exotic plants invade and dominate native grasslands, they may threaten bumblebees by competing with the native nectar and pollen plants relied upon by bumblebees.

Analysis Area

The analysis area for the Western bumblebee includes the area within the project boundary of the Proposed Action.

Effects Analysis

No Action – Direct and Indirect Effects

Under the No Action alternative, bumble bee nesting, foraging, and over-wintering habitat would not be impacted and, therefore, there would be no impact to bumble bees.

Proposed Action – Direct and Indirect Effects

The proposed project may temporarily impact flowering plants during road maintenance, road decommissioning, road closures, storm proofing, 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 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 road maintenance activities could temporarily reduce the number of nests available 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 is not likely to impact populations, nor contribute to a potential loss of viability of this species**. The approximate total number of acres impacted (including road maintenance) would not exceed 450 since most of the treatment units are heavily timbered and do not provide foraging habitat or nest sites. This impact represents less than one percent of the Forest Service owned lands within the Middle Fork Hood River Watershed. While the number of bees in the project area may be slightly reduced, this reduction would be temporary as flowering shrubs and nest sites increase within a few years after treatments. Because bumblebees can forage for nectar on a variety of flowering plants, the untreated portions of the Middle Fork Hood River Watershed would continue to provide a food source. These untreated portions of the watershed would also continue to provide for nesting and hibernating habitat. The adjacent untreated areas would allow for bumblebees to recolonize the impacted acres within the treatment area as foraging and nesting habitat return.

Cumulative Effects

The projects that could have cumulative effects to bumblebee include: construction of the BPA powerline, past timber harvests on federal and private lands, road decommissioning and road closures, BPA maintenance, county and private timber sales (including burning), Lakebranch and Red Hill timber harvest, McGee Creek riparian thinning, pre-commercial thinning, road and trail maintenance, and noxious weed treatments. Cumulative effects for this species were considered at the watershed scale since genetic diversity and connectivity between colonies is a concern for the bumblebee.

Projects that may increase or improve foraging habitat in the long-term include road decommissioning and closures, construction of the BPA powerline, riparian thinning, and noxious weed treatments. Depending on the prescription and the condition of the stand before treatments, timber sales may increase or decrease the amount of foraging habitat available. Road, trail, and BPA maintenance have the potential to reduce the amount foraging 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 bumblebees by removing flowering food sources, disturbing nest sites and altering the vegetation community. The size of bumblebee populations diminish and inbreeding becomes more common as habitats become fragmented. This in turn decreases the genetic diversity and increases the risk of population decline.

While the projects analyzed under cumulative effects may have impacts to individual bumblebees, 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. Because some of the proposed activities increase or improve habitat while others may decrease it, the impacts would likely be relatively small and populations of this species would still persist at the watershed scale.

Consistency Determination

The Following Mt. Hood National Forest Land and Resource Management Plan Standards and Guidelines that apply to the Proposed Action alternatives and would be met:

- FW-174: Habitat for threatened, endangered, and sensitive species has been identified and managed in accordance with the ESA (1973), the Oregon ESA (1987), and FSM 2670.
- FW-175: Habitat for threatened, endangered and sensitive species shall be protected and/or improved.

3.8.3 Survey and Manage Species

3.8.3.1 Dalles Sideband

Methodology

Surveys were conducted in the project area in 2012 for Survey and Manage Species in compliance with the applicable species survey requirements and management provisions found in the Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines 2001.

Existing Condition

This species has been found in moist talus habitat (especially around seeps and springs), and in forested areas in upland sites near, but outside of, riparian corridors. Mollusks which inhabit rocky habitats also utilize the surrounding forest areas during moist, cool conditions. In some forested sites, the species has been found associated with down wood where no rock substrates occur. Down wood may provide temporary refugia used during dispersal in the wet season, while rock substrates provide more stable refugia during summer and winter. Areas with frequent fire return intervals where rock crevice refugia are available may have historically favored this species over other, larger forms of Monadenia.

Habitat alteration and fragmentation leading to isolated populations is considered to be the major threat to the Dalles sideband. Land snails cannot tolerate extremely dry (xeric) conditions, have restricted ranges, and are slow to disperse. All activities that directly or indirectly alter a site's ecological parameters outside the range of natural conditions, such as moisture, shade, temperature, soil compaction (compacted), food supplies, or dispersal routes can adversely affect a population. Loss of local populations can be caused by severe fire, herbicide use, recreation development, over-collecting, and disturbance during aestivation. Catastrophic wildfire causes direct mortality in high intensity fires and may result in loss of populations over large areas. Road-building and road maintenance have been identified as specific threats.

Analysis Area

The Analysis Area for the Dalles sideband includes the area within the project boundary of the Proposed Action. A complex array of soils and substrates exists across the project area, including unvegetated talus slopes, wetlands, and outwash plains. They have been derived from glacial deposits of various ages mixed with thin layers of volcanic ash. Where soils are present, surface textures are sandy and loamy, with a noticeable increase in rock content below about 10 inches. One individual of this species was found in the project area during 2012 surveys. The units that contained the snail have subsequently been dropped from the Proposed Action.

Effects Analysis

No Action – Direct and Indirect Effects
There would be no short-term effects to the Dalles sideband under this alternative. The units that are currently providing no suitable habitat would continue to be deficient in snag and down wood levels remaining essentially unchanged.

In the long-term, the stands that are currently considered unsuitable habitat may eventually develop old growth characteristics. However, with no action, it could take as long as 60 to100 years for these stands to develop late-successional features. Refer to the Silviculture Specialist Report for further discussion of tree response under the No Action Alternative.

Proposed Action – Direct and Indirect Effects
Removal of the overstory may cause desiccation of rocky substrates and loss of the moss ground cover. Tree-felling and ground-based logging systems can disturb the substrate resulting in destabilization of talus and substrate compaction, which reduces substrate interstices used by The Dalles sideband as refuges and for their movements. The areas underlying skid trails nearest to landings are most likely to incur damage because they receive the most trips with equipment.

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 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.

Activities in the young managed stands would not pose substantial threats to The Dalles sideband. The existing stand structure is typically uniform, even aged, and lacks the suitable habitat features required for this species. Given the extent of past activity, the proposed treatment sites would not currently be expected to support populations of this species. Treatments would improve habitat for the sideband in the long-term by creating larger diameter trees (future down wood) and improving the overall health of the stand.

The proposed timber harvest activities would pose a limited risk to these snails. Hazard tree removal would have minimal disturbance to substrates. Thinning of the proposed treatment units would avoid severe compaction of substrates (see Soils Report) and likely could be conducted in soils with rocky substrates without adverse effects to this species. Very localized activity may impact a few individuals but would not affect populations.

Colonization of the suitable habitat that would eventually develop in the treated stands would occur from adjacent areas of cliff, talus or scree habitat that support the Dalles sideband. Presumably, snails in these rocky habitats would serve as a source population for colonization of adjacent managed stands when habitat conditions become suitable.

Cumulative Effects
The cumulative effects project list in Chapter 2 has been reviewed and no activities overlap in either time or space within the analysis area for The Dalles sideband. Therefore, no adverse cumulative effects are expected.

Consistency Determination
The Propose Action is consistent with the survey requirements and management provisions found in the Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines 2001.

3.8.3.2 Larch Mountain Salamander

Methodology
Surveys were conducted in the project area in 2012 for Survey and Manage Species in compliance with the applicable species survey requirements and management provisions found in the Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines 2001.

Existing Condition
The Larch Mountain salamander occurs in an area of 4,550 mi^2 in the Cascade Range of Washington and Oregon (Nauman and Olson 1999). It has been found from 160-4200 feet in elevation. While from 1954-1985, sites were known only in or adjacent to a 31 mi stretch of the Columbia River Gorge (e.g., Nussbaum et al. 1983), today it is found about 120 miles north of the Columbia River in Clark, Cowlitz, Skamania, Lewis, King, Pierce, Klickitat, and Kittitas Counties, Washington, and to about 14 miles south of the Columbia River in Multnomah and Hood River Counties, Oregon. The current knowledge of the species range is likely incomplete and additional range extensions may include areas to the north, south and east.

Currently, there are 103 sites known on federal lands, with most occurring on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area, and fewer on the Mount Baker-Snoqualmie, Wenatchee and Mount Hood National Forests. Most (~70%) federal sites occur on reserved lands, including Late Successional Reserves, Congressional Reserves, and Administratively Withdrawn land use allocations.

Much of the landscape within the range of the Larch Mountain salamander has been fragmented by past timber harvest practices and is a patchwork of stands of different seral stages, from early seral to mature forests. Sites with salamanders are nested within this patchy forested landscape.

The Larch Mountain salamander is a fully terrestrial species that does not require standing or flowing water at any time during its life history. They are primarily nocturnal and are typically active on the ground surface during the cool, wet weather of spring and fall (Crisafulli 2005). Because these animals occur over a broad elevation, temperature, and moisture range, their surface activity patterns may vary by location (Nussbaum et al. 1983, Crisafulli 1999). High elevation and eastern Cascade Range populations have a much shorter surface active period compared to lower elevation and western Cascade Range populations.

Individuals of this species are thought to have limited dispersal ability, making daily to seasonal vertical migrations in the ground surface as microclimate conditions change, but not extensive horizontal overland movements. Genetic analyses indicate limited gene flow and suggest that populations have been on different evolutionary pathways for a long time.

Habitat

Larch Mountain salamanders occupy old-growth forests; younger naturally regenerated forests in gravelly/cobble soils with residual late successional features (snags and large down logs); scree and talus (forested and un-forested); and lava tube entrances where debris (e.g., pieces of lava, wood, fine organic and inorganic particles) has accumulated. At a coarse level of characterization, these specific habitats can be simplified into two general categories: 1) habitats with pumice-derived loamy soils; and 2) habitats with rocky substrates. The distinction between these two general habitat types may provide a useful and biologically meaningful way to view the species' habitat associations. Crisafulli (unpubl. data) suggests that substrate/soil type and vegetation are important factors in determining the suitability of a site for *P. larselli* occupancy. The relative importance of vegetation composition and structure appears to be related to the substrate/soil conditions present at a site. When rocky substrates (scree, talus or gravelly soils) are prevalent, the role of vegetation composition and structure appears to be less important; and animals are found where several vegetation types occur. In contrast, when loamy soils are present, Larch Mountain salamanders appear to be restricted to sites only with old-growth forest conditions, or confined to small isolated pockets of refugia possessing rocky substrates within the matrix of old-growth forest with loamy soils.

Threats

Habitat loss, degradation, and disturbance are the primary threats to the persistence of Larch Mountain salamander populations. Important habitat features used by this species vary by macrohabitat type, and include forest structures (e.g., living and dead), rocky substrates, soils, and microsites that provide cool, moist conditions. Disturbance of macrohabitats and surface microhabitats is of primary concern. Alteration of the microhabitat and microclimatic conditions within these areas may negatively impact these salamanders. Microclimate regimes may be altered by vegetation management activities within and adjacent to occupied habitat areas. While little definitive information is known about key factors contributing to the species long-term persistence, it is perceived that some level of connectivity among neighboring populations and sub-populations is likely important.

Dominant disturbances which pose threats to this species include: 1) timber harvesting (including subsequent site scarification and fuels treatment); 2) construction of roads, trails, homes, and railways; 3) mining of rock; 4) fire (both natural and human caused); 5) recreation; 6) vulcanism; and 7) chemical applications. In areas where this salamander is associated with isolated talus slopes, such as the eastern Cascade Range, impacts to those discrete patches are a concern. While fire and volcanism may have been part of the natural disturbance processes with which these animals have occurred historically, those disturbances may now pose a more severe threat due to the species' restricted and fragmented distribution, and in the face of multiple additional stressors that in combination provide heightened concern. Incidental mortality from several sources of human activity in an area may pose substantial cumulative impacts to these animals.

Analysis Area

The Analysis Area for the Larch Mountain Salamander includes the area within the project boundary of the Proposed Action. A complex array of soils and substrates exists across the planning area, including unvegetated talus slopes, wetlands, and outwash plains. They have been derived from glacial deposits of various ages mixed with thin layers of volcanic ash. Where soils are present, surface textures are sandy and loamy, with a noticeable increase in rock content below about 10 inches. There is a compacted glacial till deposit at depth in Upper Tony Creek drainage, but for the most part soils are well drained. Two individuals of this species were found in the project area during 2012 surveys. The units that contained these salamanders have subsequently been dropped from the Proposed Action.

Effects Analysis

No Action – Direct and Indirect Effects

There would be no short-term effects to Larch Mountain salamander under this alternative. The units that are currently providing no suitable habitat would continue to be deficient in snag and down wood levels remaining essentially unchanged.

In the long-term, the stands that are currently considered unsuitable habitat may eventually develop old growth characteristics. However, with no action, it could take as long as 60 to100 years for these stands to develop late-successional features. Refer to the Silviculture Specialist Report for further discussion of tree response under the No Action Alternative.

Proposed Action – Direct and Indirect Effects

Studies in the Pacific Northwest documented greater salamander abundance in old-growth compared to clearcuts or early seral forest (Raphael 1988; Welsh and Lind 1988, 1991; Welsh 1990; Ollivier et al. 2001). As with other salamanders, the impact of timber harvest on a given population would depend on the effect the impact has on the microclimate and microhabitat structure (Welsh 1990). This is expected to vary on a site-by-site basis, and with the timber management practices implemented.

Removal of the overstory may cause desiccation of rocky substrates and loss of the moss ground cover. Tree-felling and ground-based logging systems can disturb the substrate resulting in destabilization of talus and substrate compaction, which reduces substrate interstices used by salamanders as refuges and for their movements. The areas underlying skid trails nearest to landings are most likely to incur damage because they receive the most trips with equipment.

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 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.

Activities in the young managed stands would not pose substantial threats to Larch Mountain salamanders. The existing stand structure is typically uniform, even aged, and lacks the suitable habitat features required for this species. Given the extent of past activity, the proposed treatment sites would not currently be expected to support populations of Larch Mountain salamanders. Treatments would improve habitat for Larch Mountain salamanders in the long-term by creating larger diameter trees (future down wood) and improving the overall health of the stand.

The proposed timber harvest activities would pose a limited risk to these salamanders. Hazard tree removal would have minimal disturbance to substrates. Thinning of the proposed treatment units would avoid severe compaction of substrates (see Soils Report) and likely could be conducted in soils with rocky substrates without adverse effects to this species. Very localized activity may impact a few individuals but would not affect populations.

Colonization of the suitable habitat that would eventually develop in the treated stands would occur from adjacent areas of cliff, talus or scree habitat that support Larch Mountain salamanders. Presumably, salamanders in these rocky habitats would serve as a source population for colonization of adjacent managed stands when habitat conditions become suitable.

Cumulative Effects
The cumulative effects project list in Chapter 2 has been reviewed and no activities overlap in either time or space within the analysis area for Larch Mountain Salamander. Therefore, no adverse cumulative effects are expected.

Consistency Determination
The Propose Action is consistent with the survey requirements and management provisions found in the Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines 2001.

3.8.4 Management Indicator Species

Methodology
The National Forest Management Act requires the Forest Service to manage wildlife habitat to "maintain viable populations of existing native and desired non-native vertebrate species in the planning area." The National Forest Management Act requires the Forest Service to identify Management Indicator Species through the planning process, and to establish objectives to maintain and improve the habitat of indicator species. The primary assumption of this process is that indicator species represent the habitat needs of other species because they have similar habitat requirements. Spotted owls, for example, indicate the needs of a variety of animals that use old growth forest. This analysis focuses on certain key species and does not specifically

address common species except to the extent that they are represented by these management indicator species.

Management Indicator Species for this portion of the Forest within the project area include northern spotted owl (see analysis above), deer and elk, pileated woodpecker, and American marten (Table 3-44).

Table 3-44: Management Indicator Species for the Project Area.

Management Indicator Species	Habitat Description	Habitat Present in Analysis Area	Species Present in Analysis Area
Northern Spotted Owl	Old Growth	Yes	Documented
Deer	Early Forest Succession Mature/Old Growth	Yes	Documented
Elk	Early Forest Succession Mature/Old Growth	Yes	Documented
Pileated Woodpecker	Mature/Over Mature	Yes	Documented
American Marten	Mature/Over Mature	Yes	Suspected

With the selection of some of these species there was a special emphasis on mature, over mature, and old growth habitat. The selection was done at a time when timber harvest was planned to replace many older stands with younger more rapidly growing stands: it was suspected that the mature and over mature stands would decline and the species associated with this habitat could be lost. Several species were selected to represent all of the species that required this type of habitat.

3.8.4.1 Mule Deer and Elk

Existing Condition

Black-tailed deer are common and relatively abundant in the spring, summer and fall within the Project Area. Elk are less common. Population numbers for deer and elk are probably most limited by the unavailability of quality winter range. Elk herds within the project area likely exhibit a close association with riparian habitat in areas of gentle terrain and low 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. Forage is widely available, but is generally of low quality. The low quality of the forage and the lack of wetlands and permanent low-gradient streams are considered one of the limiting factors for elk and possibly deer in the Project Area.

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. Most of the stands in the project area consist of thermal cover. There are few patches of old-growth habitat within the watersheds that would provide optimal cover but these stands are not proposed for treatment.

The Forest Plan Standards and Guidelines have minimum requirements for optimal and thermal cover habitat components, but no specific level for forage. During the 1980s and 1990s, wildlife managers considered thermal cover to be important to deer and elk survival and production. Over time, wildlife managers have questioned if elk required thermal cover. Telemetry data presented at the Elk Modeling Workshop (April 2010) indicated that elk were negatively associated with cover and that openings are far more valuable for elk than cover. With the reduction in regeneration timber harvest, the Forest now has abundant optimal and thermal cover, but openings for forage are becoming scarce. There are approximately 69,226 acres of early-seral habitat on the Forest. This level is declining over time at mid and lower elevations since plantations have grown dense with trees that shade out forage. The Gnarl Ridge and Dollar Lake fires have increased forage at the higher elevations.

High road densities lead to harassment of elk herds. Harassed elk move more often than elk left alone and use of habitat decreases as road density increases (Witmer 1985). It is also recognized that elk within or moving through areas of high open-road densities move longer distances; often several miles per day.

Analysis Area

The analysis area for deer and elk includes the Bear Creek, Coe Branch, Elliot Branch, and Tony Creek drainages. The treatment units are located within winter, sever winter, and summer range. The East Fork and Middle Fork Hood River Watershed Analysis found that not many deer or elk reside here during the winter, especially in the harsher winters when snowpacks are heavy. The deer and elk that reside in the project area during the summer usually move off-Forest onto other ownerships in the winter.

The overall open road density within the project area is currently 2.3 miles of road per square mile, which is less than the 2.5 miles per square mile for the Forest Plan Standard in inventoried summer range. The open road density within Inventoried Deer and Elk Winter Range is currently 1.3 miles of road per square mile, which is below the 2.0 miles per square mile standard for inventoried winter range under the Forest Plan. There are 2.3 miles of open roads per square mile within B10 winter range which exceeds the Forest Plan Standard of 1.5 miles per square mile between December 1 and April 1.

Effects Analysis

No Action – Direct and Indirect Effects

Approximately 1,447 acres of young managed plantations would continue to serve as thermal cover. No cover would be lost and no forage would be gained in this alternative. In addition, no roads would be closed or decommissioned. With the No Action alternative, the stands would continue to remain crowded and forage would not increase above current levels. Road densities would remain unchanged from current conditions. See the Silviculture Specialist Report for further discussions of the response of stands to the No Action alternative.

Proposed Action – Direct and Indirect Effects

The proposed treatments would temporarily remove thermal cover from the stands. While there would be a loss of low-moderate quality thermal cover, there would also be an increase in forage within these same stands. The loss of thermal cover and increase in forage in the proposed units could alter the distribution and use of habitat by deer and elk in the project area. During the summer, fewer animals would be expected to use the area since it would be relatively open. More animals may use the area during the winter because more forage would be available. Some of this increased forage would not occur close enough to cover for it to be fully utilized by deer and elk. Canopy closure is expected to eventually increase over the next 10 to 15 years to the point in which most forage benefits are lost and consequently forage levels would return to pre-treatment levels. Most of the lost thermal cover characteristics in the stands should be regained in about 15 years.

Portions of the stands would include the creation of heavy thins, gaps, landings, and skid trails. These gaps and heavy thins would no longer be providing thermal cover. However, opening the canopy to this degree allows abundant sunlight to reach the forest floor, promoting the development of understory vegetation. Usually this vegetation consists of shrubs and some grasses which are highly palatable to deer and elk. The areas treated in gaps could lose much of their forage qualities in approximately 20 years and return to providing thermal cover in about 40 years. The skips would maintain their forest structure and continue to provide thermal cover.

Deer are a species that can readily adapt to these changes. Elk are more selective and not as adaptive. Only small impacts are predicted to the deer populations in the area. Elk do not appear to use this habitat extensively in the winter, so only small impacts are predicted to the elk population as well. Although there is the possibility that herd sizes would be reduced to a small degree, these effects are not predicted to last long and would be partially off-set by the increase in forage.

Timber removal, road maintenance and decommissioning activities could potentially disturb animals in the area at the time of implementation. The project area is in both summer and winter range. 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 active calving sites.

Project activities would not all be occurring at the same time, but only in a few places at any one time. The potential disturbance is predicted to be small in scale, temporary in nature and only impact a few individuals. The project is not expected to cause a measurable reduction in the current local population size for either deer or elk.

New temporary road construction and old existing temporary roads would be reopened and reconstructed to access several of the units. These roads would not be open to the public and the only disturbance occurring as a result of these roads being opened would be from the activities that would be required to open the road and to accomplish the treatments in the project area. After treatments, the roads that were opened would be closed and open-road density would be back to the current level. There would be no increase in the long-term harassment of deer and elk with this alternative; effects would be short-term only.

There is a potential haul route that goes through deer and elk B10 winter range. All haul roads that go through the B10 land use allocation would have their use restricted between December 1 and April 1, as described in the Project Design Criteria.

This alternative proposes approximately 2.1 miles of road decommissioning and approximately 15.4 miles of road closures. In addition, 7.0 miles of road would be seasonally closed allowing access only during huckleberry harvesting season. These actions would improve the deer and elk habitat being provided in the areas of the proposed road closures. They would reduce the disturbance to deer and elk in summer and winter as well as reducing the likelihood of poaching due to reduced accessibility of the areas.

Open road densities after closures under the Proposed Action would be reduced to 1.8 miles per square mile which is below the Forest Plan Standard of 2.5 miles per square mile for inventoried summer range and less than the 2.0 miles per square mile for inventoried winter range. The Forest Plan Standard for open road densities within B10 winter range would remain unchanged.

Cumulative Effects
Since deer and elk move up and down the watersheds depending on the season, the analysis area used for cumulative effects includes the private lands in the watershed in addition to the Bear Creek, Coe Branch, Elliot Branch, and Tony Creek drainages. The projects included in the cumulative effects analysis include: construction of the BPA power line, past timber harvests on federal and private lands, road decommissioning, road closures, and pre-commercial thinning.

Projects that impact deer and elk forage and cover include construction of the BPA power line, past timber harvests on private and federal lands, and pre-commercial thinning. The potential future harvest on private lands has been estimated. It is assumed that 50 percent of the private acreage would not provide thermal cover at any given time. The cumulative effects analysis area would have 38 percent forage and 62 percent cover after the proposed treatments. The optimum cover forage ratio is 60 percent forage and 40 percent cover (Thomas, 1979). Forage availability is more of a limiting factor on-Forest, but is more available off-Forest as a result of regeneration harvest on private lands. Cumulatively, there would be a small change in cover forage ratios with forage increasing and cover decreasing after the Proposed Action treatments. This would move the forage to cover ratio towards the optimum ratio.

Road closures and road decommissioning in the Lake Branch and Red Hill project areas would improve deer and elk habitat by reducing the disturbance to deer and elk in summer and winter as well as reducing the likelihood of poaching because accessibility to the area would be reduced.

3.8.4.2 Pileated Woodpecker

Existing Condition

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 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 association with late seral stages comes from the need for large-diameter snags or living trees with decay for nest and roost sites, large-diameter trees and logs for foraging on ants and other arthropods, and a dense canopy to provide cover from predators. Nest cavities average 8 inches in diameter and 22 inches in depth and are excavated at an average height of 50 feet above the ground, therefore nest trees must have a large diameter in order to contain nest cavities. Because ants are the main diet for pileated woodpeckers, large diameter snags and logs with some decay are selected for foraging because carpenter ants inhabit these sites.

A pair of pileated woodpeckers shares and defends a territory all year against other birds. Nest excavation occurs from late March to early May, incubation from May to early June, and fledging in early July. Both birds excavate, incubate, and rear young.

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).

There are 405,092 acres of pileated woodpecker habitat on the Mt Hood National Forest based on GIS data for habitat 80 years and older. By dividing the acres of pileated woodpecker habitat by the average home range with overlap of 970 acres there are 418 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 be up to three home ranges in the project area. While there is some habitat within the watersheds, there is no suitable nesting habitat proposed for removal under the Proposed Action.

<u>Threats</u>

Timber harvest has the most substantial effect on habitat for the pileated woodpecker. Removal of large-diameter live and dead trees, of down woody material, and of canopy eliminates nest and roost sites, foraging habitat, and protective cover. Forest fragmentation likely reduces population density and makes birds more vulnerable to predation as they fly between forest fragments. Activites that reduce the number of snags, logs, and cover may reduce the ability of an area to support nesting, roosting, and foraging for this species (Marshall, D.B. et al. 2003).

<u>Analysis Area</u>

The Analysis Area for the pileated woodpecker includes the area within the project boundary of the Proposed Action. While there are pockets of late seral forest, The Middle Fork Hood River

Watershed contains the lowest amount of late seral habitat on the Forest and the Watershed Analysis indicates that there is not enough habitat present to support populations of late seral, large home range species including pileated woodpecker. There is one B5 pileated woodpecker/pine martin habitat area within the Analysis Area and there are 2 treatment units within this habitat area.

Effects Analysis

No Action – Direct and Indirect Effects

There would be no short-term effects to pileated woodpecker under this alternative. In the short-term, the units would not provide nesting habitat and snag levels would remain essentially unchanged. In 20 to 30 years, the 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 to100 years for these stands to develop into suitable habitat. Refer to the Silviculture Specialist Report for further discussion of tree response under the No Action Alternative.

Proposed Action – Direct and Indirect Effects

None of the proposed harvest units provide nesting habitat for this species. Most of the stands proposed for treatment are young managed plantations and range in age from about 30 to 75 years. Units 33 and 43 are within B5 Habitat Areas and each of these units averages 45 years of age and 14 inches in diameter. Unit 54 is approximately 100 years old with an average diameter of 13 inches. None of these units contain sufficient numbers of large trees or snags to provide nesting habitat for the pileated woodpecker. The number of snags and down logs that are currently in these units would not be impacted.

There would be no effects to pileated woodpecker from road decommissioning. Open road densities after closures under the Proposed Action would be reduced to 1.8 miles per square mile which is below the Forest Plan Standard of 2.0 miles per square mile for B5.

The proposed treatments include a thinning prescription 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. This would increase the rate that suitable nesting and foraging (large snags) habitat would be available for pileated woodpeckers.

The main threats to pileated wood pecker includes activites that reduce the number of snags, logs, and cover which may reduce the ability of an area to support nesting, roosting, and foraging. The Propose Action would temporarily reduce cover by opening the stands, but as these stands respond to thinning treatments, the cover needed by pileated woodpecker would return in 20 to 30 years. The Propose Action would not reduce the number of snags and logs, but it would eventually increase the number of large trees for nesting and increase the number of snags and logs needed for foraging.

3.8.4.3 American Marten

Existing Condition

In the western United States, the American marten's distribution is fragmented. Summaries of track plate and camera surveys (Kucera et al. 1995) show that marten continue to be distributed throughout the Sierra Nevada and Cascades but are absent from the historic range in northwest California. Home ranges vary from 1 to 4.5 square miles for males and from 0.4 to 3.6 square miles for females (Simon 1980, Zielinski et al. 1997).

Martens prey on vertebrates smaller and larger than themselves, eat carrion, and forage for bird eggs, insects, and fruits (Martin 1994). Their diets in summer include a wide range of food types, while berries are important in the fall. As snow cover increases, martens utilize mostly mammalian prey, the most important of which are ground squirrels, mice, and rabbits. Martens forage by walking along the ground or snow surface, with forays up trees, investigating possible feeding sites by sight and smell. They can easily become habituated to human foods and will inhabit areas with relatively high levels of human use in order to take advantage of discarded food items.

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. 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). While martens may utilize meadows and small harvest units, marten populations markedly decline in areas with clear cut logging (Thompson and Harestad 1994).

Threats

Activities such as timber harvest and road construction that fragment, dissect, and isolate habitats are the largest threats to marten. Fragmented habitats attract habitat generalist predators like the great-horned owl, coyote, and bobcat which can all prey on marten. In addition, fragmentation eliminates the connectivity and creates isolated individuals and populations which are more susceptible to extirpation.

Analysis Area

The analysis area for the pileated woodpecker includes the area within the project boundary of the Proposed Action. While there are pockets of late seral forest, The Middle Fork Hood River Watershed contains the lowest amount of late seral habitat on the Forest and the Watershed analysis indicates that there is not enough habitat present to support populations of late seral, large home range species including marten. Marten have been sighted in the Cloud Cap/Tilly Jane area, on the border with the East Fork Watershed outside of the Analysis Area. There are two B5 pine marten habitat areas with no treatment units and one B5 pileated woodpecker/pine martin habitat area within the Analysis Area with 2 treatment units.

Effects Analysis

No Action – Direct and Indirect Effects

There would be no short-term effects to American marten under this alternative. In the short-term, the units would not provide habitat and snag levels would remain essentially unchanged. In 20 to 30 years, the 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 to100 years for these stands to develop into suitable habitat. Refer to the Silviculture Specialist Report for further discussion of tree response under the No Action Alternative.

Proposed Action – Direct and Indirect Effects

None of the proposed harvest units provide nesting habitat for this species. Most of the stands proposed for treatment are young managed plantations and range in age from about 30 to 75 years. Units 33 and 43 are within B5 Habitat Areas and each of these units averages 45 years of age and 14 inches in diameter. Unit 54 is approximately 100 years old with an average diameter of 13 inches. None of these units contain sufficient numbers of large trees or snags to provide denning habitat for marten. The number of snags and down logs that are currently in these units would not be impacted.

The main threats to marten is habitat fragmentation. The Proposed Action would not further fragment habitat and would decrease the open road densities which would benefit marten. Open road densities after closures under the Proposed Action would be reduced to 1.8 miles per square mile which is below the Forest Plan Standard of 2.0 miles per square mile for B5.

Consistency Determination for Management Indicator Species

General

This analysis is consistent with The National Forest Management Act which requires the Forest Service to manage wildlife habitat to "maintain viable populations of existing native and desired non-native vertebrate species in the planning area." The National Forest Management Act requires the Forest Service to identify Management Indicator Species through the planning process, and to establish objectives to maintain and improve the habitat of indicator species. A Forest wide analysis was completed and is incorporated by reference. Viable populations of all the Management Indicator Species in this BE would be maintained at the Forest-scale.

Deer and Elk

Open road densities after closures under the Proposed Action would be reduced to 1.8 miles per square mile is below the Forest Plan Standard of 2.5 miles per square mile for inventoried summer range and less than the 2.0 miles per square mile for inventoried winter range (FW-208). The Forest Plan Standard for open road densities within B10 winter range would remain unchanged and would not meet the Forest Plan Standard of 1.5 miles per square mile.

Pileated Woodpecker and American Marten

The Forest wide Standards and Guidelines would be met for pileated woodpeckers and pine marten B5- Pileated Woodpecker/Pine Marten land allocation. At least 300 acres of mature and/or old growth forest habitat shall be maintained within each 600 acre Management Area for pileated woodpecker habitat areas (B5-008) and at least 160 acres of mature and/or old growth forest habitat shall be maintained within each 320 acre Management Area for pine marten (B5-010). Snags are discussed below under "Snag and Down Log Associated Species."

Open road densities after closures under the Proposed Action would be reduced to 1.8 miles per square mile which meets the Forest Plan Standard of 2.0 miles per square mile for B5. allocation. Snags are discussed below under "Snag and Down Log Associated Species."

3.8.5 Snag and Down Log Associated Species

Methodology

The Middle Fork Hood River watershed as a whole will be analyzed for historic and current snag levels as stand level analysis does not provide a meaningful measure to snag and down wood dependent species. Management for snags and down wood would be compared to unharvested stands, which represent historic conditions.

DecAID Advisor

DecAID is a planning tool intended to help advise and guide managers as they conserve and manage snags, partially dead trees and down wood for biodiversity (Mellen et al. 2003). It also can help managers decide on snag and down wood sizes and levels needed to help meet wildlife management objectives. This tool is not a wildlife population simulator nor is it an analysis of wildlife population viability.

A critical consideration in the use and interpretation of the DecAID tool is that of scales of space and time. DecAID is best applied at scales of subwatersheds, watersheds, subbasins, physiographic provinces, or large administrative units such as Ranger Districts or National Forests. DecAID is not intended to predict occurrence of wildlife at the scale of individual forest stands or specific locations. It is intended to be a broader planning aid not a species or stand specific prediction tool.

Modeling biological potential of wildlife species has been used in the past. DecAID was developed to avoid some pitfalls associated with that approach. There is not a direct relationship between the statistical summaries presented in DecAID and past calculations or models of biological potential.

Refer to the DecAID web site listed in the References section for more detail and for definition of terms. This advisory tool focuses on several key themes prevalent in recent literature:

- Decayed wood elements consist of more than just snags and down wood, such as live trees with dead tops or stem decay;
- Decayed wood provides habitat and resources for a wider array of organisms and their ecological functions than previously thought; and,
- Wood decay is an ecological process important to far more organisms than just terrestrial

vertebrates.

Existing Condition

Most of the proposed harvest units consist of young second-growth stands that have undergone a regeneration harvest 40 to 60 years ago. As a result, few remnant or legacy snags or large down wood remain in the units. When they are found in these units, they are scattered and few in numbers. Most of the snags and down wood in these units are less than 12 inches in diameter.

Douglas-fir is the most common and most dominant trees species in this watershed, but a wide array of other trees species occur. The primary and secondary cavity nesting species for this habitat type are pileated woodpecker, northern flicker, hairy woodpecker, and red-breasted nuthatch.

Lower elevations or drier sites may have ponderosa pine as a co-dominant with Douglas-fir in the overstory and often have other shade-tolerant tree species growing in the understory. On moist sites, grand fir, western redcedar and/or western hemlock are dominant or co-dominant with Douglas-fir. On mesic sites western larch and/or western white pine occur. On colder sites Engelmann spruce, lodgepole pine and subalpine fir occur.

Many wildlife species evolved to use large snags and logs that were historically abundant on the landscape. The loss of large snags and logs from managed stands affects biodiversity. Approximately 78 percent of the watershed has been harvested in the past. The percent ground cover of wood ≥ 3 inches diameter is less than 5 percent; much less in many cases. The number of snags ≥ 10 inches diameter are less than 2.5 per acre, and in many cases less than 2 per acre.

Analysis Area

The analysis area includes the Middle Fork Hood River Watershed. All of the units are located within the habitat type identified in DecAID as the Eastside Mixed Conifer Forest Cascades/Blue Mountains and vegetation condition of "small/medium trees." For this habitat type, the DecAID advisor identifies the 30 percent tolerance level for snags as 6.7 snags per acre greater than 10 inches with 2.7 per acre greater than 20 inches in diameter. It identifies the 30 percent tolerance level for down wood as up to 6.5 percent cover of down wood (including all decay classes) with sizes of logs averaging 5 to 8 inches in diameter. All of the proposed treatment units contain snag and down wood numbers below the 30 percent tolerance level.

Effects Analysis

No Action – Direct and Indirect Effects

In the short-term, plantations would have few snags and down wood. It is presumed that there would continue to be low numbers of snags per acre ≥10 inches diameter in the units. Most snags present would be smaller than this. Based on tolerance levels for snags and down wood within the applicable habitat type and structural condition identified in the DecAID advisor, most of the proposed harvest units would remain below the 30 percent biological potential level (6.7 snags/acres).

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. However, some of the 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 (USDA 2009). Table 3-45 shows the number of snags per acre recruited over time for the No Action and Proposed Action alternatives.

Table 3-45: Snags in the No Action and Proposed Action Alternatives

Years After Treatment	Trees per Acre		QMD (in.)		Snags per acre ≥12" DBH		Snags per Acre ≥24" DBH	
	NA	PA	NA	PA	NA	PA	NA	PA
0	1860	1860	6.1	6.1	0.0	0.1	0.0	0.0
10	1752	427	6.5	8.1	0.2	0.3	0.0	0.1
20	1506	418	7	8.7	1.7	1.0	0.0	0.1
30	1344	410	7.5	9.4	4.2	1.3	0.0	0.1
40	1223	462	8	9.4	6.2	2.6	0.0	0.1
50	1101	447	8.6	10	7.2	3.9	0.0	0.1
60	1103	477	8.5	10.2	8.4	4.8	0.0	0.1
70	965	458	9.2	10.8	9.2	6.5	0.1	0.2
80	970	443	9.1	11.3	10.2	9.9	0.1	0.3
90	857	419	9.8	12	10.9	11.9	0.1	0.5
100	770	395	10.4	12.6	11.2	13.3	0.1	1.1

Proposed Action – Direct and Indirect Effects

It is likely that some snags would need to be cut during harvest operations, temporary road construction, road decommissioning, road closure, and storm proofing due to safety considerations and that some downed logs would be degraded during project implementation. All snags and down wood that need to be cut or moved but would remain nearby.

Snags that are left standing after thinning would be more prone to wind damage and snow breakage than they would have been without thinning. There would likely be some loss of the remaining snags within 10 years after harvest which would become down wood.

Some live trees would be selected as leave trees that are defective or have the elements of decay as described in DecAID advisor. Hollow structures are created in living trees by heart rot decay organisms over many years. These hollow structures in living trees provide especially valuable habitat for a variety of wildlife, including cavity users. Trees that have heart rot decay present may include features such as, openings in the bole, broken boles with bayonet tops, large dead tops or branches, old wounds on the bole, crooks in the bole signifying previous breakage, and the presence of fruiting bodies. Defective trees with deformities such as forked tops, broken tops, damaged and loose bark or brooms caused by mistletoe or rust can also provide important habitat for a number of species.

Logs existing on the forest floor would be retained. 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 where possible. The harvesting operations would also add small woody debris of the size class of the cut trees at the site. This would include the retention of cull logs, tree tops, broken logs and any snags that would be felled for safety reasons. Snags or green trees that fall down after the harvest operation would contribute to the down wood component of the future stand.

Under the Proposed Action, skips and streamside protection buffers would provide short and mid-term recruitment of snags and down wood similar to the level described for no action. Large snags and down wood would continue to be provided in the late-successional habitat within the watershed.

Structural diversity is a combination of several stand characteristic which would include, but would not be limited to, number of canopy layers, down wood and snags. The stands under the Proposed Action are currently highly stocked even-aged stands. The stands have very little growth and lack snags and downed wood. In addition, the stands have low tree diversity, are single-canopied, even-aged stands, or have trees that are insufficient in size to provide quality snags or downed wood. Thinning can have both immediate effects on forest diversity and long-term effects restoring native plant communities as understory species are released and provide a seed source for future snag and down wood recruitment.

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 snags and downed wood. Thinning may have short-term impacts on downed wood quality, but tree response to thinning is expected to result in increased growth which would speed the ability of the stands to provide the size of snags and down wood needed to meet the Forest Plan standards (Table 3-45).

Cumulative Effects

Past harvest activities on approximately 78 percent of the analysis area has reduced the abundance of snags, although there are small and large snags in the mature forests within the project boundary. A much larger percentage of the watershed (68.4 percent) currently contains no snags compared to the historic condition of 20.1 percent (Figure 3-18). The remainder of the watershed in this habitat type is well below historic levels for the number of snags per acre with the exception of the 30 + category. Implementation of this project could result in the loss of some snags cut for safety concerns, but there are few snags (0.2/acre) greater than 20 inches diameter in the plantations. Because of the very small number of snags expected to be cut, there would not be a reduction in the percentage of biological potential being provided for species dependent on snags and down wood.

The boundary used for this DecAID analysis includes the Middle Fork Hood River Watershed. Other projects in the watershed include past timber harvest on federal and private lands which have the potential to reduce snags and down wood on the landscape.

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 will 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.

The Dollar Lake and Gnarl Ridge fires increased the number of snags in the Watershed. The Dollar Lake burned a total of 6,304 acres, 5,189 of these acres burned in the Middle Fork of the Hood River Watershed. The Gnarl Ridge fire burned a total of 3,280 acres, 754 of these acres burned in the Middle Fork of the Hood River Watershed. These acres increased the level of high density snags in the watershed by 13 percent. With the addition of these snags, the current percentage of snags in the 30 + snags/acre category for this wildlife habitat type would be 15 which is above the reference condition of 9.2 percent of the watershed in high density patches of snags.

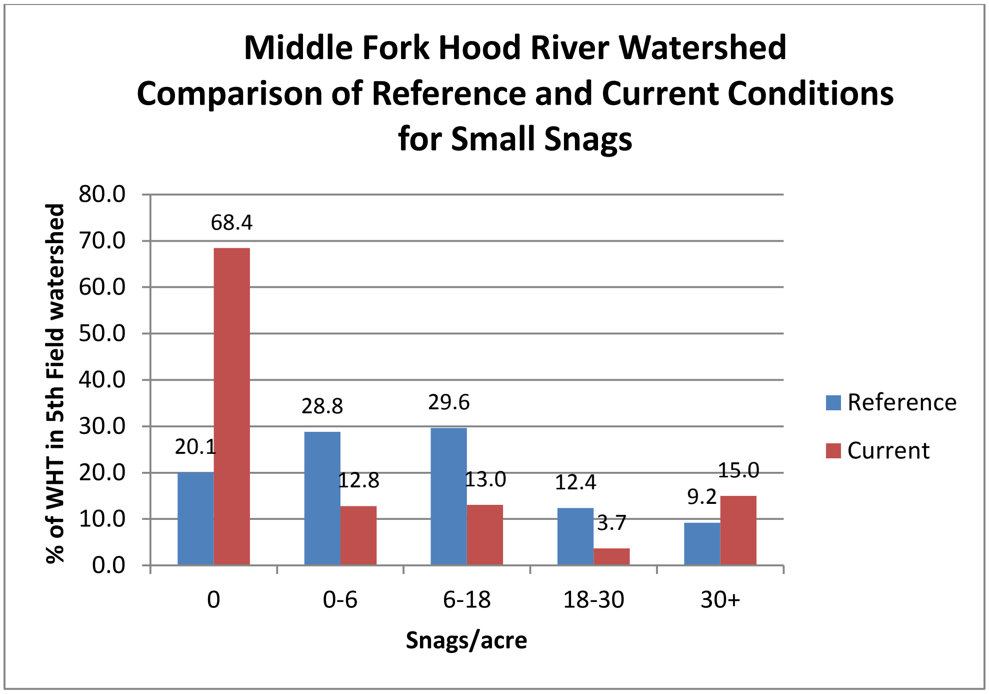


Figure 3-18: Comparison of Current and Reference Condition for Snag Densities

Consistency Determination

Thinning may have short-term impacts on downed wood quality, but tree response to thinning is expected to result in increased growth which would speed the ability of the stands to provide the size of snags and down wood needed to meet the Forest Plan standards FW-215, FW-216, FW-219 through FW-223.

FW-219 and FW-223 indicate that stands should have 6 logs per acre in decomposition class 1, 2, and 3 and that they should be at least 20 inches in diameter and greater than 20 feet in length. However, FW-225 and FW-226 indicate that smaller size logs may be retained if the stand is too young to have 20 inch trees. Under the Proposed Action, logs representing the largest tree diameter class present in the stand would be retained.

Currently most of the trees are not large enough to produce snags of the desired size, (22 inches diameter, FW-234), but FW-235 allows the retention of smaller trees if the treated stand is too young to have trees of sufficient size. In this case, snags and green leave trees retained would be representative of the largest size class present in the stand.

3.8.6 Neotropical Migratory Birds

Methodology

The Forest Service has implemented management guidelines that direct migratory birds to be addressed in the NEPA process when actions have the potential to impact migratory bird species of concern.

Conservation strategies for land birds of the east slope of the Cascade Mountains in Oregon and Washington and a conservation strategy for land birds in coniferous forests in western Oregon and Washington were prepared in June 2000 and March 1999 respectively by Bob Altman of American Bird Conservancy for the Oregon-Washington Partners in Flight. The strategies are designed to achieve functioning ecosystems for land birds by addressing the habitat requirements of "focal species." By managing for a group of species representative of important components of a functioning ecosystem, it is assumed that many other species and elements of biodiversity would be maintained. The Middle Fork Hood River Watershed contains elements of both these physiographic regions.

Existing Condition

Table 3-46 displays the focal species potentially positively or negatively affected by changes in habitat in the eastern slope of the Cascade Mountains region, and the forest conditions and habitat attributes they represent.

Table 3-46: Focal Migratory Bird Species

Forest Conditions	Habitat Attribute	Focal Species
Ponderosa Pine	Old forest, large patches	White-headed woodpecker
Ponderosa Pine	Large trees	Pygmy nuthatch
Ponderosa Pine	Open understory, regeneration	Chipping sparrow
Ponderosa Pine	Burned old-forest	Lewis' woodpecker
Mixed Conifer	Large trees	Brown Creeper*
Mixed Conifer	Open understory, regeneration	Williamson's sapsucker
Mixed Conifer	Grassy openings, dense thickets	Flammulated owl
Mixed Conifer	Multi-layered, structural diverse	Hermit thrush
Mixed Conifer	Fire edges and openings	Olive-sided flycatcher*
Oak-Pine Woodland	Early-seral, dense understory	Nashville warbler
Oak-Pine Woodland	Large oaks with cavities	Ash-throated flycatcher
Oak-Pine Woodland	Large pine trees/snags	Lewis' woodpecker
Lodgepole Pine	Mature/old-growth	Black-backed woodpecker
Whitebark Pine	Mature/old-growth	Clark's nutcracker
Montane Meadows	Wet and dry	Sandhill crane

Forest Conditions	Habitat Attribute	Focal Species
Aspen	Large trees/snags, regeneration	Red-naped sapsucker
Subalpine fir	Patchy presence	Blue grouse*

* Significantly declining population trends in the Cascade Mountains Physiographic Region.

Close to 30 species of migratory birds occur within the District, 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. White-headed woodpeckers and pygmy nuthatches require open stands of large ponderosa pine and would not be found in the proposed treatment units.

In developing the list of species to be considered in the planning process, the current (updated every 5 years) FWS Birds of Conservation Concern was consulted as was the State lists, and comprehensive planning efforts for migratory birds. This analysis was completed in part to evaluate the effects of the agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors.

Analysis Area

The analysis area for migratory birds includes the area within the project boundary of the Proposed Action.

Effects Analysis

No Action – Direct and Indirect Effects

There would be no habitat alteration under this alternative. As such, there are no direct or indirect effects on migratory birds.

Proposed Action – Direct and Indirect Effects

There would be no effects to migratory birds from road decommissioning, road closures, and storm proofing. Research has demonstrated that thinning enhances habitat for a number of migratory species and provides habitat for some species that are rare or absent in un-thinned stands (Hagar and Friesen 2009). However, some species of migratory have been shown to decline following thinning. 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 following migratory species present in the watershed may benefit from thinning: Hammond’s flycatcher, warbling vireo and western tanager. The following migratory species may be negatively impacted by thinning: hermit warbler, Pacific slope flycatcher, black-throated gray warbler, and Swainson’s thrush. This project covers only a very small portion of the migratory songbirds breeding habitat on the Forest. Since relatively young plantations on the

District are very common, there would be a redistribution of the individuals affected, but the reduction of habitat would not result in measurable population changes to the species. These effects would be short-term since more structurally diverse conditions are expected to return as these stands develop over the next 20 to 30 years.

Cumulative Effects

Because there would be no meaningful or measurable direct or indirect effects to migratory birds there would be no cumulative effects.

Consistency Determination

The Proposed Action is consistent with Executive Order 13186 (66 Fed. Reg. 3853, January 17, 2001) "Responsibilities of Federal Agencies to Protect Migratory Birds." This Executive Order directs federal agencies to avoid or minimize the negative impact of their actions on migratory birds, and to take active steps to protect birds and their habitat. This Executive Order also requires federal agencies to develop Memorandum of Understandings (MOU) with the FWS to conserve birds including taking steps to restore and enhance habitat, prevent or abate pollution affecting birds, and incorporating migratory bird conservation into agency planning processes whenever possible. The BLM and FS have both completed, and are currently implementing, their respective MOU's with the FWS.

3.8.7 Summary of Effects by Alternative

Table 3-47 summarizes the effects to species by alternatives.

For northern spotted owls, there would be no short-term effects under the No Action alternative. Some of the stands may eventually develop nesting habitat characteristics and become suitable spotted owl habitat; however, it could take as much as 60 to 100 years. The Proposed Action **may affect, but is not likely to adversely affect**, northern spotted owls because dispersal habitat would be maintained and because timing restrictions would reduce impacts from sound.

For northern spotted owl critical habitat, there would be no short-term effects under the No Action alternative. Some of the stands may eventually develop nesting habitat characteristics and become suitable spotted owl habitat; however, it could take as much as 60 to 100 years. Because the impacts to PCEs would be short-term; treatments are expected to improve habitat components within the PCEs in the long-term; and because CH in the project area would continue to support the life history needs of dispersing spotted owls, the Proposed Action **may affect, but is not likely to adversely affect**, spotted owl CH.

There would be no short-term effects to harlequin ducks under the No Action alternative. In 20 to 30 years, the stands would start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood. No trees would be placed in the streams to improve habitat. Under the Proposed Action temporary impacts to prey species from large wood placement and disturbance to nesting sites from project activities may **impact individuals, but is**

not likely to impact populations, nor contribute to a potential loss of viability of this species. These impacts would be temporary and habitat would be improved in the long-term.

For the Western bumblebee, bumble bee nesting, foraging, and over-wintering habitat would not be impacted and, therefore, there would be no impact to bumble bees under the No Action alternative. Under the Proposed Action, there would be a temporary reduction in flowering shrubs and nesting sites that **may impact individuals, but is not likely to impact populations, nor contribute to a potential loss of viability of this species**.

There would be no short-term effects to The Dalles sideband and Larch Mountain salamander under the No Action alternative. The units that are not providing suitable habitat would continue to function as so and snag and down wood levels would remain essentially unchanged. Under the Proposed Action timber harvest activities would pose a limited risk to these snails. Hazard tree removal would have minimal disturbance to substrates. Thinning of the proposed treatment units would avoid severe compaction of substrates (see Soils section) and likely could be conducted in soils with rocky substrates without adverse effects to this species. Very localized activity may impact a few individuals but would not affect populations.

Under the No Action Alternative 1,447 acres of young managed plantations would continue to serve as thermal cover for deer and elk. No cover would be lost and no forage would be gained in this alternative. For deer and elk, the timber removal, road maintenance and decommissioning activities in the Proposed Action could potentially disturb deer and elk in the area at the time of implementation; however, the seasonal restriction identified in the project design criteria is expected to reduce disturbance effects created by the project in the winter. The road decommissioning and closures would improve the deer and elk habitat being provided in the areas of the proposed road closures. They would reduce the disturbance to deer and elk in summer and winter as well as reducing the likelihood of poaching due to reduced accessibility of the areas. Thinning may have short-term impacts on downed wood quality, but tree response to thinning is expected to result in increased growth which would speed the ability of the stands to provide the size of snags and down wood needed to meet the Forest Plan standards.

There would be no short-term effects to pileated woodpecker under the No Action alternative. In the short-term, the units would not provide nesting habitat and snag levels would remain essentially unchanged. The proposed treatments include a thinning prescription 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. This would increase the rate that suitable nesting and foraging (large snags) habitat would be available for pileated woodpeckers.

There would be no short-term effects to American marten under the No Action alternative. In the short-term, the units would not provide habitat and snag levels would remain essentially unchanged. The main threat to marten is habitat fragmentation. The Proposed Action would not further fragment habitat and would decrease the open road densities which would benefit marten.

Open road densities after closures under the Proposed Action would be reduced to 1.8 miles per square mile which is below the Forest Plan Standard of 2.0 miles per square mile for B5.

The stands have very little growth and lack snags and downed wood. In addition, the stands have low tree diversity, are single-canopied, even-aged stands, or have trees that are insufficient in size to provide quality snags or downed wood. Thinning can have both immediate effects on forest diversity and long-term effects restoring native plant communities as understory species are released and provide a seed source for future snag and down wood recruitment. Thinning may have short-term impacts on downed wood quality, but tree response to thinning is expected to result in increased growth which would speed the ability of the stands to provide the size of snags and down wood needed to meet the Forest Plan standards.

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. These effects would be short-term since more structurally diverse conditions are expected to return as these stands develop over the next 20 to 30 years.

Table 3-47: Summary of Effects to Wildlife Species by Alternative

Species	Impact of Proposed Action	Impact of No Action
Federally Threatened, Endangered or Proposed		
Northern spotted owl (*Strix occidentalis caurina*)	NLAA	NE
Northern spotted owl critical habitat	NLAA	NE
R6 Sensitive Species		
Harlequin duck (*Histrionicus histrionicus*)	MII-NLFL	NI
Western bumblebee (*Bombus occidentalis*)	MII-NLFL	NI
Survey and Manage		
Larch Mountain salamander *(Plethodon larselii)*	NI	NI
Dalles sideband *(Monadenia fidelis minor)*	NI	NI
Management Indicator Species		
Mule Deer (*Odocoileus hemionus*) and Elk (*Cervus elaphus nelsoni*	MII-NLFL	NI
Pileated Woodpecker *(Dryocopus pileatus)*	MII-NLFL	NI
American Marten *(Martes americana)*	MII-NLFL	NI
Snag and Down Log Associated Species	MII-NLFL	NI
Neotropical Migratory Birds	MII-NLFL	NI

3.9 Botany

More information is available in the project record including the full botanical analysis file, and biological evaluation as part of the Botany Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.9.1 Methodology

Analysis Assumptions
The effects analysis in this report is based on the assumption that the final area of actual project disturbance would be the same as the proposed areas of disturbance described in Chapter 2 of the PA (i.e., final acreages and specific project perimeters proposed for disturbance accurately reflect the description).

Survey guidelines for R6 Sensitive species and survey protocols for Survey and Manage botanical species are not intended to cover 100 percent of a project area; individuals might be missed between survey transects. Generally if a species is not found during surveys through all suitable habitats in a project area it is reasonable to assume the target species are not present for various reasons. Species that have suitable habitat in the Lava Restoration project area, but were not detected during surveys, are discussed under Existing Conditions – Survey Results.

Forest Service Direction

R6 Sensitive Species - The Five Step Biological Evaluation Process
Forest Service policy requires a 5-step biological evaluation process

1) Pre-field review of all existing information;
2) Field reconnaissance if sensitive species or habitats are determined to be present and may be affected by proposed project activities;
3) Evaluation of project effects on sensitive species and habitats;
4) Analysis of the significance of the project's effects on species locally and throughout their range; and
5) A biological investigation if needed (due to lack of information). Management of known sites can be addressed during the project planning phase to avoid sites by project design if needed to maintain viability of a species in the project area and throughout the species' range. A determination of No Impact for sensitive species can be made at any step in the process, at which time the biological evaluation is complete.

Survey and Manage Species – 2001 ROD Standards and Guidelines
Methodology for Survey and Manage botanical species is essentially the same as the five step biological evaluation process. In addition, a species and its habitat *must* be protected if the species is listed under a Survey and Manage category that requires management of known sites; Survey and Manage Categories are:

- Category A = Pre- disturbance surveys are practical and must be conducted if suitable habitat is present, and manage all known sites;
- Category B = Equivalent Effort surveys required in old growth habitat unless Strategic Surveys have been completed, and manage all known sites;
- Category C = Pre- disturbance surveys are practical and must be conducted if suitable habitat is present, and manage high-priority sites;
- Category D = Pre-disturbance surveys not practical or not necessary, manage all known sites until high-priority sites can be determined;

- Category E = Pre-disturbance surveys are not required, status undetermined, manage all known sites until a determination is made whether the species meets the basic criteria for Survey and Manage (ROD SG pages 7-14).

Survey Protocol
Survey protocols and guidelines vary for Survey and Manage and R6 Sensitive botanical species but in general for ground disturbing projects greater than one acre intuitive survey transects may be used to cover all high probability habitats identified during prefield review of existing information. Field surveys and survey results are discussed under Existing Conditions.

Analysis Area
The analysis area is the project area. The analysis of cumulative effects and the final determination of effects also take into consideration the amount of existing mid- to late-successional forest habitat present in similar elevations throughout the analysis area and surrounding reserve areas including the Mt. Hood Wilderness, and riparian reserve areas within the East Fork, Middle Fork, and West Fork of the Hood River Watersheds.

The analysis area is defined as the project area because potential for habitat disturbance would be directly and indirectly related to activities proposed under the Proposed Action. Only the proposed projects or portions of projects proposed in this PA that have the potential for direct or indirect effects are included below under cumulative effects.

The spatial context for the following effects analysis is the affected environment described under Existing Conditions. The discussion of cumulative effects (and the final determination of effects) also considers the presence of suitable habitat in reserves outside the project area because the areas encompass pristine subalpine late-successional forest habitat needed for persistence of associated botanical species within range of the Mt. Hood National Forest. The discussion of cumulative effects (and the final determination of effects) also considers the intended future condition of units that would be treated to encourage development of late-successional and old-growth forest components.

The temporal context for the following effects analysis depends on existing and future project related activity – if there is an overlap in time from an effects perspective then it is included in the discussion under cumulative effects.

3.9.2 Existing Condition

Environmental Description
The project area is located within the West, East and Middle fork of the Hood river watersheds on the north side of Mt. Hood. Elevations in the project area range from 1800 to 5000 feet. Plant associations throughout the project area are typical of forests on the north side of Mt. Hood. Plant associations include Pacific silver fir/dwarf Oregon grape, Pacific silver fir/big leaf huckleberry/bear grass, Pacific silver fir/rhododendron /bear grass, Pacific silver fir/cool-wort foamflower , Mountain hemlock/big leaf huckleberry/bear grass, Western

hemlock/rhododendron/bear grass and Western hemlock/devil's club/starry false Solomon's seal. Overstory is predominantly Douglas-fir (*Pseudotsuga menziesii*), Western hemlock (*Tsuga heterophylla*), and Pacific silver fir (*Abies amabilis*), with Western red cedar (*Thuja plicata*) and noble fir (*Abies procera*) as minor components depending on slope, aspect, and elevation.

Forested stands in the proposed units range from approximately 25 to 130 years old and most have been previously logged. Current canopy densities range between 30 percent and 80 percent closure. Of all the units proposed for treatment, the following three units have suitable mid- late-successional forest habitat for Survey and Manage botanical species: Unit 51 (proposed for firewood removal) is 58 acres with a stand age of approximately 100 years and a current canopy closure of 50%. Unit 52 is 68 acres and unit 53 is 35 acres (both proposed for huckleberry enhancement) have an approximate stand age of 130 years with a current canopy closure of 70%. Unit 54 (proposed for plantation thinning) is 81 acres with an approximate stand age of 75 years with borderline suitable habitat and a current canopy closure at 80%. Younger stands proposed for treatment in the proposed project area generally lack snags and large diameter decomposing wood, and species diversity in the understory is low.

In addition to the older units mentioned above, there is suitable habitat for R6 Sensitive species in units that encompass or are near riparian corridors (Bear Creek, Boomer Creek, Tony Creek Squeegee Creek, and various unnamed creeks), areas of exposed talus, boulder patches and/or rock outcrops, and microhabitats that are of interest from a botanical standpoint.

Past Field Surveys Analysis

Survey Results – No Known Sites

Botanical surveys were completed during June, July, September, October 2012 and 2013. R6 Sensitive and Survey and Manage bryophyte, lichen, and vascular plant species were not detected and there are no known sites of R6 Sensitive species or Survey and Manage species in the proposed project area. Surveys have been completed according to survey guidelines for R6 Sensitive species and survey protocols for Category A and C species within range of the Mt. Hood National Forest . Fungal Species that are listed as both R6 Sensitive and Survey and Manage Category B are discussed below under "Fungal Species".

R6 Sensitive Species

The pre-field review process concluded there is suitable habitat in the proposed project area for the following R6 Sensitive species, therefore surveys focused on these species and associated habitats:

- Vascular plants - *Botrychium minganense, Botrychium montanum, Calamagrostis breweri, Carex vernacula; Diphasiastrum complanatum(Lycopodium complanatum);*
- Bryophyte species - *Brachydontium olympicum*(moss), *Bryum calobryoides* (moss), *Chiloscyphus gemmiparus* (liverwort), *Conostomium tetragonum* (moss), *Gymnomitrion concinnatum* (liverwort), *Herbertus aduncas* (liverwort), *Rhytidium rugosum* (moss), *Schistostega pennata* (moss), *Tayloria serrata (moss),Tetraphis geniculata* (moss), *Tetraplodon mnioides* (moss), *Trematodon boasii* (=*T. asanoi*) (moss);

- Lichen species - *Chaenotheca subroscida, Hypogymnia duplicata, Lobaria linita, Nephroma occultum, Pannaria rubiginosa (=Fuscopannaria rubiginosa), Peltigera pacifica;* and
- Fungal species, *Bridgeoporus nobilissimus.*). R6 Sensitive fungal species are discussed below.

The 2011 list of R6 Sensitive species was used to conduct surveys during spring, early summer and autumn 2012 and 2013. There is one R6 Sensitive species, *Calamagrostis breweri*, known to occur in the vicinity of the project area near the Mt. Hood Wilderness boundary, however, the location falls outside of proposed project activity areas.

<u>Survey & Manage Category A and C Species (Surveys Practical)</u>
The 2001 ROD requires pre-disturbance surveys for Rare and Uncommon Survey and Manage species in Categories A and C if habitat-disturbing activities are likely to have a negative impact on the species and its habitat. The following Category A bryophyte species, lichen species, and one fungi species have suitable habitats in the project area but were not detected during surveys (there are no Category C species that have suitable habitat in the project area):

- Bryophytes - *Schistostega pennata* (moss), *Tetraphis geniculata* (moss);
- Lichens **–** *Hypogymnia duplicata, Leptogium burnetiae* var. *hirsutum, Leptogium cyanescens, Lobaria linita; and*
- Fungi - *Bridgeoporus nobillisimus.*

Habitat typically associated with the following Category A and C species is not present in the proposed project area and there are no known sites that require management:

- Vascular plants - *Corydalis aquae-gelidae, Coptis trifolia, Cypripedium montanum; and*
- Lichens - *Pseudocyphellaria rainierensis.*

<u>Survey and Manage Category B Species</u>
Surveys for Rare Category B species are only required in habitat-disturbing projects that encompass "old growth" forests *unless*; 1) Strategic Surveys have been conducted in the province that encompasses the project area, or 2) Equivalent Effort surveys have been conducted in the old growth habitat to be disturbed. Strategic Surveys have been conducted for Category B lichens and bryophytes in the Eastern Oregon Physiographic Province that encompasses the project area but currently have not been completed for Category B fungal species, and there are no Category B Vascular plant species listed in the 2001 ROD. Forests in the proposed project area are under 180 years old and do not meet the definition of old-growth as defined in the 2001 ROD therefore equivalent effort surveys for Category B species are not required**;** *however,* some of the Survey and Manage Category B fungal species are also listed as R6 Sensitive therefor were included in the list of species that were surveyed for during the 2012 and 2013 field season. Survey and Manage Category B fungal species area discussed below.

<u>Survey & Manage Category D and E Species (Surveys Not Required)</u>

Late-successional forest habitat is present in the proposed project area for one Category D fungal species, *Phaeocollybia attenuata,* and two Category E lichen species, *Chaenotheca subroscida* and *Tholurna dissimilis,* also listed as R6 Sensitive species. Pre-disturbance surveys are not required for Survey and Manage Category D and E species (2001 ROD) but are required for R6 Sensitive species if proposed project activities might impact suitable habitat; therefore surveys were completed for lichen species *Chaenotheca subroscida* and *Tholurna dissimilis,* and fungal species *Phaeocollybia attenuata.* The species were not detected during surveys and there are no known sites that require management.

Fungal Species Listed as Survey & Manage and R6 Sensitive
Surveys have been completed according to a two year / multi-season protocol (Sporocarp Survey Protocol for Macrofungi, Version 1.0, December 2008). Multi-year/multi-season surveys are necessary because fungi do not fruit (produce mushrooms) consistently each year. Sporocarp (fruiting body) production is variable and unpredictable from year-to-year for all fungi (Vogt et al. 1992), therefore a one-time survey only conducted during spring, summer, or autumn cannot reliably determine the presence or absence of a species. In addition, surveys are less likely to find hypogeous fungi (e.g., below ground fruiting such as truffles and false truffles) because locating the fruiting bodies requires digging or raking to remove soil, duff, and forest debris. While multi-year surveys are more likely to detect epigeous fungi (above ground fruiting) the timing has to be planned based on seasonal weather patterns year-to-year which does not always correspond with project timelines.

Multi-year / multi-season surveys for fungal species were feasible given the timeline of the proposed project and development of the Proposed Action. Surveys were completed for the following Survey and Manage and R6 Sensitive fungi *Alpova alexsmithii, Choiromyces venosus, Chroogomphus loculatus, Cortinarius barlowensis, Cystangium idahoensis, Gastroboletus imbellus, Gomphus kaufmannii, Helvella crassitunicata, Hygrophorus caeruleus, Leucogaster citrinus, Macowanites mollis, Mycena monticola, Octaviania macrospora, Phaeocollybia attenuata, Phaeocollybia californica, Phaeocollybia oregonensis, Phaeocollybia piceae, Phaeocollybia pseudofestiva, Phaeocollybia scatesiae, Ramaria amyloidea, Ramaria aurantiisiccescens, Ramaria gelatiniaurantia, Ramaria spinulosa* var. *diminutive, Rhizopogon ellipsosporus, Rhizopogon exiguous, Rhizopogon inquinatus, Sowerbyella rhenana, Stagnicola perplexa.*

3.9.3 Effects Analysis

No Action – Direct and Indirect Effects
There are no known sites of R6 Sensitive botanical species in the proposed project area so there would be no direct or indirect effects as a result of No Action. There are no known sites of Survey and Manage botanical species in the proposed project area so there would be no direct or indirect effects as a result of No Action.

Proposed Action – Direct and Indirect Effects

There are no known sites of R6 Sensitive botanical species in the proposed project area so there would be no direct or indirect effects as a result of the Proposed Action. There are no known sites of Survey and Manage botanical species in the proposed project area so there would be no direct or indirect effects as a result of the Proposed Action.

Cumulative Effects
There would be no direct or indirect effects to any botanical threatened or endangered species, R6 sensitive species, or survey and manage species resulting from the implementation of the Proposed Action. As such there would be no effects to cumulate with any other projects or actions. Given this, there would be no cumulative effects expected.

3.9.4 Consistency Determination

Activities proposed under the Proposed Action are consistent with the following Forest Service policy, direction, standards and guidelines for the following reasons: 1) Surveys have been completed in all suitable habitats for R6 Sensitive bryophytes, lichens, and vascular plant species and have been conducted according to protocols for Survey and Manage Category A and C species; 2) There are no known sites that require management; 3) The proposed project as described under the Proposed Action would not lead to a loss of viability or trend toward Federal listing of undetected R6 Sensitive fungi species and Survey and Manage fungi species on the Mt. Hood National Forest or throughout their range; and 4) The proposed project is consistent with the 2011 R6 Sensitive Species list and the 2001 ROD list of Survey and Manage Species.

Forest Service Policy - Viability
2672.1 Sensitive Species Management: "Sensitive species of native plant and animal species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing. There must be no impacts to sensitive species without an analysis of the significance of adverse effects on the populations, its habitat, and on the viability of the species as a whole. It is essential to establish population viability objectives when making decisions that would significantly reduce sensitive species numbers."

FSM 2670.22(2): "Maintain viable populations of all native and desired non-native wildlife, fish and plant species in habitats distributed throughout their geographic range on National Forest System lands."

FSM 2670.3: Forest Service policy requires a 5-step biological evaluation process to "assure that management activities do not jeopardize the continued existence of sensitive species or result in an adverse modification of their essential habitat".

Mt. Hood National Forest Plan Direction
FW-148 and 149: Management activities shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species. The diversity of plants and animals shall be at least as that which would be expected in a natural

forest; the diversity of tree species shall be similar to that existing naturally in the allotment area (36 CFR 219.27) FW-150.

FW-162: Habitat management should provide for the maintenance of viable populations of existing native and desired non-native wildlife, fish (36 CFR 219.19) and plant species (USDA Regulation 9500-4) well distributed throughout their current geographic range within the National Forest System.

FW-175: Habitat for threatened, endangered, and sensitive plants and animals shall be protected and/or improved.

Northwest Forest Plan 2001 Record of Decision Standards and Guidelines

- SG 6-11, and SG 41-50: Conduct pre-disturbance surveys for species in Rare & Uncommon Categories A and C.
- SG 23-24: Conduct surveys according to protocol.

3.9.5 Summary of Effects by Alternative

Surveys have been completed as required, listed species were not found in the project area, and there are no known sites in the area that might be impacted by proposed project activities.

There are no known sites of R6 Sensitive Bryophytes, Lichens, and Vascular Plants in the proposed project area. The No Action and Proposed Action would have **No Impact** on R6 Sensitive Bryophytes, Lichens and Vascular Plants.

3.10 Invasive Plant Species

More information is available in the project record including the full noxious weed analysis file, as part of the Noxious Weed Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.10.1 Methodology

Analysis Assumptions

It is assumed that the final project footprints and unit acres would be the same as the proposed areas of disturbance outlined in Chapter 2 of this PA. Also, it is assumed that the U.S. Forest Service has only a slight influence on movement of humans, livestock, wildlife, or vehicles in or out of the project area. Once a small infestation is detected, the rate of spread can be controlled by mitigation and an active treatment program. Herbicides are the most cost effective method for controlling the spread of noxious weeds.

Methodology - Noxious Weed Risk Assessment Process

The proposed projects have a High Risk of introducing or spreading noxious weeds. Noxious weed control measures are identified under the Project Design Criteria/Mitigation Measures

(PDC) section of the Preliminary Assessment (PA) in Chapter 2. The methodology for risk ranking is detailed below.

Forest Service Manual (FSM) direction requires that Noxious Weed Risk Assessments be prepared for all projects involving ground-disturbing activities. For projects that have a moderate to high risk of introducing or spreading noxious weeds, Forest Service policy requires that decision documents must identify noxious weed control measures that would be undertaken during project implementation (FSM 2081.03, 11/29/95).

Criteria Used to Determine Effects

1) Presence of noxious weed species in or around the proposed project area; 2) Presence of vectors (listed above); 3) Potential for project to spread or introduce noxious weeds, 4) Potential for project to contribute to a cumulative increase of noxious weeds in the analysis area.

Analysis Area

The analysis area is defined as the project area as the potential for the spread and/or introduction of noxious weeds would be directly and indirectly related to activities proposed under the Proposed Action. Only the proposed projects or portions of projects proposed in this PA that have direct or indirect effects are included in the cumulative effects.

Spatial and Temporal Boundary

The spatial context for the following effects analysis is the affected environment described under Existing Conditions. The discussion of cumulative effects (and the final determination of effects) also considers past and future treatments to control noxious weeds in the analysis area.
The temporal context for the following effects analysis depends on existing and future project related activity – if there is an overlap in time from an effects perspective then it is included in the discussion under cumulative effects.

3.10.2 Existing Condition

Invasive plants are plant species that are not native to a particular ecosystem and are likely to cause environmental harm or harm to human health; they include, but are not limited to, species on the Oregon Department of Agriculture (ODA) Noxious Weed list (Attachment A, Table 2 in the Noxious Weed Specialist Report).

There also are invasive plant species not yet included on the ODA list of noxious weeds, however, they have been increasingly reported as nuisance invaders in Oregon (Attachment B, Table 3 in the Noxious Weed Specialist Report). These species should be watched for and reported to the ODA Weed Mapper website (oregon.gov/ODA/PLANT/WEEDS/weedmapper.shtml).

There are six noxious weed species of concern in the project area along the following roads and haul routes: 1600, 1610, 1611, 1612, 1612-640, 1620, 1630, 1630-660, 1631, 1640, 1650. The species are: Diffuse knapweed (*Centaurea diffusa),* spotted knapweed (*Centaurea stoebe, i.e C.*

maculosa), meadow knapweed *(Centaurea debeauxii, i.e C. pratensis),* yellow toadflax, *(Linaria vulgaris),* tansy ragwort (*Senecio jacobaea)*. The sites have been approved for treatment under the 2008 Site Specific Invasive Plant Treatment EIS (treatment # 66-028, 66-047, 66-048, 66-063, and 66-083) and were treated during 2012 by the Oregon Department of Agriculture (ODA) in partnership with the US Forest Service.

There are also known populations of orange hawkweed, yellow hawkweed (*Hieracium floribundum*), and Scotch broom (*Cytisus scoparius*) in the Lolo Pass area and along the BPA power line corridor and Longview Fiber lands that intersect the 1800 and 1600 road systems. The sites have been treated annually by the ODA since 2008 in cooperation with the US Forest Service, Bonneville Power Administration (BPA), and Longview Fiber.

Throughout the analysis area, St. Johnswort (*Hypericum perforatum)* can be found along most road corridors, and Canada thistle (*Circium arvense)* and Bull thistle (*Circium vulgare)* have been reported primarily around old log decking areas, landings, and clear-cut timber sale units on National Forest System land as well as adjacent county and private lands. Over the years biological control insects have been released in the West Fork Watershed by Hood River County Weed and Pest Control and ODA to help control these ubiquitous noxious weed species.

Populations of the noxious weed species listed above are located within, or adjacent to, the planning area and are listed on the Oregon Department of Agriculture's (ODA) A or B List. Canada thistle, bull thistle, Scotch broom, St. John's-wort, and tansy ragwort are widely established regionally and management objectives on the Mt. Hood National Forest are to control infestations on a case-by-case basis in coordination with ODA. Orange hawkweed, meadow hawkweed, spotted knapweed, and diffuse knapweed are not widely established and early detection followed by rapid response is coordinated annually by the Mt. Hood National Forest and ODA to check the spread of these species especially along road corridors and adjoining project activity areas, and trails into wilderness areas.

The main noxious weeds of concern in the planning area are briefly described below including their mode of establishment and the threat each species poses to native ecosystems and agricultural lands:

- *Bull thistle* is a biennial weed with a short, fleshy taproot. It is common in areas with previous soil disturbance, including roadsides, forest plantations, old log deck landings, and manipulated openings in forests and grasslands. Present control efforts are limited to hand-pulling associated with specific site objectives or project areas.

  Mode of Establishment: Spreads by wind, animals, and vehicles.
  Threats: This plant is a threat to agricultural lands and to native forest biodiversity.

- *Canada thistle* is a perennial weed distributed on the west side of the Cascade Range

Crest in areas where previous soil disturbance has occurred (e.g., roadsides, timber harvest areas, forest plantations, forest openings, and meadows). It can also colonize areas with little or no disturbance such as dry or wet meadows. Canada thistle is difficult to eradicate because of its deep rhizomes (root system) and new plants can sprout from rhizomes even if all the above ground plants have been removed.

> Mode of Establishment: Spreads asexually via rhizomes (underground stems) or by wind, animals, and vehicles.
> Threats: This plant is a threat to agricultural lands and to native forest biodiversity.

- *Meadow and orange hawkweed* have invaded over 1,000 acres in the Bonneville powerline corridor along Lolo Pass Road (west of Mt. Hood). Sparse populations of orange and yellow hawkweed can also be found along the 1800 road to the junction of the 1600 road. Populations are very difficult to eradicate. Control requires annual treatment with herbicide (clopyralid). The Oregon Department of Agriculture (ODA) has been treating meadow and orange hawkweed along the Lolo Pass road for over 15 years with some success in most areas.

> Mode of Establishment: These species reproduce and spread by seed dispersed by wind, animals, people, or vehicles or vegetatively by stolons, root fragments, and rhizomes.
> Threats: These two species can be considered ecosystem-altering invasive plants because of their ability to overrun (displace) native species in montane meadows and openings.

- *Scotch broom* establishes in open areas with little tree cover and along roadways at low and moderate elevations, mostly west of the Cascade Range crest. Management priorities on the Forest are two-fold: east of the crest, control populations to keep them from expanding, with the long-term goal of eradication; west of the crest, where the species is well-established, active management is considered on a site-by-site basis where there are overriding resource concerns. Bio-control insects are established west of the crest and are relied on to depress Scotch broom infestations where resource concerns are not critical.

> Mode of Establishment: Scotch broom establishes from seed that may be transported by vehicles carrying soil or plant parts.
> Threats: Where broom establishes, it can form a monoculture, outcompeting and displacing native trees, shrubs, forbs, and grasses; delaying forest development; and altering ecologic functioning. The hard-shelled seed can persist in the soil for up to 75 years.

- *Spotted, diffuse, and meadow knapweeds* have been documented in concentrated and sparsely dispersed populations throughout the planning area. The tap-rooted plants displace native vegetation and can form dense populations. Population distributions are spotty on the west side of the Cascade Range crest (e.g., scattered along Highway 26), but on the east side they can form dense populations that exclude native shrubs, forbs, and grasses. A number of areas and Forest Service roads on the nearby Hood River Ranger District are infested with spotted, diffuse, and meadow knapweed.

> Mode of Establishment: Spreads by seed. Dispersal distances for the seed are short; seeds generally fall within a 3-12 dm radius of the parent plant. Movement over greater distances requires transport by rodents, livestock, vehicles, or hay or commercial seed.
> Threats: Displaces native vegetation.

- *St. John's-wort* is distributed across the Forest along road shoulders, in rock storage areas, in quarries, and in other areas of soil disturbance. Similar to Scotch broom, active management to control or eradicate an infestation occurs when there are overriding resource concerns. Bio-control insects are well established and are the primary means of control on the Forest.

  > Mode of Establishment: St. John's-wort establishes from seed that may be transported by vehicles carrying soil or plant parts.
  > Threats: While infestations don't result in a great deal of economic harm in forestry settings, St. John's-wort displaces native vegetation and can alter ecological functioning of native plant communities and biodiversity.

- *Tansy ragwort* distribution on the Forest is similar to that of Scotch broom. West of the Cascade Range crest, control efforts on the Forest are mostly limited to bio-control insects. East of the crest, bio-control insects have not become easily established, due to the colder winters. Management priority in this area is to control and eradicate infestations by manual, mechanical, or chemical treatment methods.

  > Mode of Establishment: The light seed is dispersed by wind and can be transported in soil on vehicles.
  > Threats: Tansy ragwort is poisonous to livestock (particularly horses). At sites where it becomes dominant, it can displace native vegetation and alter ecologic functioning.

3.10.3 Effects Analysis

Invasive plants and noxious weeds disrupt natural ecosystems and reduce species diversity by displacing native plants. Noxious weeds are considered to be ecosystem-altering invasive plants because of their ability to out-compete native species for nutrients and moisture. Noxious weeds can be spread directly and indirectly by seed and/or fragmented roots and rhizomes that are dispersed by machinery, equipment, vehicles, people, animals, wind, and water.

No Action – Direct and Indirect Effects

Under the No Action alternative there would be no direct or indirect effect as a result of not implementing the proposed project. The risk of introducing or spreading noxious weeds by project machinery directly or indirectly from outside the area would not occur because the project would not be implemented. New weed populations might continue to be spread or be introduced by other vectors already present in the project area (such as normal vehicular traffic and recreationists). Annual treatment of high priority sites of tansy, hawkweed, yellow toadflax, and knapweed in the analysis area would continue, and other noxious weed sites would continue to be treated depending on available funds.

Proposed Action – Direct and Indirect Effects

There is a **High Risk** of introducing and/spreading noxious weeds directly and indirectly via machinery and equipment used during all ground disturbing activities proposed under the Proposed Action alternative as shown in Table 3-48. Noxious weeds could also be introduced inadvertently in nursery stock (tree seedlings, etc.), mulch material used for erosion control, and gravel/soil used for road construction and road maintenance; implementation of the Project Design Criteria/Mitigation Measures (PDC) specifically for prevention and control of noxious weeds (i.e., washing machinery before entering the Mt. Hood National Forest, and using only certified weed-free nursery stock, gravel, and mulch) would reduce the risk. Annual monitoring for early detection would allow for application of appropriate control measures to prevent future spread of noxious weeds in the analysis area.

Table 3-48: Risk Rating Factors and Vectors

Project: Lava Restoration	Factors	Vectors	Risk Ranking
Proposed Action	A, B, C	1, 2, 3, 6, 7, 8	High

The Factors and Vectors considered in determining the risk level for the introduction or spread of noxious weeds are as follows:

- Factors
    A. Known noxious weeds in close proximity to project area that may foreseeably invade project
    B. Project operation within noxious weed population
    C. Any of vectors 1-8 in project area

- Vectors
    1. Heavy equipment (implied ground disturbance including compaction or loss of soil)
    2. Importing soil/cinders/gravel/straw or hay mulch.
    3. ORVs (off-road vehicles) or ATVs (all-terrain vehicles)
    4. Grazing
    5. Pack animals (short-term disturbance)

6. Plant restoration
7. Recreationists (hikers, mountain bikers, etc.)
8. Forest Service or other project vehicles

High-, moderate-, or low-risk rankings are possible. For the high ranking, the project must contain a combination of either factor A + C or B + C above. The moderate ranking contains any of vectors #1-5 in the project area. The low ranking contains any of vectors #6-8 in the project area or known weeds within or adjacent to the project area, without vector presence.

Cumulative Effects

The cumulative effects project list in Chapter 3 has been reviewed for this analysis, including past, ongoing, and future activities described in the Lava Restoration PA. Disturbances related to project activities, unrelated vehicular traffic, and recreational uses, over the years have contributed to the cumulative spread of noxious weeds in the analysis area and surrounding watershed. The effects are most obvious where knapweed has become the dominant weed species along miles of road systems 1800, 1600, and 1300; yellow/meadow hawkweed has become the dominant roadside ground cover in many areas near Lolo Pass and intersecting BPA power line to the south and also to the north on Longview Fiber land; and scotch broom has been the dominant noxious weed in the BPA power line corridor that parallels Forest Service Road 1800.

Past, ongoing and future site-specific invasive plant (e.g., noxious weed) treatment is also considered in this cumulative effects analysis. The Mt. Hood National Forest (in partnership with the ODA, Hood River County Weed and Pest Control, BPA, and Longview Fiber) has applied approved herbicides since 2008, and biological controls since 1995, to control high priority noxious weed populations in the analysis area. Treatments throughout the analysis area are planned annually and are intended to slow the cumulative spread and establishment of weeds; implementation of PDC associated with the Proposed Action alternative would contribute to this effort and reduce the risk of introducing and spreading noxious weeds as a result of proposed project activities.

3.10.4 Consistency Determination

Development of weed prevention practices is supported by U.S. Forest Service noxious weed policy FSM 2080. Forest Service policy is to prevent the introduction and establishment of noxious weed infestations, determine the factors that favor establishment and spread of noxious weeds, analyze weed risks in resource management projects, and design management practices to reduce these risks (FSM 2080.44). The USDA Forest Service Guide to Noxious Weed Prevention Practices identifies development of practices for prevention and mitigation during ground-disturbing activities such as forest vegetation management and road management (V.1 2001, pages 12-13 and 17) which are included in the project design criteria for this project.

Region 6 completed a Final Environmental Impact Statement (FEIS) for Preventing and Managing Invasive Plants in April 2005. In 2008, the Mt. Hood National Forest and Columbia River Gorge National Scenic Area completed a FEIS for Site- Specific Invasive Plant Treatments that would authorize herbicide use and an early detection/rapid response program. Executive Order 13112 on Invasive Species (February 1999) requires federal agencies to use relevant programs and authorities to prevent the introduction of invasive species and not authorize or carry out actions that are likely to cause the introduction or spread of invasive species unless the agency has determined, and made public, documentation that shows the benefits of such actions outweigh the potential harm. All feasible and prudent measures to minimize risk of harm will need to be taken in conjunction with the actions. An additional authority for coordinated efforts to prevent and control the spread of Invasive Plants in Region 6 is the 1988 Final EIS for Managing Competing and Unwanted Vegetation.

As part of the NEPA process, the Forest Service must analyze and discuss the need for measures to prevent the establishment or spread of invasive plants based upon a survey of project areas proposed for ground disturbance. These may include locations of proposed temporary roads and new specified roads, reconstruction of existing roads, and likely transportation routes to establish the presence or absence of invasive plants and to identify equipment cleaning and other potential requirements. Weed risks must be analyzed in the planning stage to identify the likelihood of weeds spreading to the project area and determining the consequence of weed establishment in the project area. A finding of risk is the basis for identifying the appropriate weed-prevention practices, which are intended to be effective in a particular project situation.

The Forest Service Guide to Noxious Weed Prevention Practices supports implementation of Executive Order 13112. Federal agencies are expected to follow the direction of this order. In addition, Best Management Practices may be used in establishing equipment cleaning needs and requirements.

3.10.4 Summary of Effects by Alternative

Under the No Action alternative some vectors that potentially introduce and spread noxious weeds would remain present therefor the project area would still meet the criteria for a “High” risk rating if there was no action. Annual treatment of known sites in the project area would still occur as funding allows. Treatment of high priority noxious weed sites and infested road corridors in the project area would still occur annually (as funding allows) to reduce the spread and persistence of noxious weeds in the area. Under the Proposed Action alternative noxious weeds in the project area and vicinity of proposed project activities would be targeted for priority pre-treatment in 2014 and post-treatment thereafter. Implementation of PDCs and BMPs is intended to reduce the High Risk of introducing and spreading noxious weeds via proposed project activities.

3.11 Recreation and Visual Quality

More information is available in the project record including the full recreation analysis file, as part of the Recreation and Visual Quality Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.11.1 Methodology

The intent of this report is to analyze how the recreation and visuals related resources would be affected by the management actions proposed by the US Forest Service. The area used in this analysis is the Lava Restoration project area boundary determined by using Geographic Information System (GIS) data maintained by the Mt. Hood National Forest. Visual resources were assessed according to the applicable distance zones in relation to the project area using ground knowledge and GIS resources. Professional judgment was incorporated in determining the project's potential effects. Forest Service standards are applied in the trail design features to ensure that National Forest System Trails (NFST) would be appropriately reconstructed where necessary after the completion of the project. Design standards for Forest Service Trails are found in Forest Service Handbook 2309.18 and vary depending on designed use and trail class. Issues relevant to the recreational resource include:

1. FS System Trails and Roads and associated Trail Visual Quality Objectives
2. Land Use Allocation (LUA) and associated Visual Quality Objectives
3. Developed Recreation Facilities (including Campgrounds)
4. Dispersed Recreation Opportunities (including Special Use Permits)

3.11.2 Existing Condition

Recreation Opportunity Spectrum (ROS) - Roaded Modified

The Lava project area is in the Roaded Modified ROS setting which provides 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.

Recreation is often only one of many management objectives applied to these areas. Recreation management may be secondary to other resource needs and commodity production, or vegetation restoration may be the dominant emphasis. A wide range of management activities and uses, such as providing commercial wood products, may often take priority, and may result in substantially altered settings over much of the area. Prescribed fire could be used to attain a variety of resource objectives.

There may also be a wide range of facilities and structures to support other Forest uses, such as telecommunication facilities, power lines, and administrative sites. There generally should be few recreation developments in these areas. Basic facilities may be provided in some areas for resource protection. Camping occurs at user defined or dispersed camping locations.

The transportation network primarily consists of unpaved, gravel, or native-surface local or secondary roads. Cross-country snowmobile use may occur on adequate snow depth in accordance with the current travel management plan or map and travel amendments. There may be areas, trails, or roads within this ROS class where motorized use is prohibited or restricted to enhance recreation experiences or to protect public safety or resources.

FS System Trails and associated Trail Visual Quality Objectives

Portions of the Vista Ridge Trail (Forest Service Trail #626), the Pinnacle Ridge Trail (#630) and Elk Cove Trail (#631) are located within the project area boundary and all access the Mt. Hood Wilderness, making them Trail Sensitivity Class 1 (Forest Plan page Four-115). The Pacific Crest Trail (PCT) runs north and south along a ridge to the west and is not in the Lava project area. The only units visible from the PCT would be huckleberry enhancement units 52 and 53 and they would be in the Middleground zone (modification allowed). Management prescription of Class I sensitivity trails are described below in Table 3-49.

Older timber harvest units exist throughout the project area and are visually apparent. Combined with the management actions proposed the visual contract between treated area and untreated area would be increased; however, all VQO would be in compliance with those described in the Forest Plan.

Previous road decommissioning efforts are in various stages of revegetation within the proposed project area.

Table 3-49: Trail Sensitivity Level I Visual Quality Objectives

Trail Sensitivity Level	Visual Quality Objective per Distance Zone			VQO Allowed within C1 MA for 20% of Trail.
	Near- Foreground (660' both sides of Trail)	Far-Foreground (Second 660')	Middleground (From 1320' to 5 miles)	
I	Retention (R)	Partial Retention (PR)	Modification (M)	Partial Retention (PR)

Forest Service direction provides the following definitions of the VQO categories (Agriculture Handbook 462):

- Retention (R) – This VQO provides for management activities which are not visually evident. Under Retention, activities may only repeat form, line color and texture which are frequently found in the characteristic landscape.
- Partial Retention (PR) – Management activities remain visually subordinate to the characteristic landscape. Activities may repeat or introduce form, line, color, or texture common to the characteristic landscape and may change in their qualities of size, amount, intensity, direction, pattern, etc., so long as they remain visually subordinate to the characteristic landscape.
- Modification (M) - Under the modification VQO management activities may visually dominate the original characteristic landscape. However, they should borrow from

naturally established form, line, color and texture so completely and at such a scale that it's the visual characteristics are compatible with the natural surroundings.

Land Allocation and associated Visual Quality Objectives

Eight Forest Plan land use allocations (LUAs) are located within the project area; however only five have proposed treatment units associated with them.

- C1 comprises the majority of the project area.
- B6 occupies only a few acres of firewood harvest unit 51. B6 calls for Modification and is adjacent to C1 in this unit which is also Modification.
- B1 and B5 only occur as an underlying LUA to B2 land. Since they have the same or more lenient VQO's as B2, they will be treated under the discussion on B2.

Land Use Allocation B2 lies along the east side of the project area. The key viewing portion of the affected viewshed, Highway 35 in the Hood River valley, occurs about 3 miles west of the project area at the closest point. The key viewer positions are along a six-mile stretch of Highway 35 approximately three miles on either side of the town of Mt. Hood, OR.
The VQO associated with these land allocations represent the minimum level of visual quality that should be achieved in terms of long term visual resource management. Management Area VQOs are summarized in Table 3-50 below.

Table 3-50: Land Allocation Visual Quality Objectives

Land Allocation **Shaded rows do not have treatment units associated with them**	**Visual Quality Objective per Distance Zone**		
	Foreground **0 to ½ mile**	**Middleground** **½ mile to 5 miles**	**Background** **Beyond 5 miles**
A4 – Special Interest Area	Retention (R)	Partial Retention (PR)	Partial Retention (PR)
B1 – Scenic River (as seen from the Middle Fork of Hood River)	Retention (R)	Partial Retention (PR)	Partial Retention (PR)
B2 - Scenic Viewshed (Hood River Valley – Hwy 35)	Retention (R)	Partial Retention (PR)	Partial Retention (PR)
B3 – Roaded Recreation	Partial Retention (PR)	Partial Retention (PR)	Partial Retention (PR)
B5 - Pine Marten/Pileated	Modification (M)	Modification (M)	Modification (M)
B6 – Special Emphasis Watershed	Modification (M)	Modification (M)	Modification (M)
B10 – Deer and Elk Winter Range	Modification (M)	Modification (M)	Modification (M)
C1 – Timber Emphasis	Modification (M)	Modification (M)	Modification (M)

Developed Recreation Facilities (Including Campgrounds)

The trailheads for the Vista Ridge, Pinnacle Ridge and Elk Cove trails exist within the project area. The Vista Ridge Trailhead is located at the terminus of Forest Service Road (FSR) 1650. Elk Cove Trail begins at Laurance Lake Road 2840-650. Pinnacle Ridge Trail begins on road 2840-670.

Kinnickinnick campground and day use area lie within the project area along the south shore of Laurance Lake. Only one treatment unit, number 39 (a planting unit), may be visible to users of the lake or recreation site due to topography. Lost Lake Campground is located over four miles away from the nearest proposed units and is visually screened by topography and vegetation.

Dispersed Recreation Opportunities (Including Special Use Permits)

Although sites may still appear natural, vegetation is often manicured. Sights and sounds of humans may predominate. Dispersed recreational activities found within the project area include viewing scenery, driving for please, hiking, biking, dispersed camping, picnicking (day use), gathering forest products, and hunting. The roads leading to project area are used for recreation related events; these events are permitted through the Forest Service's Recreation Special Use Permit (SUP) program.

3.11.3 Effects Analysis

No Action – Direct and Indirect Effects

Recreationists would experience no change since no activity would take place. Availability of huckleberry picking opportunities would remain the same, or decline as stands continue to grow and shade the understory. Visual experiences would remain the same. Hunting opportunities would remain the same or perhaps decline as stands get more crowded and shady. With no management activities there would be no road maintenance needs.

Proposed Action– Direct and Indirect Effects

FS System Trails and associated Trail Visual Quality Objectives

The project area may experience short-term alterations in usage due to project implementation. Recreationist may experience short delays or closures on roads depending on location and timing of vegetation management activities. These alterations would be posted on the ground and on the Forest Service website.

Vista Ridge trail runs along the south boundary of huckleberry unit #52. Hikers in the short term may experience sights and sounds of logging activities. Hikers would likely be excluded from the trail during helicopter operations in unit 52. In the long-term, users may notice a changed forest stand structure matching or exceeding VQO standards. Users of Laurance Lake should experience no visual changes to the surrounding forest. Hikers on the Pinnacle Ridge and Elk Cove trail may encounter tree planting activities in the short term, and in the long term notice a growing plantation in and near units 38, 39 and 41.

There should be no direct affects to trail tread surfaces. If logging operations impacts the trail near unit 52, it would be restored to standard by the end of the project. Hikers may notice signs on either side of unit 52 warning of logging activities. Indirectly, noise and smoke from equipment working on the project would be noticeable to recreational users during the implementation period. The trail would continue to be managed as moderately developed or trail class 2. Visual impacts associated with the proposed management activities would be in conformance with the modification VQO prescribed for the foreground (from 0 to 660 feet) as seen from the trail. It is preferred that logging operations do not use the Vista Ridge trailhead as a landing. An alternative landing could be located within an adjacent managed stand that would be more suitable for log haul operations.

Although Cloud Cap and Tilly Jane are not in the project area and are not key viewing sites, visitors may be able to see portions of planting unit 38 and thinning units 27,32,42,48 and 55 at a very oblique angle. However, thinning meeting modification or partial retention should not be noticeable from that distance (approximately five miles).

Viewers would see the project area in the middle ground to background, often through an obstructed view. Given that the units are thinning's which must conform to partial retention and would be viewed from a very low oblique angle, it is highly unlikely that viewers would notice a change in stand structure from that distance.

Developed Recreation Facilities (including Campgrounds)
The trailheads to the Vista Ridge, Pinnacle Ridge and Elk Cove trails would remain available for recreational parking through the duration of the project, or would be signed and posted on the Forest Website as needed. There would be an increase in traffic on the forest roads used to access these areas due to log haul and project implementation.

Cascade huts have a recreational structure (portable cabin) on FSR 1800-640. Although not within the project area, recreational visitors attempting to access this structure may be indirectly affected by the increase in logging related traffic within the area.

Dispersed Recreation Opportunities (including Special Use Permits)
The project area would continue to provide a Roaded Modified setting according to the ROS. Recreational opportunities for hunting and berry picking would be improved or enhanced by the opening of the forest canopy. Any road closures would minimally reduce opportunities for dispersed camping or other recreational opportunities. During stand management activities, hunters utilizing the project area may need to hike further to access roads for game retrieval purposes. Hunters may find more big game openings in the areas treated.

Cumulative Effects
Recent projects or activities within the analysis area include thinning of second growth trees, planting trees, road decommissioning, road repair projects, bridge replacement projects, stream improvement projects, forest fire rehabilitation, and many others. The analysis area for recreation and visual resources is the project area boundary. This boundary was determined based on the

interconnected access to recreational resources such as trailheads, road networks and campgrounds. Table 3-1 in the Preliminary Assessment lists recent, current, and future projects or activities that have been tracked in the analysis, including activities on private lands. Cumulative effects are outlined in Table 3-51 below for projects and activities that have the potential for cumulative effects to recreation.

Table 3-51: Cumulative Effects for Recreation and Visuals

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?
Forest Service Vegetation Treatment Activities Planned or Underway (Pre-commercial treatments)	FS System Trails & VQO	Yes	No	No	No cumulative effects would occur.
	Land Allocation VQO	Yes	No	No	
	Developed Recreation Facilities	No	No	No	
	Dispersed Recreation and SUP	Yes	No	No	
Private Land and BPA Power lines	FS System Trails & VQO	No	Yes	Yes	The non-National Forest System Lands within the watershed are heavily impacted by ongoing timber harvesting activities. They fall within the Heavily Altered VQO category. Meeting VQOs around the BPA power lines may not be possible due to the overwhelming influence this corridor has on scenic quality along roads 18, 1810 and other viewpoints in its vicinity (West Fork Hood River Watershed Analysis, 1996). There are no cumulative effects to recreation resources.
	Land Allocation VQO	No	Yes	Yes	
	Developed Recreation Facilities	No	No	No	
	Dispersed Recreation and SUP	Yes	Yes	No	
McGee Creek Riparian Thinning	FS System Trails & VQO	Yes	No	No	No cumulative effects would occur.
	Land Allocation VQO	No	No	No	

Project	Potential Effects	Overlap in Time	Overlap in Space	Measurable Cumulative Effect?	Extent, Detectable?
	Developed Recreation Facilities	No	No	No	
	Dispersed Recreation and SUP	No	No	No	
Aquatic Organism Passage Projects (McGee Creek, Red Hill Creek)	FS System Trails & VQO	No	No	No	No cumulative effects would occur.
	Land Allocation VQO	No	No	No	
	Developed Recreation Facilities	No	No	No	
	Dispersed Recreation and SUP	No	No	No	
Invasive Plant Treatments	FS System Trails & VQO	No	No	No	No cumulative effects would occur.
	Land Allocation VQO	No	No	No	
	Developed Recreation Facilities	No	No	No	
	Dispersed Recreation and SUP	No	No	No	

3.11.4 Consistency Determination

The Proposed Action would meet the goals and objectives of the Forest Plan. Design standards for Forest Service Trails are found in Forest Service Handbook 2309.18 and vary depending on designed use and trail class. The Mt. Hood Forest Plan classifies trails in three VQO levels. Forest Wide Standards and Guidelines are available on page Four-115 and 116. The Forest Plan also defines the VQO by distance zone for all levels of trails on page Four-116. Standards FW-588 and FW-559 further define that trails located in C1 Timber emphasis management areas may temporarily deviate from the prescribed standard in the foreground, but no more that 20 percent of the trail length within the C1 management area should deviate from the prescribed VQO. The Proposed Action would meet the goals and objectives outlined for both Forest Service Trail Standards and Trail VQO.

The Proposed Action would continue to provide a broad range of developed and dispersed recreation opportunities in balance with existing and future demand. No ROS class would be compromised in any alternative.

3.11.5 Summary of Effects by Alternative

FS System Trails and associated Trail Visual Quality Objectives
No developed FS System Trails would be directly affected by either alternative. The Proposed Action would indirectly affect users of the Vista Ridge Trail (Forest Service Trail #626), the Pinnacle Ridge Trail (#630) and Elk Cove Trail (#631) in that potential noise, smoke, and an increase in logging related vehicular traffic would be evident. Both alternatives would be in conformance with the prescribed Trail VQOs.

Land Allocation and associated Visual Quality Objectives
Both alternatives would be in conformance with the standards and guidelines for both recreation and visual resource management. Under the Proposed Action, forest health related actives would occur within C1 Timber Emphasis and B2 Scenic Viewshed land use allocations. The Partial Retention VQOs assigned to these areas would be met through visual screening and the proposed PDCs.

Developed Recreation Facilities (including Campgrounds)
No developed recreation facilities would be directly affected by either alternative. Under the Proposed Action, there would be an increase in forest health management related vehicular traffic noticeable to forest visitors accessing recreation sites and trails in the Lava project area.

Dispersed Recreation Opportunities (including Special Use Permits)
All alternatives would be in conformance with the existing Recreation Opportunity Spectrum prescribed for the project area. Under the Proposed Action, treatments would minimally reduce opportunities for dispersed camping, hunting, game retrieval, and gathering of forest products during times of implementation. Road closures would be timed to minimize impacts to recreation related special use permits

3.12 Fuels Management and Air Quality

More information is available in the project record including the full fuels analysis file, as part of the Fuels Management Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.12.1 Methodology

The intent of this report is to analysis how the down natural fuels related resources would be affected by the management actions proposed by the U.S. Forest Service. Professional judgment and stand level data was incorporated in determining the project's potential effects. Analyses were based on the photo series tool.

The Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest (USDA Forest Service General Technical Report PNW – 105) was used to interpret data collected during field surveys in the Lava Restoration project area. The Photo series GTR PNW – 105 was used for predicting natural down woody fuels in the project area. National Forests in Region 6 have and do use GTR PNW – 105 for assessing natural down wood fuels.

3.12.2 Existing Condition

The Lava project area encompasses approximately 13,800 acres and is located in the northern portion of the Hood River Ranger District. Elevations range from 3500 to 4000 feet. The area is predominately Douglas fir. The understory vegetation is a combination of maple, chinquapin, rhododendron and some ceanothus in harvested areas.

Field reviews of the Lava project area have resulted in the determination that the fire/fuels report for the East Fork and Middle Fork Watershed Analysis (completed in 1994) is inconsistent with the existing condition on-the-ground. In addition, this watershed analysis was conducted based on fire groups rather than fire regimes. Fire regimes are the current national standard for assessing historical fire influences in the area, while fire groups were an early attempt to map historical fire regimes.

Historically, fires would have burned in this area every 200 years. Fire suppression activities in the past 100 years have not altered the historical development of the vegetation. However, the different land management practices, such as timber harvest and the associated road development after 1855, have increased the risk in human caused fire. Both natural and human caused fires have changed the landscape and increased the risk of ignitions occurring.

Lighting strikes do occur in this project area but are often accompanied by rain that puts out any fire starts. Fire suppression efforts have been used to put out small fires that were started by lightning storms. In areas where high fuel loadings and ladder fuels are present high intensity fire behavior could still occur as a result of an uncontrolled fire. This may pose a safety problem for fire suppression crews as well as the public.

The current road system provides adequate access for fire suppression. The Lava Restoration project area had 23 wildfires in the past ten years. The cause of ignition included: lighting and abandoned campfires. Since 2006 there have been there have been four large project fires south and south East of the project area. Blue Ridge Fire (2006), Gnarl Fire (2008), Gnarl II (2008) and Dollar Fire (2011). All of these fires were natural fires starts by lighting. The main ignition source for these fires was in pockets of bug killed timber. These fires were strongly influenced by local weather patterns coming off Mt Hood. The fire behavior on the Dollar Fire was strongly influenced by high winds, which made it transition into a crown fire. This was the only large wildfire near the project area. Observations from the Dollar Lake fire saw a moderation of fire behavior within managed stands.

Fuels

The fuels objective within the Lava Restoration treatment units are to limit the potential for natural and activity created fuel to sustain and /or carry a high intensity fire, while maintaining appropriate levels of organic material to provide for nutrient recycling and/or habit needs. In accordance with the Northwest Forest Plan and recommendation in the DecAID analysis tool, down woody material would be retained in treated stands where available (see the Wildlife Specialist Report for more details on the DecAID analysis tool and down woody material requirements). In addition, in order to meet the 3 to 10 percent ground cover requirement, existing material in the 3 to 9 inch size class would also need to be left on site. It is estimated that 26.7 tons per acre of down woody material would be left on site, which exceeds Forest Plan standards and guides for fuel loading (FW-33). Excess activity fuel left on the surface is not anticipated to be a problem in a year due to natural decomposition.

The preferred method of treatment for units with activity fuels in the excess of 26.7 tons per acre is machine piling and burning. Machine piles should be located on skid trails and landings to minimize organic soil damage. Placing machine piles on disturbed soils reduces the possibility of a fire burning outside the harvest unit (Frandensen 97).

All prescribed burning would be scheduled in conjunction with the state of Oregon to comply with the Oregon state implementation Plan (FW-040) to minimize the adverse effects on air quality. Burning would be conducted when smoke dispersion conditions are favorable to minimize the potential for adverse conditions. All prescribed burning of activity fuels would comply with Forest Service Manual direction (FSM 5100, Chapter 5140).

Fire Regimes

The majority of project area is roughly divided into two Fire Regimes. Fire Regime IVC is 100 - 200 year stand replacing and Fire Regime VA is 200 - 400 year stand replacing severity. Fire regime refers to the nature of fire occurring over long periods and the prominent immediate effects of fire that generally characterize an ecosystem. Both of these fire regimes consist of a full range of fuel loadings from light to heavy. These loadings are dependent on such factors as stand type, stand condition, fire history and past management practices. Also present in the project area is Fire Regime IVB, which is 100 - 200 year stand replacing, mixed severity. This fire regime is not abundant in the project area. Fire Regimes in the Lava Restoration project area are all capable of sustaining a stand replacing wildfire. See Figure 3-19 for location of fire regimes. Also, the stands in the project area composed of the three condition classes (see Figure 3-20). The fire regime and condition class are summarized in Table 3-52 below.

Table 3-52: Fire Regime Condition Class within the Project Area

Fire Regime Condition Class	Description	Potential Risks
Condition Class 1	Within the natural (historical)	Fire behavior, effects, and other

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

Condition classes are a function of the degree of departure from historical fire regimes resulting in alterations of key ecosystem components, such as species composition, structural stage, stand age, and canopy closure. One or more of the following activities may have caused this departure: fire exclusion, timber harvesting, grazing, introduction and establishment of exotic plant species, insects or disease (introduced or native), or other past management activities.

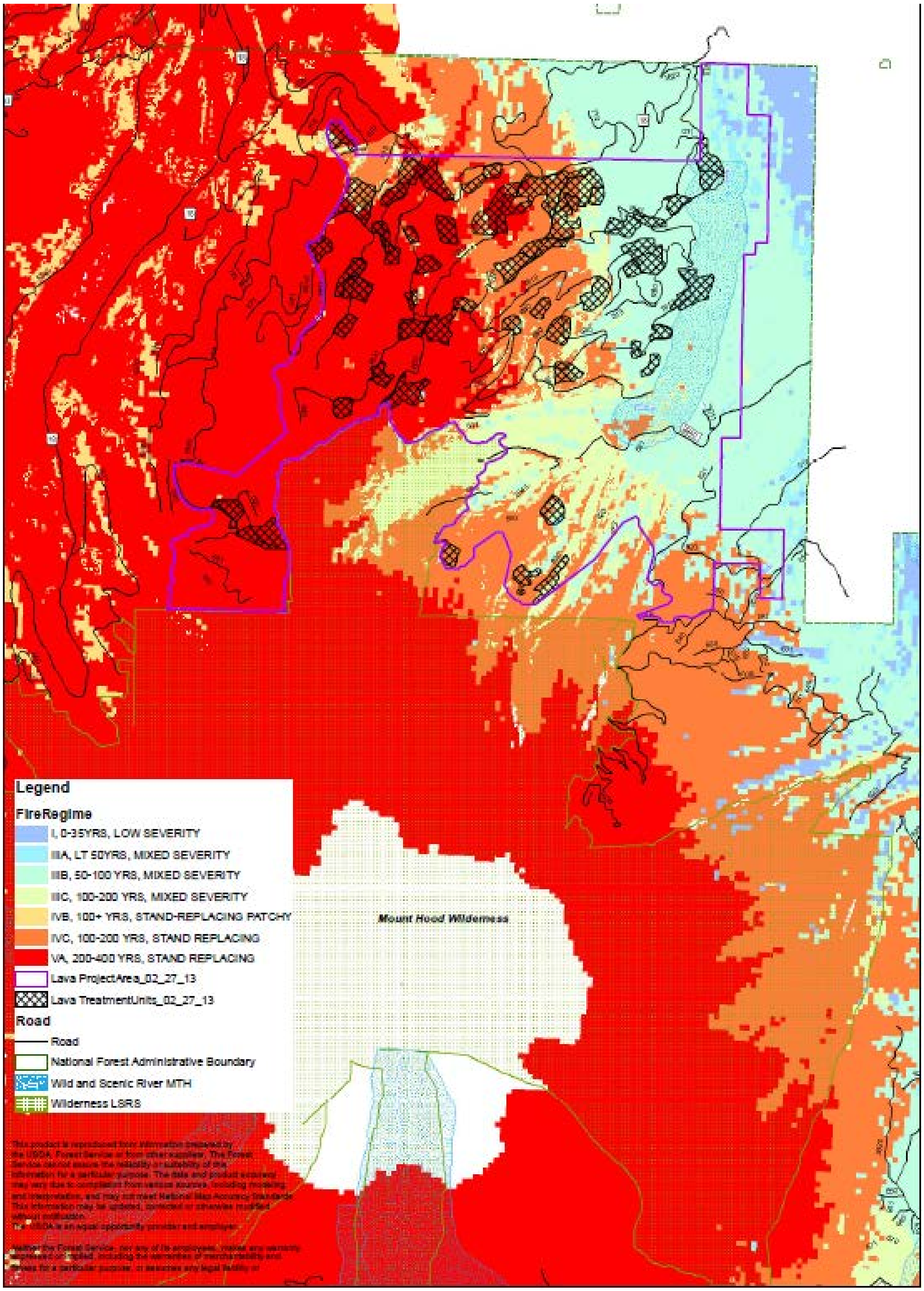


Figure 3-19: Fire Regimes Within and Around Project Area

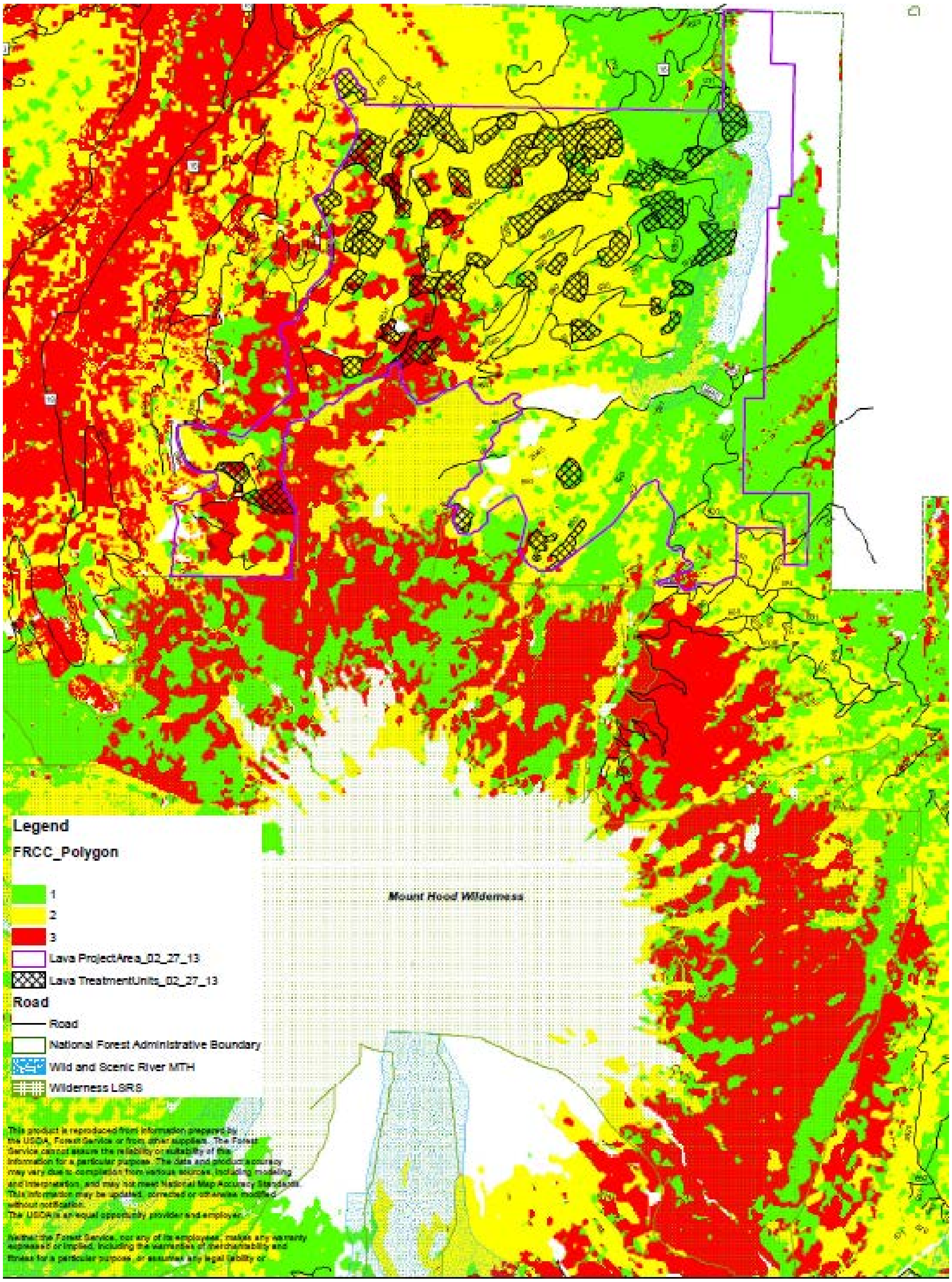


Figure 3-20: Fire Regime Condition Class Within and Around Project Area

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 borders the Lava Restoration project area. The Mark O Hatfield Wilderness, a Class I Airshed is four air miles North West of the Lava Restoration project area. The City of the Dalles, which is a state receptor site, is 21 air miles northeast of the project area. Management activities would comply with all applicable air quality laws and regulations, including the Clean Air Act and the Oregon State Implementation Plan (MHFP, FW-040). Management activities would also be in compliance with the Clean Air Act as 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: A plan of action where prescribed/pile burning is conducted in such a way that smoke produced is minimized and/or directed in a manner that keeps any impacts within acceptable limits. This primarily deals with impacts to people and/or air quality.

The effects of smoke management from activity created fuels on the surrounding area are described below and the procedures and guidelines followed when utilizing prescribed fire as a management tool. All Forestwide Standards and Guidelines for Air Quality FW-039 thru FW-053 (LRMP-MTF, 4:51-52) would be followed to minimize air quality impacts. All pile 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. For each activity requiring prescribed pile burning the Forest Service requires a written, site-specific pile burn plan approved by the appropriate Line Officer. The purpose of the plan is to ensure that resource management objectives are clearly defined and that the site, environment, or human health is not harmed. The plan contains a risk assessment to quantify the chance of fire escaping and develops a contingency plan for actions taken to prevent escape and, if it does, quickly contain the escape. The plan would be implemented to minimize the possibility of any prescribed burn affecting Class I or other "smoke sensitive" areas in accordance with the OSMP.

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.

3.12.3 Effects Analysis

No Action Alternative - Direct and Indirect Effects

Fuels

By selecting No Action Alternative the landscape of the Lava Restoration project area would be left in its current condition. The potential risk for high severity fires resulting from increasing fuel loads would continue within the treatment stands in the project area. Fuel loadings would continue to increase consistent with vegetation succession and mortality from insects and disease. Disturbance would be primarily from insects and disease. The Vegetation Resources Section 3.1 has more details on the insect and disease and other ecological disturbances within the project area. Fire suppression activities would continue to exclude natural fire from this area.

Fire Regime

If a No Action Alternative is selected, stands in a condition class 1 would continue to move towards a condition class 3, departing from its historical range. The risk of losing key ecosystem components is elevated, which adds to the possibility of reduced effectiveness of fire suppression modules and fire personnel to safely suppress wildland fires in condition class 3 regimes.

Air Quality/Smoke Management

Under the No Action alternative, the Lava project area would be left in its current condition. Air quality would remain unaffected, until a large fire event occurred. Parkdale would be impacted by such an event, with very high particulate matter imparted into the local air sheds, with potential health effects.

Proposed Action - Direct and Indirect Effects

Fuels

Harvest activities under the Proposed Action would increase fuel loading. Currently it is estimated these units have a fuel loading ranging from 20 to 59 tons per acre. Each unit would have a field reconnaissance after harvest activities have been completed to determine fuel loadings. If the fuels inventories indicate that the fuel loading is in excess of 26.7 tons/acre, machine piling would be the preferred method of reducing slash concentrations.

The Proposed Action alternative would move the vegetation towards conditions that would have occurred under a natural disturbance regime. This would lower flame lengths, reduce fire spread and lower the probability of tree mortality in the event of a wildfire, leading to more successful suppression efforts. Aerial delivered retardant or water would be more effective in lighter fuels and a more open canopy, making it safer for firefighters to successfully anchor and contain wildfires before damaging private and state lands. All pile burning would be scheduled in conjunction with the State of Oregon to comply with the Oregon Smoke Implementation Plan (FW-040) and to minimize the adverse effects on air quality. Pile burning prescriptions would be developed to minimize the potential for adverse effects. Implementation of these measures would ensure compliance with the Clean Air Act. See the Air Quality/Smoke Management section for more details.

<u>Fire Regime</u>
Fire regimes and condition class under the Proposed Action. These stands range in classification from Condition Class 1 through Condition Class 3 Proposed thinning and fuels treatment (pile burning) in these stands would move those areas into a state more indicative of Condition Class 1 or Condition Class 2. Overall, this alternative would result in moving, or maintaining, project area in a state that has fuel loadings and vegetation attributes more indicative of historic conditions.

<u>Air Quality/Smoke Management</u>
There is a possibility of smoke intrusion in the Mt. Hood Wilderness, a Class I Air Shed. All pile burning would be scheduled in conjunction with the State of Oregon to comply with the Oregon Smoke Implementation Plan (FW-040) and to minimize the adverse effects on air quality. Burning prescriptions would be developed to minimize the potential for adverse effects. Implementation of these measures would ensure compliance with the Clean Air Act.

Smoke sensitive areas near the Lava Restoration project area also include: the communities of Parkdale, Dee and Odell. Burning would only be conducted when actual and predicted atmospheric conditions would minimize the possibility of smoke affecting these areas. Because of preventative measures and compliance with OSMP, there would be no long-term effects from prescribed burning or smoke from the proposed activities.

To avoid impacting smoke sensitive areas, units would be burned 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 extinguishing burning material may be necessary. Signs would be posted on roads that are near burning operations when visibility could be affected. If visibility is predicted to be less than 750 feet, traffic flaggers and pilot cars would be required for public safety on State or Federal Highways.

Pile burning could be accomplished during the passage of weather fronts that move smoke out of the area very quickly to avoid impacts to smoke sensitive areas.

Cumulative Effects

Past actions / activities most affecting the project area include timber harvesting and insect infestation. These conditions have been incorporated into the existing condition section of the analysis. The project area is predominately in fire regime condition class 2 and 3. As the proposed treatments are on a relatively small scale these condition classes would not change post implementation and as such there would no notable cumulative impacts as a result of this project.

The Lava Restoration project area could overlap in time and space with the Red Hill Restoration project area. This could have the same effect on fire regime condition class 2 and 3. As such, this would be move a larger percentage of the watershed to a condition that has fuel loadings and vegetation attributes more indicative of historic conditions. Beyond this there is no other past, present or reasonable foreseeable future actions that the Forest Service, other agencies, or private parties are considering for implementation that would change or alter the fire regime condition class or produce cumulative impacts from a fire standpoint in the project area.

3.12.3 Consistency Determination

Management activities implemented under the Proposed Action would comply with all applicable laws and regulations, including:

- The Proposed Action complies with the following Mt hood Land and Resource Management Plan standards and guidelines: FW-039, FW-044, FW-041, FW-044, FW-046, FW-047, FW-052 and FW-053 through incorporating mitigations into applicable prescribed pile burn plan prescriptions. Through piling burning fire treatment of "wood residue" resulting from vegetation treatments; C1-043.FW-262, FW-265 and FW-266 through incorporating desired conditions into applicable prescribed fire prescriptions; and FS-267 through the development of a site specific prescribed fire burn plan for prescribed fire treatments.

- Forest Service Manual 5100 – Fire Management, Chapter 5140 – Fire Use and through incorporation the 2008 *Interagency Prescribed Fire* Planning and Implementation Procedures Guide (2008 Guide). FSM 5140 requires that the planning, approval, and implementation of all prescribed fire projects comply with the 2008 Guide. All Pile burning described in the Proposed Action would be planned, approved, and implemented through a site specific prescribed pile burn plan.

3.12.4 Summary of Effects

The direct effect of prescribed smoke for each the alternative would be directly related to the volume of timber to be removed. The direct effects of pile burning smoke are reduced visibility and increased level of small diameter particulates specifically PM 2.5 and PM 10, of concern for human health reason.

The indirect effects of pile burning smoke produced as a result of the implementation of one of the action alternatives would be directly related to the amount of timber volume to be removed. 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 cumulative effects on air quality of pile burning smoke, produced as a result of implementation of one of the alternatives, would result in an incremental 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 project area would also contribute to the cumulative particulate loading. It is not possible to predict the amount of particulates contributed by these sources.

3.13 Cultural Resources

More information is available in the project record including the full cultural analysis file, as part of the Cultural Resources Specialist Report. This information is incorporated by reference and is located in the project record, located at the Hood River Ranger District.

3.13.1 Methodology

Heritage resources include structures, sites, and objects that reflect the prehistory, protohistory, and history of people. The analysis area for heritage resources in this PA is the area of ground disturbance as proposed for all alternatives. Ground disturbance includes treatments using heavy machinery associated with logging, burning, temporary road construction, and road decommissioning.

The National Historic Preservation Act and the National Environmental Protection Act both require consideration be given to the potential effect of federal undertakings on heritage resources. The guidelines for assessing effects and for consultation are provided in 36 CFR 800. To implement these guidelines, in 2004, Region 6 of the Forest Service entered into a Programmatic Agreement (PA) with the Oregon State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP).

The proposed activities of the Lava Restoration project include tree removal, slash burning, temporary road construction, and road decommissioning involving heavy machinery and ground disturbance. In accordance with the 2004 agreement, heritage resource surveys have been conducted for those ground disturbing activities requiring inspection and documented in Heritage Resource Report 2013/060606/0027 (Dryden 2013) for the proposed action.

3.13.2 Existing Condition

Relatively few archaeological surveys and excavations have been conducted within the project area, and little is known about the prehistory of the region. There is some evidence that huckleberries and other plant resources were gathered, along with hunting forays for deer, elk and other wildlife. Limited tool manufacture specific to hunting activities was also occurring. Expansive vistas of Mount Hood were enjoyed for recreational and spiritual pursuits. Some of the current hiking trails likely follow earlier Indian trails. An ancient Indian Trail that once traveled up the Hood River Valley and passed over the northwest shoulder of Mount Hood along Lost Lake and Bull Run Lake, to terminate at the Willamette Falls may have skirted along the northern portion of the project area (OWP 1940: 40, 41). The Indians referred to it as the Walk-Up Trail, which was later corrupted to the Walker Trail. The earliest recorded use of the trail was by Daniel Lee who in 1838 drove 14 head of cattle from the Willamette Mission in the Willamette Valley to the newly established Wascopam (The Dalles) mission following an old Indian trail (Lee 1844: 155; Christian Advocate Journal, 1843). The 1842 F.X. Matthieu party also reportedly followed an Indian trail from The Dalles around the north side of Mount Hood on their way to Oregon City (Geer 1912: 191). The trail became popular with early emigrants on the Oregon Trail who would drive their livestock over the trail while their provisions floated down the Columbia River, but lost favor with the construction of the Barlow Road in 1845.

The area appears largely remote through the late 19th century, except for access up the Middle Fork of Hood River along the Lava Beds during the dry season. At that time, the area to the east of the Middle Fork had been burned, and was covered with a second growth of thickets of immature trees (Langille et al. 1903). No grazing activities are listed for the area.

In 1908, a portion of the Parkdale Lava Flow situated to the southwest of Parkdale, Oregon was surveyed for the placement of a “yearlong ranger station” within the “Lava Beds.” The location was chosen because of the reliable water source provided by the Middle Fork, and the proximity of the area to the Mt. Hood Post Office. A rudimentary structure with a chimney may have been constructed, but the site was abandoned in favor of a permanent ranger station in Parkdale. The Forest Service has designated 854 acres of the Parkdale Lava Flow as a geologic “Special Interest Area” for the stated purpose of “public recreation use, study and enjoyment.”

A 1911 General Land Office (GLO) survey of T1S, R9E covered only a small portion of the township on the east side of the Parkdale Lava Flow. The GLO survey for the remainder of the area was not completed until 1941.

The unincorporated community of Parkdale was established in 1910 to serve as a terminus for the Mount Hood Railroad. By 1912, other small communities had sprung up at Trout Creek, Dee, and Winans. The Oregon Lumber Company had placed a railroad up the West Fork of Hood River by this time, and they received a timber contract to harvest trees from 7,000 acres within the West Fork of Hood River in 1916. At about this time, a few homesteads were widely scattered to the north of the project area. A structure shown above Tony Creek on the 1912 Oregon National Forest Map was probably the Tony Creek Guard Station. A cabin apparently associated with trapping activities was probably constructed ca.1912 above Bear Creek.

By 1927, a telephone line linked the Tony Creek "Cabin" to Parkdale. The Clear Creek Ranger Station was built at the south edge of the Lava Beds. Trails traveled up Clear Branch and Vista ridge to areas higher on Mount Hood.

By 1931, a trail had been constructed up Cove Branch to Elk Cove. By 1939, a road was constructed by the Civilian Conservation Corps (CCC) across the Middle Fork continuing up to the Tony Creek Guard Station (later named Red Hill Guard Station). It is believed that the CCC probably completed other improvements to roads and trails within the Lava project area at the time, and may have added improvements to the Tony Creek Guard Station. A trail traveled up Cathedral Ridge to the Eden Park Forest Camp. A telephone line and the Vista Ridge Trail traveled from the Tony Creek Guard Station to Red Hill and continued up to Eden Park. A communication line linked the Clear Creek Ranger Station with Parkdale through File Butte rather than down the Middle Fork.

The Bonneville Power Administration (BPA) was created in 1937 to sell electric power from the Bonneville Dam located on the Columbia River, and to construct facilities necessary to transmit the power. Powerlines were constructed shortly after that, traveling up the West Fork of Hood River and continuing south.

The earliest signs of logging within the Lava project area occurred about 130 years ago in the 1880s, and probably consisted of high-grading, or single-tree selection within the forest. Some scattered harvest occurred later in the 1930s, but intensive forest management occurred in the 1950s consisting of clear cutting followed by burning followed by planting. The Dollar Quarry was probably established as a rock source at this time, and the 1600 road was probably paved with asphalt. The area was re-entered in the 1980s employing the same harvest methods. Many of the roads in the project area were decommissioned at this time.

By 1943, railroad logging had ended within the adjacent West Fork subwatershed, with the last tracks pulled in 1944. Longview Fibre continues to harvest trees from large blocks of privately-owned lands within the watershed of the Middle Fork.

Panoramic photos from the ridge to the southwest of the Tony Creek Guard Station in 1933 indicate that a large wildfire had covered much of the area a few years previous to the photo (see Figure 3-21 below). The partial GLO plat map for 1911 also mentions a "big burn" adjacent to the Parkdale Lava Flow.

Figure 3-21: Panoramic photograph taken on 11/10/1933 from ridge summit to the southwest of the former Tony Creek Guard Station. Note that much of the area appears burned. (USFS historic photograph)

The Tony Creek Guard Station was dismantled and burned in the 1960s, as part of nationwide efforts to eliminate “attractive nuisances” created by abandoned facilities. The network of telephone lines throughout the area was also dismantled at this time.

The Middlefork Irrigation District (MFID) started with some early homesteaders interested in obtaining a reliable water source for the expanding agriculture in the Upper Hood River Valley. Between 1950 and 1953, the MFID merged with the Glacier Ditch Company operating out of the headwaters of the East Fork of the Hood River. In the 1960s the MFID, in partnership with the Forest Service, dammed the Clear Branch in order to form Laurance Lake.

Previously documented Heritage Resources within the project area include culturally-modified (peeled) cedar trees, the remains of a cabin, the remains of the Tony Creek Guard Station, stacked rock features, and a tree-mounted ceramic insulator.

3.13.3 Effects Analysis

No Action - Direct and Indirect Effects

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.

Proposed Action - Direct and Indirect Effects

The remains of the Bear Creek Cabin (666EA0009) are located adjacent to a harvest unit. A 100-foot buffer zone for the exclusion of heavy machinery was flagged around the cabin remains. Any trees harvested near the buffer zone should be felled directionally away from the buffer zone. Burning activities would also be excluded from the buffer zone. With these stipulations, the project can proceed with no effect to the Bear Creek Cabin (666EA0009).

The Klickitat Rock Mounds (666NA0015) are located adjacent to a harvest unit. A 100-foot buffer zone for the exclusion of heavy machinery was flagged around the site along the edge adjacent to the harvest unit. Any trees harvested near the buffer zone should be felled directionally away from the buffer zone. Broadcast burning may occur within the buffer zone, but piling may not occur. With these stipulations, the project can proceed with no effect to the Klickitat Rock Mounds (666EA0015).

The remains of the Tony Creek Guard Station (666EA0040) are located adjacent to a road proposed for decommissioning. A 100-foot buffer zone for the exclusion of heavy machinery was flagged around the remains of the guard station. No road decommissioning activities would occur within the flagged buffer zone. With this stipulation, the project can proceed with no effect to the Tony Creek Guard Station (666EA0040).

Peeled cedar trees within site 666NA0047 are located within a harvest unit. The trees were flagged for avoidance from harvest activities. A 100-foot buffer zone for the exclusion of heavy machinery was flagged around the trees. Any trees harvested near the buffer zone should be felled directionally away from the buffer zone. Broadcast burning may occur within the buffer zone, but piling may not occur. With these stipulations, the project can proceed with no effect to the site 666NA0047.

It was determined that a tree documented as culturally-modified (666NA0116) was not actually a cultural artifact. No protective measures are required or recommended for non-cultural trees. The project would have no effect on site 666NA0116.

A ceramic insulator associated with a telephone line (666EA0146) could not be relocated. All substantial information about the insulator has been obtained through previous site documentation. No protective measures are required or recommended for heritage resources that cannot be relocated. The project would have no effect on site 666EA0146.

Some remaining portions of a telephone line linking the Tony Creek Guard Station to Parkdale extend through the project area (666EA0285). The remains consist of ceramic insulators mounted on two trees. One tree with an attached insulator would be protected with directional falling away from the artifact; it was determined that the remaining tree was decayed and would soon fall over. All substantial information about the artifact was collected; it was determined that no protective measures are required or recommended for the artifact. The project would have no effect on site 666EA0285.

The Tony Creek Blazed Trees (666EA0286) are located within a harvest unit. The trees were flagged for avoidance from harvest activities. A 100-foot buffer zone for the exclusion of heavy machinery was flagged around the trees. Any trees harvested near the buffer zone should be felled directionally away from the buffer zone. Broadcast burning may occur within the buffer zone, but piling may not occur. With these stipulations, the project can proceed with no effect to the site 666EA0286.

The historic Vista Ridge Trail (666EA0287) lies adjacent to Unit 52. The trail was apparently constructed ca.1939 from the Tony Creek Guard Station, and abandoned in the 1980s when the trailhead was relocated. The trail would be buffered by a 100-foot buffer zone for the exclusion of heavy machinery. Broadcast burning may occur within the buffer zone, but piling may not occur. With these stipulations, the trail tread would remain unaffected and the project can proceed with no effect to the site 666EA0287.

Cumulative Effects

For heritage resources, any effects are limited to site specific locations. Any cumulative effects would also be limited to heritage resources situated within proposed areas of ground disturbance. The project design criteria for the Proposed Action resulted in no direct or indirect effects to heritage resources since there are no significant heritage resources affected by any alternatives. For cumulative effects, all projects shown in Table 3.1 were considered; however, none of the proposed projects involve heritage resources situated within the proposed project areas. Also, heritage resources are generally avoided for all federal undertakings with no cumulative effects. Because this project would have no effect 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.

The consultation for the Heritage Resource Survey results and recommendations for the project have been completed in accordance with the 2004 PA and submitted to the Oregon SHPO for review; the results of the SHPO review are pending.

3.13.4 Consistency Determination

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 Affected" determination (Stipulation III (B) 5).

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-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).

3.13.5 Summary of Effects by Alternative

Under the No Action Alternative, heritage resources would continue to be subject to naturally occurring processes.

Under the Proposed Action, both the Bear Creek Cabin (666EA0009) and the Tony Creek Guard Station (666EA0040) have been excluded from project activities involving heavy equipment and prescribed burning; the project would have no effect on the sites.

Peeled cedar tree site 666NA0116 was determined to be non-cultural with no required protective measures. Telephone line 666EA0146 could not be relocated and does not require protective measures. Peeled cedar tree site 666NA0047 and blazed tree site 666EA0286 were flagged for avoidance. Rock feature site 666NA0015 was flagged with a buffer for exclusion from heavy machinery. For the telephone line site 666EA0285, one tree with a ceramic insulator was flagged for avoidance, while the other tree was fully documented and requires no protective measures. With the recommended Project Design Criteria, the project would have no effect on heritage resources.

3.14 Climate Change

3.14.1 Existing Condition

A growing body of scientific evidence and climate modeling indicate that climate change is occurring. While there are no specific projections for the project area, the situation would likely be one where the summers are drier and the snow melts earlier in the spring (Bare 2005), (Mote 2003), (Mote 2005), (Dale 2001). There are some who believe that climate change is not occurring or that it is not human caused. This document is not intended to present arguments on any of these theories as they are well documented elsewhere.

This project was not specifically designed to mitigate or respond to potential climate change. This section addresses aspects of the project that may affect carbon emission or sequestration and how the project may impact the forest's ability to deal with climate change. This analysis will not attempt to quantify carbon emission or sequestration.

This project involves the thinning of trees in primarily second growth stands (plantations). A small proportion (<8%) of the thinning activities would occur in older stands to encourage huckleberry development. Rapidly growing forests are recognized as a means of carbon sequestration (FAO 2007). Forest health and growth issues are discussed in Section 3.1, Vegetation Resources.

3.14.2 Effects Analysis

No Action – Direct, Indirect and Cumulative Effects

As no vegetative manipulation would occur and no pile burning would take place the current carbon sequestration rates would remain unchanged and no additional carbon would be released into the atmosphere. The No Action alternative would not result in carbon emissions from vehicles or burning and would result in the retention of relatively slow growing trees. The mortality that results would be retained on site (see Sections 3.1, Vegetation Resources and 3.8, Wildlife for more details).

Proposed Action – Direct, Indirect and Cumulative Effects
This project is not likely to have direct localized effects on climate. By its very nature, the discussion of a project's effect on climate change is indirect and cumulative because the effects occur at a different time and place, and because the scale of the discussion is global. Since it is not reasonable to measure a project's global impact, the discussion here focuses on key elements of forest management discussed in the scientific literature.

For this proposal, the following actions have the potential to affect carbon emissions or sequestration:

- Thinning to enhance the health of the residual stand would result in trees that are better able to withstand stresses such as dry summer conditions (Millar 2007) (Spittlehouse 2003).

- Variable density thinning with skips and gaps and the retention of minor species would result in stands that are resilient and better able to respond to whatever changes come in the future (Millar 2007).

- Fossil fuel would be used by equipment such as saws, tractors, skyline yarders and log trucks. It would be possible for some of this equipment to use biofuels if available and priced competitively.

- Logging debris at landings would be burned on site or transferred to a bio-energy facility to use in generating power. Residual and/or natural fuel accumulations would be burned through pile burning. All of these activities would release carbon into the atmosphere.

- Utilizing trees to create long-lived wood products would sequester carbon. (IPCC 2007) (FAO 2007) (Stavins 2005) (Upton 2007).

To summarize, the Proposed Action would result in some carbon emissions and some carbon sequestration. The benefits to forest health and resiliency with the Proposed Action would allow stands to better respond and adapt to the future climate variation or change.

3.15 Environmental Justice and Civil Rights

On February 11, 1994, President Clinton issued the Executive Order on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Order 12898). This order directs agencies to identify and address disproportionately high and adverse human health or environmental effects of projects on certain populations. In accordance with this order, the proposed activities have been reviewed to determine if they would result in disproportionately high and adverse human and environmental effects on minorities and low-income populations.

The communities of Mt. Hood/Parkdale, Odell and Hood River are less than 20 miles of the project area. The communities of Dufur and The Dalles are less than 20 miles to the east / northeast of the project area. Other communities that may have an interest in the proposal would include Sandy, Gresham and Portland to the West.

The Lava Restoration project area is located on usual and accustomed land for the Confederated Tribes of Warm Springs (as is all of the Mt. Hood National Forest). The Treaty of 1855 granted the Confederated Tribes of the Warm Springs (CTWS) the right of “usual and accustomed” gathering of traditional native plants and “special interest” use. According to the Ethnographic Study of the Mt. Hood National Forest (French et al. 1995), no traditional use areas have been identified in this project area. No activities are proposed that would preclude any granted rights. Fieldwork by the Interdisciplinary Team has revealed that huckleberries exist throughout the majority of the project area and do offer potential for enhancement. This project was developed with feedback and support from the CTWS regarding the potential huckleberry enhancement opportunities identified in the Proposed Action. Therefore, the proposal to implement this project would not have any adverse effect on members of the CTWS.

Although there is no formal tracking system, based on observations, it suspected that many of the foliage/greenery permits are sold to low-income individuals and minorities. The large majority of this projects impact would be within second growth stands (plantations) and is not expected to affect these users because the majority of the disturbance is not in areas where permit harvesting is concentrated. It is likely that the Lava Restoration project would generate more special forest products as the area is treated and new vegetation grows (e.g., huckleberry and bear grass). Therefore, the proposal to implement this project is not expected to have any negative effect on special forest product gatherers.

3.16 Other Required Disclosures

3.16.1 Conflicts with Plans, Policies or Other Jurisdictions

This project would not conflict with any plans or policies of other jurisdictions, including the Tribes. This project would not conflict with any other policies, regulations, or laws, including the Clean Water Act (see Section 3.5), Endangered Species Act (see Sections 3.6, 3.8 and 3.9), National Historic Preservation Act (see Section 3.13) and Clean Air Act (see Section 3.12). Other potential conflicts with plans, policies, or other jurisdictions are discussed below.

3.16.2 Floodplains and Wetlands

There would be very limited impacts to floodplains or wetlands from this project. Due to the steepness of the topography, small stream size and confined nature of streams in this area, floodplain width is fairly limited. The impacts to wetland and floodplains are discussed in Section 3.5, Water Quality. Due to the PDCs and BMPs which are aimed at minimizing the impacts to wetlands and floodplains, there would be minimal direct and indirect effects.

3.16.3 Air Quality

Section 3.12, Fuels Management and Air Quality describe the impacts associated with pile burning on air quality. Pile burning would have a minimal impact on local airshed/air quality. Piles would be burned under conditions that minimize impacts to protected and sensitive areas, and would move smoke away from populated areas in the least amount of time. 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.

3.16.4 Consumers, Civil Rights, Minority Groups, Women, and Environmental Justice

Executive Order No. 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs Federal agencies to address effects accruing in a disproportionate way to minority and low income populations. No disproportionate impacts to consumers, civil rights, minority groups, and women are expected from this project. Commercial thinning work would be implemented by contracts with private businesses. Project contracting for the project's activities would use approved management direction to protect the rights of these private companies. Section 3.15 contains more information on Environmental Justice.

3.16.5 Treaty Resources and Reserved Indian Rights

No impacts on American Indian social, economic, or subsistence rights are anticipated. No impacts are anticipated related to the American Indian Religious Freedom Act. The Confederated Tribe of Warm Springs was contacted in reference to this Proposed Action. More information on consultation with the tribes is available in Chapter 4.

3.16.6 Inventoried Roadless Areas, Unroaded and Potential Wilderness Areas

There would be no impacts to Inventoried Roadless Areas (IRA) as none exist within the project area. The project area contains no unroaded or potential wilderness areas as the project area has a well-developed road system maintained for management activities, including recreation and timber harvest.

3.16.7 Prime Farmlands, Rangelands, and Forestlands

None of the alternatives would have an adverse impact to the productivity of farmland, rangeland, or forestland.

3.16.8 Potential or Unusual Expenditures of Energy

The No Action alternative would not require any expenditure of fuel or energy. The Proposed Action would require expenditures of fuel for workers to access the project area, use power equipment, and to utilize the logging systems. Jet fuel use for helicopter operations would also occur. Overall, the proposed action would not result in any unusual expenditure of fuel.

3.16.9 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that are forever lost and cannot be reversed. Irretrievable commitments of resources are considered to be those that are lost for a period of time and, in time, can be replaced. The use of rock for road surfacing is an irreversible resource commitment.

3.16.10 Conflicts with Plans, Policies, or Other Jurisdictions

NEPA at 40 CRF 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with . . . other environmental review lands and executive orders."

Based on information received during scoping, informal consultation meetings, and analysis in the PA, none of the alternative under consideration would conflict with the plans or policies of other jurisdictions, including the Confederated Tribes of Warm Springs. This project would not conflict with any other policies and regulations or laws, including the Clean Water Act, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, National Historic Preservation Act, and Clean Air Act. Refer to the following sections for discussions regarding these laws:

- Section 3.5 Water Quality – Clean Water Acts;
- Section 3.6 Fisheries and Aquatic Fauna and 3.8 Wildlife – Endangered Species Act;
- Section 3.6 Fisheries and Aquatic Fauna – Magnuson-Stevens Fishery Conservation and Management Act;
- Section 3.13 Cultural Resources– National Historic Preservation Act; and
- Section 3.12 Fuels Management and Air Quality – Clean Air Act

CHAPTER 4 – CONSULTATION AND COORDINATION

The Forest Service consulted with the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment.

4.1 Federal, State and Local Agencies

In addition to the formal government-to-government consultation description below, other state and local agencies were involved in the collaborative process through the Hood River Stewardship Crew. These agencies included: Hood River Soil and Water Conservation District, Oregon Department of Fish & Wildlife, Oregon Department of Forestry, and Hood River County. Each of these agencies also received the scoping information for this project.

4.1.1 Consultation with the National Marine Fisheries Service (NMFS)

Early involvement with NMFS was conducted in regard to listed anadromous fish species and their habitat that occur within or near the action area. A field trip of the action area occurred on July 23, 2013 and a presentation of the draft Proposed Action is scheduled to be presented to the Level 1 team on February 11, 2013. A Biological Assessment would be completed for this project and a Letter of Concurrence would be signed before any final decision is made.

4.1.2 Consultation with the US Fish and Wildlife Service (FWS)

Early involvement with U.S. Fish and Wildlife Service (FWS) was conducted in regard to designated bull trout critical habitat within the action area. A field trip of the action area occurred on July 23, 2013 and a presentation of the draft Proposed Action is scheduled to be presented to the Level 1 team on February 11, 2013. A Biological Assessment would be completed for this project and a Letter of Concurrence would be signed before any final decision is made.

The effects to northern spotted owls (*Strix occidentalis caurina*) for this project were consulted on with the U.S. Fish and Wildlife Service through informal consultation on FY 2014 activities within the Willamette province that have the potential to adversely affect spotted owls due to habitat modification and disturbance. This project was included in a programmatic informal consultation submitted to the U.S. Fish and Wildlife Service. A Letter of Concurrence is currently pending and would be obtained before any final decision is made.

4.1.3 Consultation with the Oregon State Historic Preservation Officer (SHPO)

The National Historic Preservation Act and the National Environmental Protection Act both require consideration be given to the potential effect of federal undertakings on historic resources, (including historic and protohistoric cultural resource sites). The guidelines for assessing effects and for consultation are provided in 36 CFR 800. To implement these guidelines, in 2004, Region 6 of the Forest Service entered a Programmatic Agreement (PA) with the Oregon State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP).

In accordance with the 2004 agreement, the proposed activities of the project, including road decommissioning, temporary road construction, commercial thinning, pile burning, mastication, and non-commercial thinning, involve heavy machinery and ground disturbance and required Heritage Resource inventory surveys. A modified survey strategy was designed and implemented which excluded most of the intensively-treated plantations. The results, findings, and recommendations of the survey have been documented in Heritage Resource Report 2013/060606/0027 (Dryden 2013).

The recommended protective measures would adequately protect the known heritage resources. The site protection measures were developed on the Mt. Hood National Forest to be consistent with the National Historic Preservation Act and adapted for use across the forest. The Oregon State Historic Preservation Officer concurrence is pending on the project and would be obtained before any final decision is made.

4.2 Tribes

The Lava Restoration project area is located on usual and accustomed land for the Confederated Tribes of Warm Springs (as is all of the Mt. Hood National Forest). The Treaty of 1855 granted the Confederated Tribes of the Warm Springs (CTWS) the right of "usual and accustomed" gathering of traditional native plants and "special interest" use. According to the Ethnographic Study of the Mt. Hood National Forest (French et al. 1995), no traditional use areas have been identified in this project area. No activities are proposed that would preclude any granted rights. Fieldwork by the Interdisciplinary Team has revealed that huckleberries exist throughout the majority of the project area and do offer potential for enhancement. This project was developed with feedback and support from the CTWS regarding the potential huckleberry enhancement opportunities identified in the Proposed Action. Therefore, the proposal to implement this project would not have any adverse effect on members of the CTWS.

CTWS was part of the collaborative group who provided guidance in the development and design of the Lava Restoration project and did not raise any issues with the proposed project.

4.3 List of Preparers

The following is a list of Interdisciplinary Team (IDT) members who assisted in the development of the Preliminary Assessment.

Role	**Person**
IDT Leader / NEPA Specialist	Andrew Tierney / Jennie O'Connor Card
Silviculturist	Whitney Olsker
Logging Systems	Andrew Tierney
Roads Engineer	Lucas Jimenez
Geologist	Tom DeRoo
Soil Scientist	John Dodd

Hydrologist	Mark Kreiter
Fish Biologist	Gary Asbridge and Chris Rossel
Wildlife Biologist	Patty Walcott
Botanist / Invasive Species	Susan Nugent
Aquatic Conservation Strategy	Mark Kreiter
Fuels Specialist	Leo Segovia
Recreation / Visual Quality	Edan Lira and Beth Kennedy
Heritage Resource Specialist	Mike Dryden
GIS	Cathy Bauer and Andrew Tierney

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APPENDIX 1

Hood River Collaborative Stewardship Group
Recommendations for the Lava Planning Area
July 2013

Plantation Thinning Recommendation: Variable density thin from below with skips (leave islands) and gaps (openings up to two acres). (Rocky Mountain Elk Foundation does not agree on gap size. They prefer bigger gaps for greater quantity and quality forage). If there is a site specific reason, such as white pine planting areas, up to 3 acre gaps is suggested (Oregon Wild does not agree). Base the silvicultural cutting prescription on function and structure of the stand and leave the best. Gaps are preferred on flat ground and not near open roads (wildlife harassment issue) or too close to private timber land (past logging has already created forage opportunities). Incorporate wet areas, legacy trees, and downed timber into skips.

Improvements/Objectives: Scattered openings will foster deer and elk grazing. Thinning will increase species diversity, reduce tree stress, insect and pathogen related mortality, and increase structural diversity.

Riparian Enhancement Recommendation: Some thinning in the Riparian Reserve, but not in the true Riparian zone located directly adjacent to the water body. Some skips and no gaps within the treatment portion of the riparian reserve. Existing openings in the Riparian Reserve can be utilized. Thinning in the Riparian Reserve should not increase water temperature or measured sedimentation.

Improvements/Objectives: We also recommend opportunities for stream enhancement and restoration that create downed woody debris and/or planting (shade tolerant species) for diversity. Fish habitat is improved. Plantation stands are disrupted to create more viable long-term forests and promote restoration of a large tree component. Reduction of the current Douglas fir monoculture is important. Retain minor species (western hemlock, western red cedar, etc). Funds are generated to support restoration activities.

Forest Health Treatment*:* Majority of members agree with treating Unit 54 for forest health. (BARK and Oregon Wild advocate no cutting in this unit). Utilize variable density thinning. Incorporate areas of downed timber and legacy trees into skips.

Oregon Wild does not see any ecological benefit to logging this never-before-logged stand. This native forest is more complex than much of the surrounding forest. As most of the surrounding forests in this subwatershed have been logged in the past, Oregon Wild believes that it’s important to retain some intact untreated stands.

Huckleberry Enhancement Recommendation: Treat units 52 and 53 for huckleberry enhancement according to silvicultural treatment prescription.

BARK and Oregon Wild do not support logging units 52 and 53 for several reasons. The units are healthy intact potential wilderness and roadless forests directly adjacent to the Mount Hood Wilderness. Logging at the Vista Ridge trailhead is in conflict with recreational interests and uses and will degrade the user experience. This forest is high elevation and will not quickly recover as is evidenced by nearby old clear cut scars on the landscape.

Huckleberry growth will be encouraged in numerous stands in this project that are far less controversial. There has also been plenty of opportunity for huckleberry growth in nearby burned areas. With both the burned areas opportunity for huckleberries as well as the majority of other units encouraging huckleberry growth there is no need to include these additional sensitive and controversial units in the project. These units had been included and were dropped from the Red Hill project which we felt was a positive collaborative compromise, seeing them again in this project did not encourage trust. Collaborative group has consensus to defer units 49 and 50 until monitoring of units 52 and 53 show huckleberry enhancement results.

Improvements/Objectives: Greater huckleberry availability for tribal members. Better understanding of where and how huckleberries thrive because we haven't had enough experiments with different logging approaches over the last seven decades on Mount Hood.

Roads Recommendation: For roads not projected to be used in the next 10 years, stormproofing, at a minimum, should be used to improve hydrologic function. Sight lines from major roads should be obliterated to minimize improper use.

Improvements/Objectives: Reduced erosion and improved water quality.

Final Recommendation: Peer review after logging to see if objectives were met.

APPENDIX 2

Lava Preliminary Assessment - Best Management Practices for water quality protection

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Plan-2. Project Planning and Analysis	Use the project planning, environmental analysis, and decision making processes to incorporate water quality management BMPs into project design and implementation.	The project planning, environmental analysis, and decision making process is the framework for incorporating water quality management BMPs into project design and implementation. The process should identify likely direct, indirect, or cumulative impacts from the proposed project or management activities on soils, water quality, and riparian resources in the project area. Project documents (plans, contracts, permits, etc.) should include site-specific BMP prescriptions to meet water quality objectives as directed by the environmental analysis. Project planning should ensure that activities are consistent with land management plan direction; State BMPs, floodplain, wetland, coastal zone; and other requirements including CWA 401 certification, CWA 402 permits, and CWA 404 permits; wilderness or wild and scenic river designations; and other Federal, State, and local rules and regulations.	Hydrologists, fish biologists, geologists, and soil scientists evaluate watershed characteristics and estimate response to proposed activities. The project is designed to include site-specific prescriptions for each area of water quality concern. The subsequent contract would include provisions to meet water quality criteria and other resource protection requirements as provided by the PA. The Forest Service Contracting Officer or his/her designee would monitor the implementation of the PDCs during construction and operations on regular basis and would have the authority to provide direction and/or take action if construction or	Throughout the planning process The IDT reviewed the list of recommended methods from the BMP Technical Guide and developed project level PDCs based on the methods where applicable and PDC D-1, D-2	High	High based on experience and fact	Monitored throughout the NEPA planning process. The project will be in a pool of timber/stewardship sale projects where District Rangers will conduct a “Plan in Hand” review on a minimum of one timber/stewardship sale within each zone every other year. The goal of the review is to monitor and evaluate forest resource management prescriptions to measure compliance with goals and objectives, determine effects, and adjust subsequent management actions when needed as required by Forest Service Manual direction. The Forest Service Contracting Officer or his/her designee would monitor the implementation of the PDCs, as described in implementation and responsibility. This project would go into a pool of similar projects to be selected for project level BMP

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
			operations are not conducted according to the PDC				implementation and effectiveness monitoring as per the National BMP Monitoring Protocol. If selected an IDT would evaluate whether the site-specific BMPs were implemented and the effectiveness of the BMPs.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Plan-3. Aquatic Management Zone Planning	To maintain and improve or restore the condition of land around and adjacent to waterbodies in the context of the environment in which they are located, recognizing their unique values and importance to water quality while implementing land and resource management activities.	The land around and adjacent to waterbodies plays an important ecologic role in maintaining the structure, function, and processes of the aquatic ecosystem. These areas provide shading, soil stabilization, sediment and water filtering, large woody debris recruitment, and habitat for a diversity of plants and animals. The quality and quantity of water resources and aquatic habitats may be adversely affected by ground-disturbing activities that occur on these areas. Protection and improvement of soil, water, and vegetation are to be emphasized while managing these areas under the principles of multiple use and sustained yield. Designation of a zone encompassing these areas around and adjacent to a waterbody is a common BMP to facilitate management emphasizing aquatic and riparian-dependent resources. These management zones are known by several common terms such as streamside management area or zone, riparian management area, stream environment zone, and water influence zone. For purposes of the National Core BMPs, these areas would be referred to as AMZs. Local regulation often stipulates the area and extent of AMZs and may be listed in land management plans; biological opinions, evaluations, or assessments; and other regional or State laws, regulations, and policies.	The AMZ requirements are identified by an interdisciplinary team during the environmental analysis. The project is designed to include site-specific BMP prescriptions for the prevention of sedimentation and other stream damage from construction and operations. The Forest Service Contracting Officer or his/her designee would monitor the implementation of the PDCs during construction and operations on regular basis and would have the authority to provide direction and/or take action if construction or operations are not conducted according to the PDC.	Throughout the planning process and PDC V-2, V-3, F-3, R-14, L-2, L-3, A-1 through A-8, D-9, D-13, D-14, D-19	Moderate to High	Moderate to High based on literature, experience and fact	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
AqEco-2. Operations in Aquatic Ecosystems	Avoid, minimize, or mitigate adverse impacts to water quality when working in aquatic ecosystems.	Common construction or maintenance operations in waterbodies often involve ground disturbance. The close proximity to, and contact with, the waterbody increases the potential for introducing sediment and other pollutants that can affect water quality. This BMP includes practices for minimizing direct and indirect water quality impacts when working in or adjacent to waterbodies.	The project is designed to include site-specific prescriptions for each area of water quality concern. The subsequent contract would include provisions to meet water quality criteria and other resource protection requirements as provided by this PA. The IDT will coordinate with the personnel developing the contract to insure that PDCs associated with the BMP are incorporated into the contract. The Forest Service Contract Administrator or his/her designee would monitor the implementation of the PDCs during construction and operations on regular basis and would have the authority to provide direction and/or take action if construction or operations are not conducted according to the PDC.	PDC R-10, R-11, R-14, L-3, A-1, A-2, A-4, A-5, A-6, A-9 through 13, A-15, D-2 through D-9, D-13 through D-16, D-19	Moderate to High	Moderate to High based on literature, experience and fact	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Road-1. Travel Management Planning and Analysis	Use the travel management planning and analysis processes to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during road management activities.	Road management related planning includes travel analyses as well as consideration of road management objectives and maintenance levels to address access needs and adjustments for projects. Planning occurs at scales that range from forestwide assessments and plans, to watershed scale or project-level analyses, to individual road activities. Effects to soil, water quality, and riparian resources are evaluated during planning and balanced with the social, economic, and land management needs of the area. Appropriate protection and mitigation measures are considered when soil, water quality, and riparian resources may be adversely impacted. Project-level travel analyses are conducted to inform decisions and facilitate vegetation, fire and fuels, rangeland, recreation, minerals, or other management actions. Such analyses contain detail on the condition of individual roads. Road Management Objectives (RMOs) are developed and documented for each system road and include the intent and purpose in providing access to implement the land management plan. In addition to considering route needs at the site scale, RMOs also document the purpose of the road (access needs) along with operational maintenance levels and objectives.	Hydrologists, fish biologists, geologists, soil scientists and roads project engineers on the IDT for the project evaluate the road network and develop PDCs to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during road management activities. The subsequent contract to implement the project will include provisions to meet water quality criteria and other resource protection requirements during road management activities. The IDT will coordinate with the personnel developing the contract to insure that PDCs associated with the BMP are incorporated into the contract The Forest Service Contracting Officer or his/her designee would monitor the implementation of the PDCs during project	Throughout the NEPA planning process Travel management planning at the project level is included in the PA at s. 3.2. The proposed road actions are described in s. 2.2.	High	High based on experience	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
			implementation on regular basis and will have the authority to provide direction and/or take action if construction or operations are not conducted according to the project design criteria.				
Road-3. Road Construction and Reconstruction	Avoid or minimize adverse effects to soil, water quality, and riparian resources from erosion, sediment, and other pollutant delivery during road construction or reconstruction.	During road construction and reconstruction activities, vegetation and ground cover is removed exposing soil to erosion. Temporary and long-term erosion control and stormwater management measures are necessary to reduce erosion and maintain overall slope stability. These erosion control measures may include vegetative and structural practices to ensure long-term stability of the area.	Same as previous BMP.	PDC R-10 through R-13, A-9 through A-13, D-9, D-13, D-15	High	Moderate to High based on literature, experience and fact	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Road-4. Road Operations and Maintenance	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by controlling road use and operations and providing adequate and appropriate maintenance to minimize sediment production and other pollutants during the useful life of the road.	Control of road use and operations and appropriate maintenance can protect road investment and soil, water quality, and riparian resources. Periodic inventory and assessment that determine road condition are used to determine operational controls and maintenance needs. Operational objectives and activities are documented in the RMOs. In travel management decisions, roads open to motorized vehicle use are designated by allowed vehicle class and, if appropriate, by time of year. Road operations include administering permits, contracts, and agreements, controlling allowed use, maintaining roads in closed status, and revising maintenance levels and seasonal closures as needed. Road closures and restrictions are necessary because many forest roads are designed for dry season use. Many local roads are not surfaced; while others have some surfacing but little to no base. Such roads can be damaged by use during wet periods or by loads heavier than the road was designed to convey. Properly maintained road surfaces and drainage systems can reduce adverse effects to water resources by encouraging natural hydrologic function. Roads and drainage systems normally deteriorate because of traffic, weather, and age. In addition, roads occasionally become saturated by groundwater springs and seeps after a wildfire or unusually wet periods. Many such conditions can be corrected by timely maintenance. While routine maintenance is needed to ensure the road performs as designed, however, it can also be a source of soil disturbance, concentrated flow, sediment production, and slope instability if done improperly. Lower impact maintenance techniques may be desired to minimize disturbance of stable sites.	Same as previous BMP.	PDC R-1, R-10, R-12, R-13, L-1, L-2, A-6, A-9 through A-13, D-1	High	Moderate to High based on literature, experience and fact	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Road-5. Temporary Roads	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from the construction and use of temporary roads.	Temporary roads may be used in situations where access needs are short-term and the roads can be constructed without requiring advanced engineering design or construction practices to avoid, minimize, or mitigate adverse effects to resources. Practices related to road location and stormwater and erosion control should be applied to temporary roads. Temporary roads are to be decommissioned and the area returned to resource production after the access is no longer needed.	Same as previous BMP.	PDC R-6, R-9 through R-12, L-3, A-6	High	Moderate to High based on literature, experience and fact	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Road-6. Road Storage and Decommissioning	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by storing closed roads not needed for at least 1 year (Intermittent Stored Service) and decommissioning unneeded roads in a hydrologically stable manner to eliminate hydrologic connectivity, restore natural flow patterns, and minimize soil erosion.	Roads not needed for access for long periods (greater than 1 year) may be put into storage (Intermittent Stored Service—Maintenance Level 1) to reduce maintenance costs. Level 1 roads receive basic custodial maintenance focusing on maintaining drainage facilities and runoff patterns to avoid or minimize damage to adjacent resources and to perpetuate the road for future use. The integrity of the roadway is retained to the extent practicable and measures are implemented to reduce sediment delivery from the road surface and fills and reduce the risk of crossing failure and stream diversion. Roads no longer needed are identified during transportation planning activities at the forest, watershed, or project level. The former road may be decommissioned or converted to a trail as appropriate. Decommissioned roads are stabilized and restored to a more natural state to protect and enhance NFS lands. Temporary roads constructed for a specific short-term purpose (e.g., ski area development, minerals exploration, or timber harvesting) are decommissioned at the completion of their intended use. Road decommissioning includes a variety of treatments to block the road, revegetate the road surface, restore surface drainage, remove crossing structures and fills, mitigate road surface compaction, re-establish drainageways, remove unstable road embankments, and recontour the surface to restore natural slopes. One or more treatments are applied to decommission the road depending on resource objectives and cost.	Same as previous BMP.	PDC R-4, R-8, D-1 through D-9, D-13 through D-16, D19	Moderate to High	Moderate to High based on literature, experience and fact	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Road-7. Stream Crossings	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when constructing, reconstructing, or maintaining temporary and permanent waterbody crossings.	Crossings should be designed and installed to provide for flow of water, bedload, and large woody debris, desired aquatic organism passage, and to minimize disturbance to the surface and shallow groundwater resources. Construction, reconstruction, and maintenance of a crossing usually requires heavy equipment to be in and near streams, lakes, and other aquatic habitats to install or remove culverts, fords, and bridges, and their associated fills, abutments, piles, and cribbing. Such disturbance near the waterbody can increase the potential for accelerated erosion and sedimentation by altering flow paths and destabilizing streambanks or shorelines, removing vegetation and ground cover, and exposing or compacting the soil. Use of heavy equipment has a potential for contaminating the surface water from vehicle fluids or introducing aquatic nuisance species.	Same as previous BMP.	PDC R-12, R-13, R-14, D-1, D-2, D-13, D-19, L-3	High	Moderate to High based on literature, experience and fact	Same as previous BMP.
Road-8. Snow Removal and Storage	Avoid or minimize erosion, sedimentation, and chemical pollution that may result from snow removal and storage activities.	Snow removal from roads and parking areas may adversely affect water quality and riparian resources in several ways. Plowing may physically displace native or engineered surfaces on roads, damage drainage structures, or alter drainage patterns. Plowing may also remove protective soil cover (e.g., vegetation or mulch). These changes can result in concentrated flow, increased erosion, and greater risk of sediment delivery to waterbodies. Snow piled in large mounds or berms, or in sensitive areas, may contribute to increased run-off, hill slope erosion, mass slope instability, and in-channel erosion from snowmelt. Snow stored in riparian areas and floodplains may compact soils, break or stunt vegetation, or channel runoff in undesirable	Same as previous BMP.	PDC L-1	High	High based on experience	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
		patterns, thereby weakening the buffering capacity of these areas. Additionally, both snow removal and storage may result in additions of salts or fine aggregates used for de-icing or traction control and other vehicle pollutants directly to surface water and indirectly to both surface water and groundwater during runoff.					
Road-10. Equipment Refueling and Servicing	Avoid or minimize adverse effects to soil, water quality, and riparian resources from fuels, lubricants, cleaners, and other harmful materials discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources during equipment refueling and servicing activities.	Many activities require the use and maintenance of petroleum-powered equipment in the field. For example, mechanical vegetation management activities may employ equipment that uses or contains gasoline, diesel, oil, grease, hydraulic fluids, antifreeze, coolants, cleaning agents, and pesticides. These petroleum and chemical products may pose a risk to contaminating soils, surface water, and groundwaters during refueling and servicing the equipment. BMP Fac-6 (Hazardous Materials) provides additional guidance for handling hazardous materials.	Same as previous BMP.	PDC A-6, A-15, D-4 through D-8	High	Moderate to High based on literature, experience and fact	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Veg-1. Vegetation Management Planning	Use the applicable vegetation management planning processes to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during mechanical vegetation treatment activities.	Vegetation on NFS lands is managed for a variety of purposes to achieve land management plan desired conditions, goals, and objectives for many resources. Planning for vegetation management generally follows a sequence of steps. The gathering and assessment of data involves evaluating the current condition of the vegetation compared to land management plan desired conditions, goals, and objectives. Potential vegetation treatment options to move the site towards desired conditions are developed and compared. Detailed treatment prescriptions are prepared to implement the preferred treatment option. The project is subjected to the National Environmental Policy Act (NEPA) analysis process where alternatives are developed and effects are analyzed. A decision is made and implemented. During the development of vegetation treatment prescriptions and alternatives, site specific measures consistent with BMP guidance to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resource are identified and included in the project as design criteria or mitigation measures. These BMP prescriptions are incorporated into the timber sale contract, stewardship contract, or project plan. Vegetation management for scheduled timber harvest on NFS lands has additional specific requirements from the National Forest Management Act that are incorporated into the project in the planning process. Scheduled timber harvest can occur only where watershed conditions would be maintained, lands can be adequately restocked within 5 years after final regeneration harvest, and water quality would be protected.	Same as previous BMP.	Throughout the planning process	High	High based on experience	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Veg-2. Erosion Prevention and Control	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by implementing measures to control surface erosion, gully formation, mass slope failure, and resulting sediment movement before, during, and after mechanical vegetation treatments.	Prevention and control of erosion on areas undergoing mechanical vegetation treatments is critical to maintaining water quality. The process of erosion control has three basic phases: planning, implementation, and monitoring. During planning, areas subject to excessive erosion, detrimental soil damage and mass failure can be identified and avoided. Also during planning, treatments can be designed and units laid out to minimize or mitigate damage to soils, streambanks, shorelines, wetlands, riparian areas, and water quality. Planning for erosion control is addressed in BMP Plan- 2 (Project Planning and Analysis) and BMP Veg-1 (Vegetation Management Planning). Suitable erosion control measures are implemented while the mechanical vegetation treatment is ongoing and following project completion. Inspection and maintenance of implemented measures would ensure their function and effectiveness over their expected design period. The potential for accelerated erosion or other soil damage during or following mechanical treatments depends on climate, soil type, site conditions, and type of equipment and techniques used at the site. Erosion control measures are grouped into two general categories: structural measures to control and treat runoff and increase infiltration and nonstructural measures to increase ground cover. Many erosion control handbooks, technical guides, and commercial products are available. Both structural and nonstructural measures require onsite expertise to ensure proper design and implementation to conform to local site characteristics.	Same as previous BMP.	PDC A-1, A-4, A-5, F-3, S-2	High	High based on literature, experience and fact	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Veg-3. Aquatic Management Zones	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when conducting mechanical vegetation treatment activities in the AMZ.	Designation of an AMZ around and adjacent to waterbodies is a typical BMP to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources. Mechanical vegetation treatments are a tool that can be used within the AMZ to achieve a variety of resource-desired conditions and objectives when implemented with suitable measures to maintain riparian and aquatic ecosystem structure, function, and processes. Depending on site conditions and resource desired conditions and objectives, mechanical vegetation treatments in the AMZ could range from no activity or equipment exclusion to purposely using mechanical equipment to create desired disturbances or conditions. When treatments are to be used in the AMZ, a variety of measures can be employed to avoid, minimize, or mitigate soil disturbance, damage to the waterbody, loss of large woody debris recruitment, and shading, and impacts to floodplain function.	Same as previous BMP.	PDC V-2, V-3, F-3, A-1 through A-5, A-7, A-8, S-2	Moderate to High	Moderate to High based on literature, experience and fact	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Veg-4. Ground-Based Skidding and Yarding Operations	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during ground-based skidding and yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies.	Ground-based yarding systems include an array of equipment from horses, rubber-tired skidders, and bulldozers, to feller or bunchers, forwarders, and harvesters. Each method can compact soil and cause soil disturbance, though the amount of impact depends on the specific type of equipment used, the operator, unit design, and site conditions. Ground-based yarding systems can be designed and implemented to avoid, minimize, or mitigate potential adverse effects to soils, water quality, and riparian resources.	Same as previous BMP.	PDC A-1 through A-4, S-1, S-3	Moderate to High	Moderate to High based on literature, experience and fact	Same as previous BMP.
Veg-5. Cable and Aerial Yarding Operations	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during cable and aerial yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies.	Cable and aerial yarding systems partially or fully suspend logs off the ground when yarding logs to the landing. They include skyline cable, helicopter, and balloon systems that typically are used in steep, erodible, and unstable areas where ground-based systems should not operate. Soil disturbance and erosion risks from these systems are primarily confined to cable corridors and landings.	Same as previous BMP.	PDC A-2, A-3, A-7, A-8	Moderate to High	Moderate to High based on literature, experience	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Veg-6. Landings	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from the construction and use of log landings.	Log landings, in general, are the site of intense activity, serving as the endpoint of yarding operations, the setup location of large equipment (such as skyline yarders), loading areas for log trucks, and fueling and maintenance locations for heavy equipment. To accommodate all this activity, landings tend to be large, and their soils generally become compacted, rutted, and disturbed much more than the rest of the project area. Thus, landings have a high probability of being a source of concentrated overland flow containing sediment and other pollutants.	Same as previous BMP.	PDC A-5	High	High based on literature, experience and fact	Same as previous BMP.
Veg-7. Winter Logging	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from winter logging activities.	Winter logging on frozen or snow-covered ground is a common BMP in the colder regions of the country to avoid or minimize soil, watershed, riparian, and wetland impacts. Winter logging is not without risks of watershed effects. Unknowingly operating in wetland or riparian areas when the snow cover is inadequate can cause damage to soil and vegetation. Skidding or hauling on roads when the roadbed or the soil is not sufficiently frozen can cause soil compaction and rutting. Inadequate installation and maintenance of erosion controls before snowmelt and spring runoff can cause accelerated erosion and damage to roads.	Same as previous BMP.	PDC S-3	Moderate	High based on experience	Same as previous BMP.

BMP Title (2012 National Core BMP Technical Guide)	Objective	Explanation	Implementation and Responsibility	Project Details and Project Design Criteria (PDC)	Ability to Implement	Effectiveness	Monitoring
Veg-8. Mechanical Site Treatment	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by controlling the introduction of sediment, nutrients, chemical, or other pollutants to waterbodies during mechanical site treatment.	Mechanical treatments are used to remove or reduce the amount of live and dead vegetation on a site to meet management objectives, such as site preparation for reforestation, fuel treatments to reduce fire hazards, wildlife habitat improvement, recreation access, utility corridor maintenance, and other activities that require removing vegetation from specified areas on a periodic and repeated basis. Mechanical treatments include cutting and piling; chipping or mulching; roller chopping or masticating using heavy equipment; and pushing over vegetation. Disturbance from mechanical site treatments can expose and compact soils, resulting in accelerated runoff and erosion.	Same as previous BMP.	PDC F-4	High	High based on experience	Same as previous BMP.

Criteria for Rating “Ability to Implement” and BMP “Effectiveness”

These estimates are general, given the range of conditions throughout the Forest. More specific estimates are made at the project level when the specific BMPs are developed.

Ability to implement

Provides a qualitative estimate of the ability of the Forest Service to implement the BMP. The following index is used to rate the ability to implement as either High, Moderate or Low:

High: Almost certain the BMP can be implemented as planned.

Moderate: Greater than 75% certainty the BMP can be implemented as planned.

Low: Less than 75% certainty the BMP can be implemented as planned.

Effectiveness

Provides a qualitative assessment of the expected effectiveness that the applied measure would have on preventing or reducing impacts on water quality and beneficial uses. The effectiveness of each BMP would be evaluated with an index that rates the effectiveness of each BMP as either High, Moderate, or Low.

High: Practice is highly effective (90%) and one or more of the following types of documentation are available:

- Literature/Research - must be applicable to area.
- Administrative studies-local or within similar ecosystem.
- Experience- judgment of an expert by education and/or experience.
- Fact-obvious by reasoned (logical) response.

Moderate: Documentation shows that the practice is effective less than 90% of the time, but at least 75% of the time; or logic indicates that this practice is highly effective, but there is little or no documentation to back it up.

Low: Effectiveness unknown or unverified, and there is little or no documentation; **or** applied logic is uncertain in this case, **or** the practice is estimated to be less than 75% effective.

Effectiveness of BMPs are based on guidance from the National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide (USDA, 2012), models, literature, research, 25 years of monitoring implementation of projects on National Forest Lands in the Northwest and professional experience.

Models include:

- Water Erosion Prediction Project (WEPP) (USDA Forest Service, 1999).

Other Applicable BMP Software:

- Erosion Draw 4.0 (Erosion Control Standards and Construction Drawings – Salix Applied Earthcare, 2002)

Relevant research includes:

- Effectiveness Of Timber Harvest Practices For Controlling Sediment Related Water Quality Impacts (Rashin et. al. 2006).

- Sediment Trapping by Streamside Management Zones of Various Widths after Forest Harvest and Site Preparation (Lakel and others, 2010).

- Reduction of soil erosion on forest roads (Burroughs and King, 1989)

Monitoring Includes:

Administrative BMP Monitoring Studies, Mt. Hood National Forest: Various administrative monitoring studies were planned and implemented from 1997 through 2004. Monitoring for BMP implementation and effectiveness was performed on a wide variety of BMPs, ranging from riparian reserve protection to temporary road construction. Monitoring results are summarized in the Forest Plan Monitoring and Evaluation Reports for Fiscal Years 1997 through 2004. BMP monitoring completed during this period indicates that overall the BMPs monitored were prescribed and implemented as planned, resulting in adequate soil and water protection in most instances.

Best Management Practices Evaluation Program (BMPEP), 1992-2002 Monitoring Results (Draft Report). USDA Forest Service, Pacific Southwest Region, Pacific Southwest Region
This draft report summarizes the results of the USDA Forest Service, Pacific Southwest Region, Best Management Practices Evaluation Program (BMPEP), from 1992 to 2002. Past monitoring completed as part of the BMPEP program has validated the effectiveness of BMPs in mitigating the effects of forest management activities on water quality.

Monitoring done during the Mount Hood National Forest administrative studies cited generally correlates well with the extensive monitoring done during the BMPEP monitoring program in the Pacific Southwest Region. .

Professional Experience - A small group of local professionals further refined assignments of “Ability to Implement” and “Effectiveness” ratings for Lava PDC and BMP based on experience. This group consisted of a Soil Scientist with over 25 years of professional experience in planning, monitoring and implementation of a variety of Forest Service projects in the Pacific Northwest, a Fisheries Biologist with over 23 years of professional experience in planning, monitoring and implementation of a variety of Forest Service projects in the Pacific Northwest and a Hydrologist with over 25 years of professional experience in planning, monitoring and implementation of a variety of Forest Service projects in the Pacific Northwest. The resource professionals assessment of the ‘Ability to Implement” and “Effectiveness” ratings for BMPs was validated with the area Forest Service Representative who has 25 years of experience administrating Forest Service Timber Sale Contracts.