United States
Department of
Agriculture

Forest
Service

November
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Red Hill Restoration

Preliminary Assessment

Hood River Ranger District
Mt. Hood National Forest

Hood River County, Oregon

Legal Description: T1S R8-9E; T2S, R8E; Willamette Meridian

West Fork Hood River Watershed

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SUMMARY

The Red Hill Restoration project is located on the Hood River Ranger District within the West Fork Hood River Watershed. The project area includes approximately 12,000 acres. About 90% of the project area is within C1 (Timber Emphasis) land allocation, with the majority (80%) in Matrix lands.

The stand composition, structure and densities in the project area have been altered by fire suppression efforts over the past 100 years; favorable climatic conditions for vegetation growth; and, increased presence and scale of native and non-native insects and diseases. This high density of the stands contributes to mortality of trees because of competition for nutrients, water and sunlight. Insects and diseases are more likely to kill trees that grow in dense, crowded conditions. Also, stand structure changes from lack of small and large-scale disturbance events, such as fire and wind events, have resulted in higher stocking level 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 Red Hill Restoration proposal is to improve overall forest conditions in the Upper West Fork Hood River Watershed through stand thinning and road treatments. The Proposed Action includes treating approximately 1,500 acres with plantation thinning, plantation thinning with riparian enhancements, thinning for forest health improvement, and sapling thinning. 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 variable density thinning 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 variable density thinning 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 variable density thinning. Leave trees would include minor species and would include trees with the elements of wood decay.

In addition, 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. This project would decommission approximately 12 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 would be 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 would be stabilized and restored to a more natural state. A decommissioned road would be removed from the Forest's transportation system and would no longer receive any maintenance. In addition, 3.3 miles of road would have a year-round closure and 5.6 miles of road would be storm proofed, where the roads are upgraded to minimize the aquatic risk associated with the road by improving the road conditions.

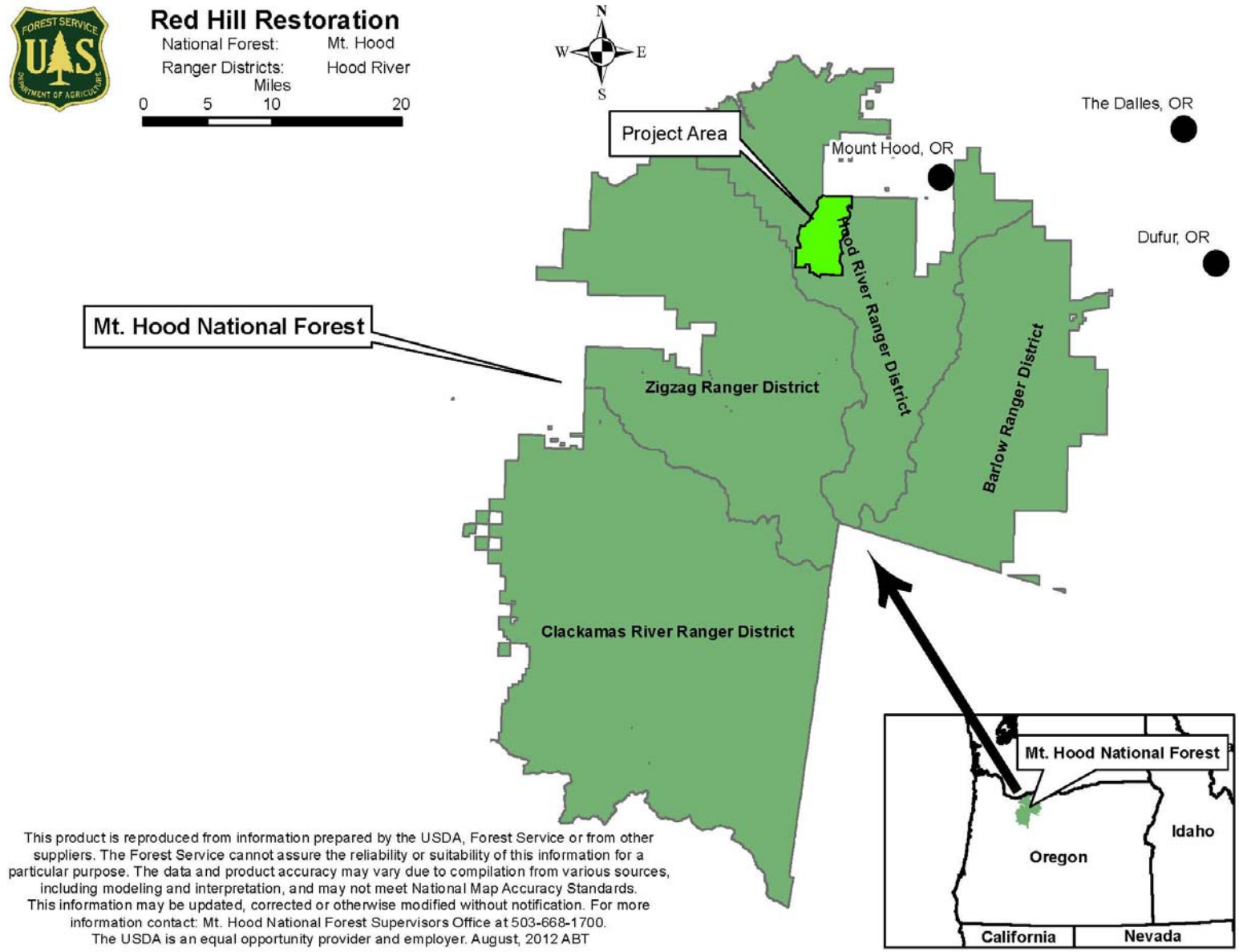

Figure 1-1: Vicinity Map of Red Hill Restoration Planning Area

CHAPTER 1 – INTRODUCTION

The Red Hill Restoration project is located on the Hood River Ranger District within the West Fork Hood River Watershed. The project area includes approximately 12,000 acres. About 90% of the project area is within C1 (Timber Emphasis) land allocation, with the majority (80%) in Matrix lands. The stand composition, structure, and densities in Red Hill project area have been altered by:

- Fire suppression efforts over the past 100 years;
- Favorable climatic conditions for vegetation growth; and,
- Increased presence and scale of native and non-native insects and diseases.

This high density of the stands contributes to mortality of trees because of competition for nutrients, water and sunlight. Insects and diseases are more likely to kill trees that grow in dense, crowded conditions. Additionally, stand structure changes from lack of small and large-scale disturbance events, such as fire and wind events, have resulted in higher stocking level 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 Environmental 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 Environmental Assessment and a list of preparers.

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

1.2 Background

The project area includes a variety of healthy and unhealthy, mature stands. High densities as well as insect and disease are the major contributors to poor forest health in this area. 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. These conditions have made most of the stands in the watershed susceptible to root disease and root decay. In addition, at higher elevations stand conditions are susceptive to other insect and diseases, such as the balsam wooly adelgid. As a result of the current situation within the Upper West Fork Hood River sub-watershed, this project was undertaken to improve overall forest conditions within the watershed.

The tables below show the current project area conditions, historical conditions, and a comparison of the current conditions to historical conditions.

Table 1-1: Current Project Area Conditions

Age Class	% of Project Area
< 20 Years	13%
21-40 Years	14%
41-60 Years	15%
61-80 Years	17%
81-100 Years	14%
101-120 Years	9%
121-140 Years	5%
141-160 Years	3%
161-180 Years	2%
181-200 Years	2%
200 + Years	5%
Unknown (private lands)	1%

Stand Structure	% of Project Area
Sparse <10% Cover	7%
Open 10-40% Cover	21%
Sapling/Pole >40% cover with QMD* of 10”	20%
Small/Medium >40% cover with QMD of 10-20”	35%
Large Tree >40% cover with QMD of 20-30”	12%
Large/Giant >40% cover with QMD of >30”	4%
Unknown (private lands)	1%

***** Quadratic mean diameter (QMD) is the diameter corresponding to the tree of arithmetic mean basal area, or average diameter by basal area. See the Chapter 3, Vegetation Resources Section 3.1 for more details

Table 1-2: Historic Area Conditions based on Dominate Plant Associations Groups (Western Hemlock/Dwarf Oregon grape-salal and Pacific Silver Fir/Alaska Huckleberry)

Historical Stand Structure	Percent of Project Area
Open	5%
Early Successional (initiation)	10-15%
Young (initiation, stem exclusion)	25-30%
Mature (stem exclusion, reinitiating)	10-20%
Old Growth	30-50%

Table 1-3: Comparison of Current Stand Conditions to Historical Conditions

Stand Structure	Current Percentage	Historical Percentage (Average for the Range)
Open	5%	5%
Early Successional	13%	12%
Young	29%	28%
Mature	40%	15%
Old Growth	17%	40%

The Red Hill Restoration interdisciplinary planning team took a holistic landscape approach with the sub-watershed planning area (16,270 acres). This planning area originally included a portion of the Bull Run Late-Successional Reserve (LSR) as well as private land and Bonneville Power Administration (BPA) in-holdings. Treatments on the in-holdings were not considered as part of this project, but they were considered when evaluating the watershed conditions. After completing the preliminary effects analysis and evaluating the current staffing to complete field surveys, the planning team determined that the geographic scope of the project was too large. Therefore, the planning area was reduced given the following considerations.

- The Bull Run LSR does not have a completed LSR Assessment and current direction in the Northwest Forest Plan prohibits treatment within the LSR until such a plan is completed. As such, these acres were dropped from further consideration.

- There currently is an unroaded area in the Lost Lake Butte area adjacent to the Bull Run LSR that is estimated to be over 1000 acres in size. It was determined to defer planning in this area until such time that treatment in the LSR was under consideration.

Within the resulting planning area (approximately 12,000 acres), proposed treatment areas were designed to address the forest ecosystem health issues based on the land use allocations and the overall purpose for this project as discussed in the following sections.

Using these sideboards, the Hood River Collaborative Stewardship Crew visited the project area and provided recommendations and the planning team conducted field surveys. Each of these efforts further refined the Proposed Action. For example, wildlife and fuels reduction treatments were dropped from further consideration because the field surveys revealed that no treatments

were necessary to achieve the desired future condition. Another example is that units were dropped or re-shaped to address riparian and slope stability issues identified on-the-ground. Also, units were dropped and treatments were changed when it was discovered that access was not economically or environmentally viable. Based on the field work and collaborative group recommendations (see Appendix 1), the final Proposed Action treats approximately 1,500 acres in the West Fork of Hood River Watershed. These treatments are fully described in Section 2.2, Proposed Action.

1.3 Purpose and Need for Action

In order to improve the overall forest conditions within the watershed, the purpose of the Red Hill Restoration project is to:

- Increase health and vigor, and enhance growth by releasing trees through a variable density thinning from below treatment to increase diameter and height growth of selected stands;
- Improve structural and species diversity within selected stands by reducing competition induced tree growth suppression and mortality, and by releasing leave trees through a variable density thinning from below to increase diameter and height growth; and,
- Maintain or enhance aquatic habitat and riparian conditions by improving forest ecosystem health of selected stands within riparian corridors and by decommissioning, closing and improving roads.

As such, the underlying need for the Red Hill Restoration project is to:

- Reduce the risk of sediment delivery to streams and reservoirs by decommissioning, closing or improving roads within the project area; and,
- Provide wood fiber for local and regional economies.

1.3.1 Management Direction

The Red Hill 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 of Hood River Watershed Analysis (US Forest Service, 1996). This Environmental 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 Environmental 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 Environmental Assessment is tiered to the West Fork Hood River Watershed Analysis. The West Fork covers approximately 65,500 acres between Mt. Hood and the mainstem Hood River. About 65 percent of the watershed, or 42,728 acres, is National Forest System lands. 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). The West Fork watershed is partially 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). The watershed analysis reviews disturbance regimes and processes, vegetation conditions, invasive plant introductions, wildlife species presence and viability, recreation use levels, other ownerships, extractive forest products, and Bull Run Management Unit buffer. The watershed analysis makes recommendations generated from the analysis and potential restoration projects.

1.3.2 Desired Future Conditions and Land Allocations

The desired future condition for the upland and riparian vegetation treatments 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 improve watershed conditions to move towards hydrologic and sediment regimes that function within their ranges of natural variability. Achieving this desired future condition would enable meeting the overall goals of the land use allocations within the project area and recommendations within the watershed analysis as described below. Figures 1-2 and 1-3 illustrate the existing conditions and desired future conditions for the vegetation treatments.

Figure 1-2: Existing Conditions within Red Hill Restoration planning area. Photo A – Dense, overstocked stands. Photo B – Dense closed canopy

Figure 1-3: Desired Future Condition in Red Hill Restoration planning area.

Several land allocations as designated by the Forest Plan and NWFP are found within the project area. The primary land use allocations in the planning area are C1-Timber Emphasis, A-9 Key Site Riparian, and B10-Deer and Elk Winter Range. In addition, the secondary Forest Plan land use allocations are B2-Scenic Viewshed and B5-Pileated Woodpecker and Pine Marten Habitat. Where these secondary land use allocations have more stringent standards and guidelines than the primary land use allocations, the secondary land use allocation standards and guidelines would be followed. See Figure 1-4 for a map of the land use allocations within the planning area.

The goal of Timber Emphasis lands (C1) is to provide lumber, wood fiber, and other forest products on a fully regulated basis, based on the capability and suitability of the land. A secondary goal is to enhance other resource uses and values that are compatible with timber production (Forest Plan page 4-289 to 4-290). The goal of Key Site Riparian land (A9) is to maintain or enhance habitat and hydrologic conditions of selected riparian areas, notable for their exceptional diversity, high natural quality and key role in providing for the continued production of riparian dependent resource values (Forest Plan page 4-179 to 4-181). Lastly, the goal of Deer and Elk Winter Range (B10) is to provide high quality deer and elk habitat for use during most winters, and provide for stable populations 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).

For Timber Emphasis, the major characteristics for the desired future conditions as related to this project are (Forest Plan page 4-289 to 4-290):

- Primary road system is suitable for passenger cars. Local roads are suitable for high clearance vehicles;
- Some roads may be closed part of the year or for several years at a time;
- Areas inaccessible by roads are open to aerial logging and foot travel;
- Extensive stands of trees at various stages of development, arranged in a mosaic pattern that is somewhat random but shows the clear influence of landform, productivity and management objectives;
- On intensively managed areas these would be an even distribution of stand age classes up to approximately 120 years, running from seedlings to mature timber;
- Non-stocked recently harvested areas are in preparation for natural or planted regeneration;
- Understory vegetation consistent with ecological and successional stage of individual areas;
- Many stands have some mature trees held over from previous stands. These trees have specific biological functions; and,
- Diversity of plant and animal communities featuring species dependent on open habitat conditions.

Other management direction for the Red Hill restoration project comes from the NWFP for Matrix and Riparian Reserves. The Matrix consists of those federal lands outside the six categories of designated areas (Congressionally Reserved Areas, Late-Successional Reserves,

Adaptive Management Areas, Managed Late-Successional Areas, Administratively Withdrawn Areas, and Riparian Reserves). Most timber harvest and other silvicultural activities would be conducted in that portion of the Matrix with suitable forest lands, according to standards and guidelines. Riparian Reserves 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 1-5 for a map of NWFP land use allocations within the planning area.

In addition, a watershed analysis was concluded in 1996 and provides recommendations for the West Fork of Hood River watershed. The analysis developed a more detailed Desired Future condition than is stated in either the NWFP or Forest Plan. The key components of the Desired Future Condition (Watershed Analysis page 6-2 to 6-4) that are applicable to this project are listed below.

- Snags are well distributed across the landscape, occurring both as clumps or patches of varying size and as individual trees. Snags vary in size, species, and decay class. Downed logs are also well distributed across the landscape and occur in numbers and sizes more characteristics of the successional stage and ecologic capability of the site.

- The Riparian Mix stand type dominates the riparian areas, occasionally broken by variously sized patches of Riparian Hardwood and Riparian Conifer stand types. Downed logs are also well distributed across the landscape and occur in numbers and sizes more characteristic of the successional stage and ecologic capability of the site.

- Northern spotted owls and other species associated with late successional forest have recovered in the watershed and area well distributed throughout. The watershed supports a diversity of terrestrial wildlife species. The only limited species are those whose habitat has always been scarce in the subwatershed. Populations of species strongly associated with a particular successional stage fluctuate throughout time, but adequate refugia are always present to allow the species to persist long enough to repopulate the area once their typical seral stage returns. Dispersal pathways exist between West Fork and the adjacent watershed for species associated with all successional stages.

- Visitors view a landscape pleasing to the eye with patch sizes and shapes that vary and follow the typical landform. Evidence of harvesting may be detectable, but does not dominate the landscape. Most views attain at least the Partial Retention Visual Quality Objective (VQO).

- Road Closures and obliterations reduce road densities to meet Forest Plan standards.

- The remaining roads have road management objectives (RMOs) and their drainage networks minimize erosion and sediment delivery to streams. Cutbanks and fill slopes are stable and fully vegetated. Roadsides are brushed and hazard trees are promptly dealt with to minimize safety concerns to Forest visitors along major travel routes, in campgrounds, and around dispersed campsites.

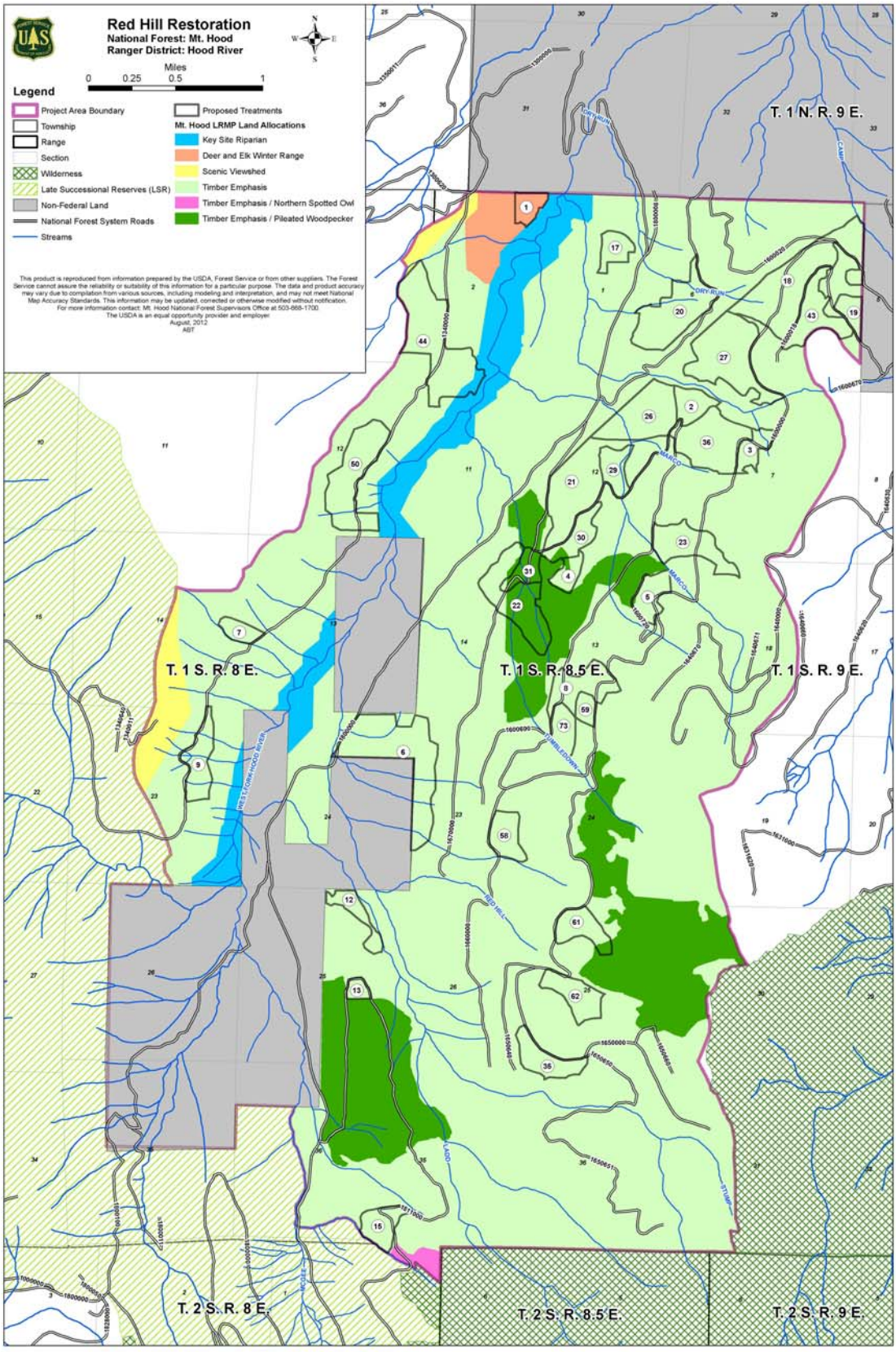

Figure 1-4: Forest Plan Land Use Allocations within Red Hill Restoration planning area

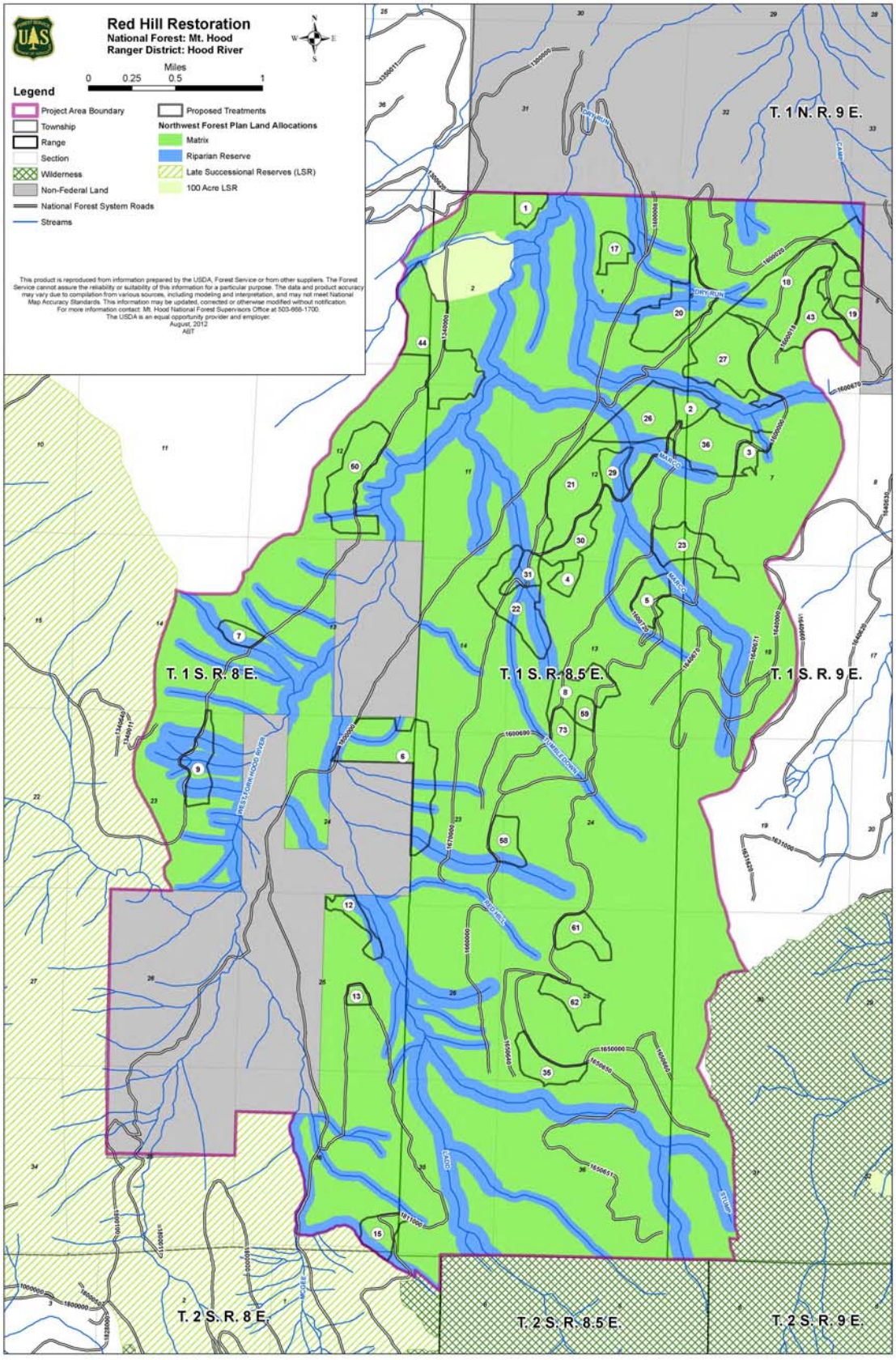

Figure 1-5: NWFP Forest Plan Land Allocations within Red Hill Restoration planning area

1.4 Proposed Action

Overall, the Proposed Action includes treating approximately 1,536 acres within the Upper West Fork Hood River sub-watershed (see Figure 1-1: Vicinity Map and Figure 1-6: Proposed Action maps). The Proposed Action includes plantation thinning, thinning for forest health improvement, and sapling thinning (described below). In addition to these treatment units, the Proposed Action includes approximately 12 acres for logging system access. Logging system access would be areas that would include but would not be limited to skyline corridors, skid trails, landings, and temporary roads. The Proposed Action is summarized in Table 1-4.

Table 1-4: Proposed Action Treatment Acres

Treatment	Acres
Plantation Thin	1209
Thinning for Forest Health Improvement	239
Sapling Thinning (Precommercial Thinning)	76
Logging System Access	12
Total	**1536**

Plantation Thinning (1,209 acres) treatments would be a variable density thinning from below treatment in 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 riparian areas as well as the upland portions of the plantations towards a properly functioning late-successional area with a large tree component that is currently absent in the majority of the stands due to high densities.

Thinning for Forest Health Improvement (239 acres) thinning treatments are within densely stocked stands that were selectively harvested or had fuels reduction treatments within the past 80 years. The concerns within these stands are due to high densities where there is a high risk of stress related mortality, above normal insect and pathogen mortality, limited species diversity, and limited structural diversity. The variable density thinning from below treatments are also designed to encourage regeneration to maintain species and structural diversity.

Riparian areas within the plantation thinning and thinning for forest health improvement are subject to the same forest health concerns. The overall desire for these treatments would be to move riparian areas as well as the upland portions of the stands towards a properly functioning late-successional area with a large tree component that is currently absent in the majority of the stands due to overcrowding and diminished tree growth.

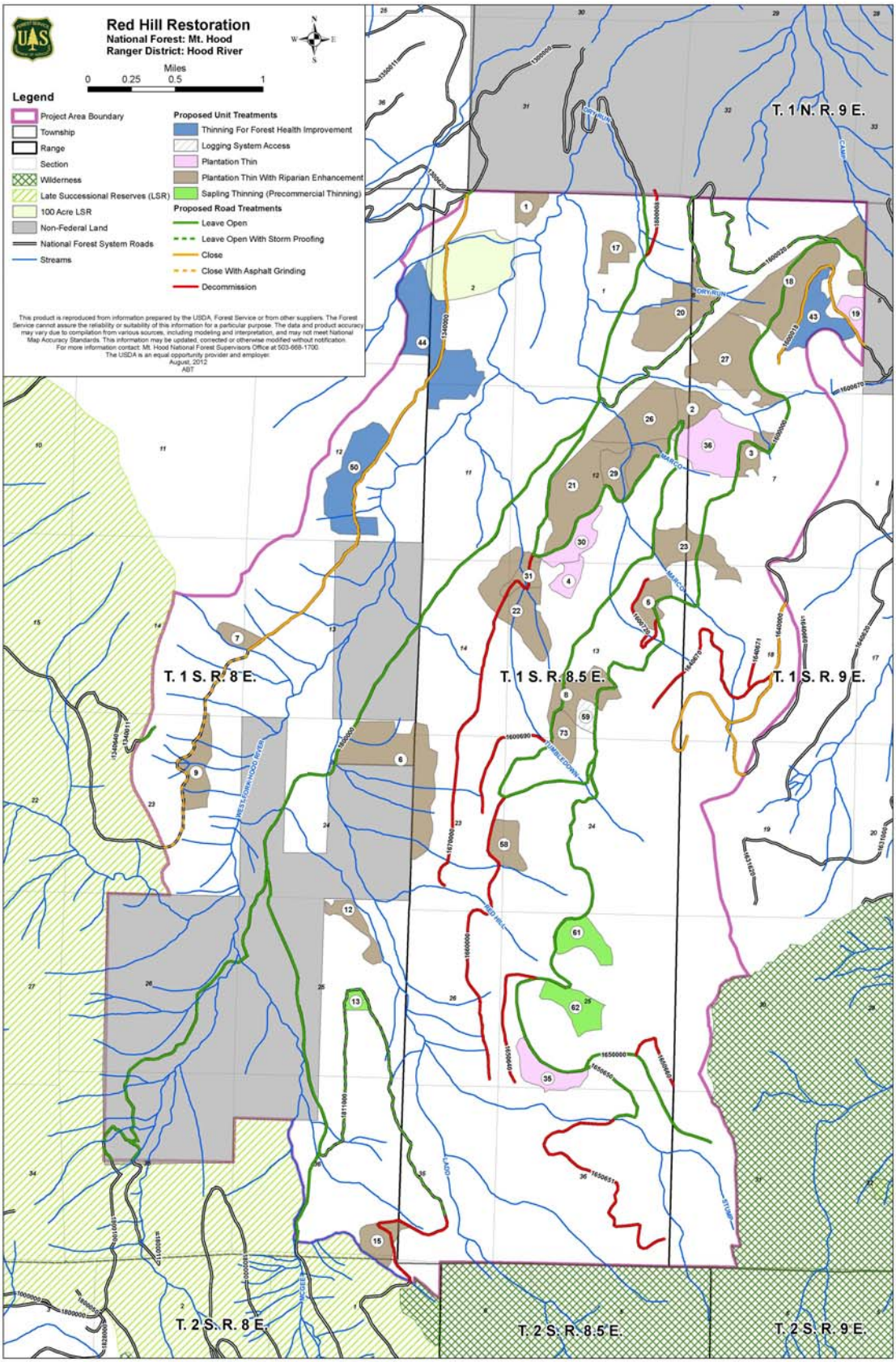

Figure 1-6: Proposed Action Map for Red Hill Restoration

Both thinning treatments would utilize variable density thinning (VDT), which allows for flexibility to achieve overall treatment objectives. This allows emphasis to be placed on leaving vigorous trees of all sizes without concern for a fixed spacing. The gaps for this project would vary from one to five acres in size based on the conditions within each unit. The gaps would be associated with treating root rot as well as other insects and disease pockets. The skips would be used to protect minor species, snags, archeological sites, and wet areas. VDT is described in more detailed in Chapter 2. The only biomass utilization associated with these treatments would be taken from the landing piles, not from within the units. This biomass would be subject to agreement under the timber/stewardship contract for a specific area.

Mechanical and hand sapling thinning treatment (precommercial thinning) would occur on approximately 76 acres leaving approximately 100 to 200 trees per acre in the wet forest type to promote and develop more resilient stand conditions. Pile burning and/or mechanical fuels treatments would be applied to these treatment areas. Fuels treatments could include, but would not be limited to, lop and scattering, masticating, or biomass collection. Biomass collection would include machine piling and removal of materials to be used to generate electricity.

Logging system access units (12 acres) are associated with proposed skyline logging systems. These areas would have skyline corridors in order to access roads or potential landing sites. 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.

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, road treatments (decommissioning, closures, storm proofing, reconstruction and maintenance).

1.5 Decision Framework

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

1.6 Public Involvement

1.6.1 Collaboration

In February 2011, the Hood River Watershed Group and Hood River Soil & Water Conservation District (SWCD) approached the Forest Service to learn more about establishing a collaborative group and implementing stewardship projects. The Forest Service provided an overview of the stewardship contracting authority as well as the current use of stewardship on the Forest.

On March 31, 2011, the Hood River SWCD hosted a kick-off meeting of the Hood River Collaborative Stewardship Crew. The group was formed “to learn about national forest health issues in the Hood River watershed and develop recommendations on particular projects and/or projects area to the District Ranger for stewardship contracting.” Twenty-eight members of the community

attended the kick-off meeting, including tribal government (Confederated Tribes of Warm Springs), federal government (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), environmental groups (Bark, Oregon Wild, Crag Law Center, Rocky Mountain Elk Foundation), recreational issues (Backcountry Horseman), timber industry (WKO/High Cascade), and individual residents/landowners. The community members decided to launch the collaborative group and begin with discussions on the Red Hill project.

Collaborative participants met from April to November 2011 to identify restoration opportunities within the West Fork of Hood River. The group discussed forest health, riparian thinning, huckleberry enhancement, fuels treatments, and plantation thinning. The group participated in two field trips to visit potential treatment units and see the outcomes associated with the Lake Branch Thinning project. In November 2011, the Hood River Collaborative Stewardship Crew submitted recommendations for the Red Hill planning area to District Ranger, Daina Bambe (see Appendix 1).

Figure 1-7: Hood River Collaborative Stewardship Crew Field Trip
Photo taken by Crag Law Center

Specific recommendations included the following.

- Plantation Thinning: Variable density thin from below with skips and gaps up to two acres. Base the prescription on function and structure of the stand and leave the best.

- Riparian Enhancement: 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 riparian reserve. Thinning in the riparian reserve should not increase water temperature or measured sedimentation.

- Huckleberry Enhancement: Utilize Unit 58 for huckleberry enhancement and thin to reduce shading of huckleberries. Look for opportunities in other plantation thinning units to implement similar hackberry enhancements. Consider the blowdown potential when identifying other areas for enhancements. Monitor areas recently burned by the Dollar Lake fire to learn more about best practices for huckleberry establishment and management.

- Roads: For roads not projected to be used in the next 10 years, storm proofing, at a minimum, should be used to improve hydrologic function and sight lines from major roads should be obliterated to minimize improper use.

Also, the group recommended that a peer review should be completed by the collaborative group after the harvest operations have been completed to see if the objectives of the project and these recommendations were met.

1.6.2 Scoping/Public Involvement

Red Hill Restoration was listed in the Mt. Hood National Forest quarterly planning newsletter (Schedule of Proposed Action [SOPA]) beginning in July 2011. The project also listed on the Mt. Hood National Forest website beginning in July 2011 at: http://www.fs.fed.us/nepa/fs-usda-pop.php/fs-usda-pop.php?project=35969. No comments were received through this effort.

In April 2012, a scoping letter providing information and seeking public comment was mailed to approximately 135 individuals and groups. During the comment period, the Forest Service received four formal comments from Oregon Wild, Bark, American Forest Resource Council (AFRC) and an individual. All of the comment letters as well as a summary of the Forest Service response is available in the project record, located at the Hood River Ranger District located in Mount Hood/Parkdale, Oregon.

In addition to the scoping letter, the Forest Service participated in government-to-government consultation with the City of Hood River Public Works and National Marine Fisheries Service on this project as detailed in Chapter 4.

1.7 Issues

Issues serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives, 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, one issue was brought forward that generated an additional alternative. This alternative was designed to address the decadence issue; the alternative was considered, but was eliminated from detailed study (see Section 2.5). In

addition, there were several concerns (diameter limits, decommissioning and closing roads and temporary roads) that were raised. Concerns identified during scoping were used to refine the Proposed Action presented in Section 2.2 as well as the effects analysis presented in Chapter 3.

- **Decadence (dead trees, down logs, large woody debris, and trees with disease):** Scoping comments raised a concern about decadence and recent scientific findings. Commenters state that there is an excessive emphasis on the health of trees and would like greater attention paid to the value of dead and down trees. In their opinions, healthy ecosystems should have an abundance of large decaying live trees, large snags and coarse woody debris all of which are lacking in plantations. A reoccurring concern is that thinning captures future mortality, and that those potential dead trees are important for wildlife and as sources of down wood in streams. One scoping comment stated: "Recognize that dead wood values are sacrificed in thinned areas due to the effect of 'captured mortality,' while other late successional values, such as rapid development of large trees and understory diversity may be delayed in unthinned areas, so an important step in the restoration process is to identify the most optimal mix of treated (thinned) and untreated (unthinned) areas. We think this should be a conscious and well-documented part of the NEPA analysis, not just an accidental byproduct of what's economically thinnable." Another scoping comment stated: "If these stands are thinned, there will be a reduction in number, and a delay in the recruitment of snags, first by removing trees that would otherwise suffer suppression mortality, and second by increasing stand vigor and postponing overall mortality."

  The Proposed Action includes project design criteria/mitigation measures (PDC) that would protect and enhance snags. 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. Also, the primary goals of the riparian treatments are to improve species composition, enhance structural diversity, and improve future quality of downed wood and in-stream large wood. Lastly, skips associated with variable density thinning and riparian protection buffers would provide down wood. The impacts to snags are discussed further in Section 3.8, Wildlife and the impacts to down wood are discussed in Section 3.5, Water Quality; Section 3.6, Fisheries and Aquatic Fauna; and, Section 3.8, Wildlife.

- **Diameter Limits:** Some scoping comments recommend using a diameter limit to balance the ecological and economic values associated with the project. Specifically, a scoping comment stated: "Use diameter limits as a management tool because it provides a useful means to prevent economic values from trumping ecological values. The public supports the use of diameter limits because it provides a means to prevent economic values from trumping ecological values. It is often appropriate to use lower diameter limits for fire tolerant species like Ponderosa pine and Douglas fir, while using higher limits for fire intolerant species like grand fir/white fir. The exceptional circumstances in which diameter limits allegedly don't work, are more rare than the circumstances in which refusing to use diameter limits will lead to unintended consequences, including removal of ecologically valuable trees and lack of public trust."

  This project does not establish a diameter limit in order to fully meet the purpose and need for action as stated in Section 1.3. Incorporating an upper diameter limit would limit the

ability to improve the forest ecosystem health. The overall purpose of this project is to improve forest conditions within the watershed by increasing health and vigor and enhancing growth by releasing trees through a variable density thinning from below treatment to increase diameter and height growth of selected stands; improving structural and species diversity within selected stands by reducing competition induced tree growth suppression and mortality, and by releasing leave trees through a variable density thinning from below to increase diameter and height growth; and, maintaining and enhancing aquatic habitat and riparian conditions by improving forest ecosystem health of selected stands within riparian corridors. The Proposed Action as described in Section 2.2 utilizes variable density thinning and thinning from below with the overall goal of leaving the best, largest trees within a stand and meeting the purpose and need for action. This concern is not considered a key issue because there are no substantive unresolved resource impacts.

- **Decommissioning and Closing Roads**: Some scoping comments received stated a concern about completing road decommissioning without fully analyzing the future access needs. One comment stated: "Complete decommissioning of roads requires careful analysis to ensure that transportation needs be addressed for current as well as future access, as well as providing for mitigation of sediment into streams and reducing risk of failure. Permanently closing roads that will be needed at a later date is not prudent and other means of mitigating problems that those roads may be causing in the present should be identified." Conversely, other scoping comments stated a concern about passively decommissioning roads rather than actively decommissioning roads. Specifically, a comment stated: "Again while we appreciate the removal of unnecessary roads from the landscape, we are concerned that passively decommissioned roads will be reopened to facilitate logging. And roads that are cited as being closed are essentially just held in storage and then reopened whenever the agency wants to get back into these areas." 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 proposed action was determined using the "Transportation System Planning and Decision-Making Requirements for All NEPA Projects" decision tree (available in the project record). The decision key incorporates public and administrative access needs; planned commercial harvest and fuels reduction activity within 5 or 10-years; and level of aquatic risk. As defined by the 2003 Roads Analysis Report, this 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 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 list of the full roads considered is available in the project record. This concern is not considered a key issue because there are no substantive unresolved resource impacts.

- **Temporary Roads**: Scoping comments raised a concern about the reopening of old road alignments and the construction of new temporary roads. The commenters feel the ground disturbance associated with this work particularly where it is in close proximity to streams, could affect aquatic resources. The commenters also were concerned about the cost-benefit analysis associated with the use of temporary roads. Specifically, a comment stated: "The NEPA analysis should rank new road segments [temporary roads] according to their relative costs (e.g. length, slope position, soil type, ease of rehabilitation, weed risk, native vegetation impacts, etc.) and benefits (e.g. acres of restoration facilitated), then use that ranking to consider dropping the roads with the lowest ratio of benefits to costs."

  The temporary roads were placed on previously road locations where possible, unless they were in close proximity to a stream. Stream crossings were eliminated as much as possible and limited to previous road locations. The temporary roads are located on decommissioned roads that had an aquatic risk rating of low to moderate. As required by the PDC, all temporary roads, skid trails, and landings would be rehabilitated after project activities are completed in each unit. Analysis of temporary roads can be found in the effects analysis section for each resource area; impacts of the temporary roads on aquatic resources can be found in Section 3.5, Water Quality and Section 3.6, Fisheries and Aquatic Fauna. This concern is not considered a key issue 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 Red Hill 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. 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, close or storm proof any roads. 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. 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

The project area includes a variety of healthy and unhealthy, mature stands. High densities as well as insect and disease are the major contributors to poor forest health in this area. 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. These conditions have made most of the stands in the watershed susceptible to root disease and root decay. In addition, at higher elevations stand conditions are susceptive to other insect and diseases, such as the balsam wooly adelgid. As a result of the current situation within the Upper West Fork Hood River sub-watershed, the Red Hill Restoration project is being undertaken to improve overall forest conditions within the watershed.

The Proposed Action is to treat approximately 1,500 acres within the watershed and includes plantation thinning, thinning for forest health improvement, and sapling thinning (precommercial thinning). In addition to these treatment units, the Proposed Action includes approximately 12 acres for logging system access. Logging system access would be areas that would include, but would not be limited to skyline corridors, skid trails, landings, and temporary roads. In addition to these actions, the Proposed Action includes temporary roads, riparian prescriptions, road decommissioning, road closures, and road reconstruction/maintenance.

2.2.1 Vegetation Treatments

Overall, the Proposed Action includes thinning for forest health improvement, plantation thinning and sapling thinning as summarized in Table 2-1 and described below.

Table 2-1: Proposed Action Treatment Acres

Treatment	Acres
Plantation Thin	1209
Thinning for Forest Health Improvement	239
Sapling Thinning (Precommercial Thinning)	76
Logging System Access	12
Total	**1536**

Plantation Thinning (1,209 acres) treatments would be a variable density thinning from below treatment in 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 riparian areas as well as the upland portions of the plantations towards a properly functioning late-successional area with a large tree component that is currently absent in the majority of the stands due to overcrowding and diminished tree growth.

Thinning for Forest Health Improvement (239 acres) thinning treatments are within densely stocked stands that were selectively harvested or had fuels reduction treatments within the past 80 years. The concerns within these stands are due to high densities where there is a high risk of stress related mortality, above normal insect and pathogen mortality, limited species diversity, and limited structural diversity. The variable density thinning from below treatments are also designed to encourage regeneration to maintain species and structural diversity.

Riparian areas within the plantation thinning and thinning for forest health improvement are subject to the same forest health concerns. The overall desire for these treatments would be to

move riparian areas as well as the upland portions of the stands towards a properly functioning late-successional area with a large tree component that is currently absent in the majority of the stands due to high densities.

Both thinning treatments would utilize variable density thinning (VDT), which allows for flexibility 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. The only biomass utilization associated with these treatments would be taken from the landing piles, not from within the units. This biomass would be subject to agreement under the timber/stewardship contract for a specific area.

Mechanical and hand sapling thinning treatment (precommercial thinning) would occur on approximately 76 acres leaving approximately 100 to 200 trees per acre in the wet forest type to promote and develop more resilient stand conditions. Pile burning and/or mechanical fuels treatments would be applied to these treatment areas. Fuels treatments could include, but would not be limited to, lop and scattering, masticating, or biomass collection. Biomass collection would include machine piling and removal of materials to be used to generate electricity.

Logging system access units (12 acres) are associated with proposed skyline logging systems. These areas would have skyline corridors in order to access roads or potential landing sites. 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.

A detailed unit table including the logging system, slope, current and target canopy closure, and fuels treatments is found in Table 2-2.

2.2.2. Variable Density Thinning

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 variable density thinning 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 variable density thinning 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 variable density thinning. Leave trees would include minor species and would include trees with the elements of wood decay.

Table 2-2: Unit Information. Abbreviations used in the table are: DF = Douglas-fir; NF = noble fir; WH = western hemlock; MH = mountain hemlock; SF = spruce fir. All fuels treatments within the units are creating piles and pile burning.

Unit	Treatment	Acres	Age (year)	Tree Species	Log System	Temp Road	Skips & Gaps	Slope	Current Canopy Cover	Target Canopy Cover	Fuels Treatment
1	Plantation Thin	17	40	DF	Ground	Yes	Yes	10-60%	90%	50%	Yes
2	Plantation Thin	23	40	DF	Ground, Cable	Yes	Yes	30-40%	70%	50%	Yes
3	Plantation Thin	20	41	DF,NF, WH	Cable, Helicopter	No	Yes	10-50%	70%	50%	Yes
4	Plantation Thin	16	50	DF,WH	Ground	Yes	Yes	20-30%	80%	50%	Yes
5	Plantation Thin	27	43	DF,NF	Cable	No	Yes	30%+	80%	50%	Yes
6	Plantation Thin	115	47	DF,WH	Helicopter W / Pre-Bunch	No	Yes	0-30%	90%	50%	Yes
7	Plantation Thin	15	50	DF	Helicopter	No	Yes	40%+	70%	50%	Yes
8	Plantation Thin	44	40	DF,WH	Cable, Helicopter W / Pre-Bunch	No	Yes	20-50%	80%	50%	Yes
9	Plantation Thin	38	40	DF	Cable	No	Yes	40%+	70%	50%	Yes
12	Plantation Thin	22	66	DF	Ground	Yes	Yes	10-30%	90%	50%	Yes
13	Sapling Thinning	9	40	DF	Mechanical	No	No	10-40%	60%	N/A	Yes

Unit	Treatment	Acres	Age (year)	Tree Species	Log System	Temp Road	Skips & Gaps	Slope	Current Canopy Cover	Target Canopy Cover	Fuels Treatment
15	Plantation Thin	29	32	DF	Cable, Helicopter	No	Yes	30-50%	60%	50%	Yes
17	Plantation Thin	20	50	DF,WH	Ground, Cable	Yes	Yes	10-30%	80%	50%	Yes
18	Plantation Thin	120	48	DF,WH	Cable, Helicopter	No	Yes	20-60%	80%	50%	Yes
19	Plantation Thin	15	57	DF,WH, NF	Cable	No	Yes	20-50%	75%	50%	Yes
20	Plantation Thin	75	59	DF	Helicopter W / Pre-Bunch, Helicopter	No	Yes	10-30%	80%	50%	Yes
21	Plantation Thin	108	61	DF,WH	Cable, Helicopter	No	Yes	20-40%	80%	50%	Yes
22	Plantation Thin	73	55	DF,WH	Helicopter W / Pre-Bunch	No	Yes	10-30%	70%	50%	Yes
23	Plantation Thin	49	40	DF,NF, WH	Ground, Cable	Yes	Yes	20-50%	80%	50%	Yes
26	Plantation Thin	66	75	DF	Cable, Helicopter W / Pre-Bunch, Helicopter	Yes	Yes	30-60%	80%	50%	Yes
27	Plantation Thin	91	55	DF,MH	Cable	No	Yes	20-60%	70%	50%	Yes
29	Plantation Thin	24	35	SF, WH	Cable	No	Yes	20-40%	80%	50%	Yes

Unit	Treatment	Acres	Age (year)	Tree Species	Log System	Temp Road	Skips & Gaps	Slope	Current Canopy Cover	Target Canopy Cover	Fuels Treatment
30	Plantation Thin	27	50	DF	Ground	Yes	Yes	20-40%	75%	50%	Yes
31	Plantation Thin	19	53	DF,WH	Ground, Cable, Helicopter W / Pre-Bunch	Yes	Yes	20-40%	80%	50%	Yes
35	Plantation Thin	35	43	DF,NF	Cable	No	Yes	10-50%	90%	50%	Yes
36	Plantation Thin	71	40	DF,WH	Cable, Helicopter	No	Yes	30-60%	70%	50%	Yes
43	Thinning for Forest Health Improvement	44	42	DF,SF,NF	Ground	No	Yes	10-20%	75%	50%	Yes
44	Thinning for Forest Health Improvement	116	99	DF,WH, NF	Helicopter	No	Yes	10-70%	70%	40%	Yes
50	Thinning for Forest Health Improvement	79	75	DF	Cable, Helicopter	No	Yes	70%	80%	40%	Yes
58	Plantation Thin	28	36	DF,NF	Cable, Helicopter	Yes	Yes	10-40%	60%	50%	No
59	Logging System Access	12	40	DF,WH	Cable	No	No	20-40%	90%	N/A	No
61	Sapling Thinning	32	40	DF	Mechanical	No	Yes	20-40%	60%	N/A	Yes
62	Sapling Thinning	35	40	DF	Mechanical	No	Yes	10-40%	70%	N/A	No
73	Plantation Thin	22	40	DF,WH	Ground	No	Yes	15-30%	80%	50%	Yes

Included in variable density thinning are skips and gaps within the stands to mimic more natural stands. 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. 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 thinning for forest health improvement prescriptions and gap locations would be focused where openings already exist, in frost and wind throw pockets, and in root rot pockets. Gap areas would be incorporated into the average canopy cover.

Some additional characteristics of skips and gaps include the following.

- 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.
- Gaps would be one to five acres in size and would retain one to six trees. In gaps, minor tree species would be retained if present.
- Gaps would build upon natural openings within Riparian Reserves. These gaps would only extend outward away from the nearest water body.
- 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 objectives.

Table 2-3 provides unit-by-unit information on the skips, gaps and heavy thins are included as part of the Proposed Action for this project.

Table2-3: Unit-by-unit description of skips, gaps and heavy thins

Unit	Skips		Gaps		Gaps in Riparian Reserves	Heavy Thins	
	No.	Acres	No.	Acres	Acres	No.	Acres
1	2	2	1	2	0	1	3
2	2	2	1	2	1	0	0
3	2	2	1	2	1	0	0
4	2	2	1	2	0	0	0
5	3	3	1	2	0	0	0
6	4	10	3	10	3	0	0
7	2	2	1	2	1	0	0
8	4	4	2	4	0	0	0

Unit	Skips		Gaps		Gaps in Riparian Reserves	Heavy Thins	
	No.	Acres	No.	Acres	Acres	No.	Acres
9	4	4	2	4	3	0	0
12	2	2	1	2	1	0	0
15	3	3	2	4	2	0	0
17	2	2	1	2	0	1	3
18	4	10	3	10	0	3	9
19	2	2	1	2	0	1	2
20	4	10	4	8	2	0	0
21	4	10	3	10	2	0	0
22	6	8	2	4	2	0	0
23	4	4	2	4	1	0	0
26	6	8	2	4	2	0	0
27	4	10	3	10	1	0	0
29	2	2	1	2	2	0	0
30	3	3	2	4	0	0	0
31	2	2	1	2	2	0	0
35	4	4	2	4	0	2	4
36	6	8	2	4	0	0	0
43	4	4	2	4	0	1	3
44	4	10	3	10	0	2	6
50	4	10	4	8	0	0	0
58	3	3	2	4	1	1	2
61	3	3	1	2	0	0	0
62	3	3	1	2	0	0	0
73	2	2	1	2	0	0	0
Total	**106**	**154**	**59**	**138**	**27**	**12**	**32**

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 14.5 MMBF of wood products would be produced now and stands would be made 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 cable 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, 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 practicable. 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 eliminated as much as possible and were limited to previous road locations.

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 4.0 miles. Of the proposed temporary roads, 1.1 miles are new temporary roads, 2.1 miles are previous temporary roads that would be reconstructed for this project, and 0.6 miles are on previously decommissioned roads. No other previously decommissioned roads are proposed to be used as part of this project. Figure 2-1 is a map showing the logging systems for each unit and location of the temporary roads.

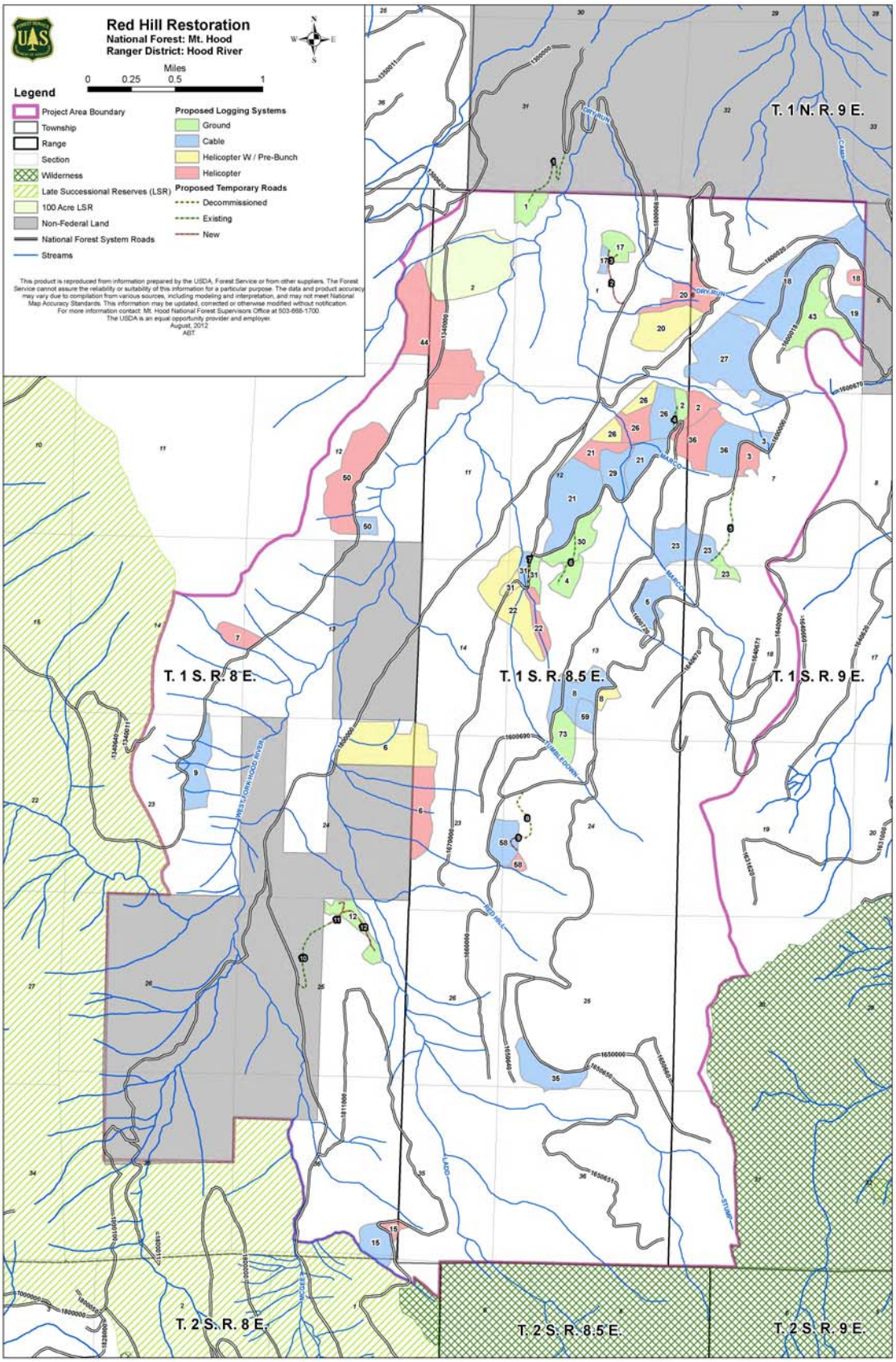

Figure 2-1: Map of Logging Systems and Temporary Roads

The temporary roads located on previously decommissioned roads minimize environmental impacts by utilizing old road prisms and previously disturbed grounds. The 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, this 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 Riparian Prescription

Management direction regarding appropriate silvicultural activities within riparian areas comes from the Forest Plan, Northwest Forest Plan and West Fork Hood River Watershed Analysis. The Forest Plan has a standard of six downed logs per acre measuring 20-inches in diameter on the small end and 16 feet in length (FW-223). Also, another Forest Plan standard states that for in-stream large wood east of the Cascade Crest is 20 logs per 1,000 lineal feet of stream greater than 12-inches in diameter, with 20 percent greater than 20-inches in diameter, and greater than 35-feet in length (FW-095).

Riparian Reserve widths designated in the Northwest Forest Plan were the starting point for project design and planning. The designed Riparian Reserve for fish-bearing streams is 300-feet, for perennial non-fish bearing streams is 150-feet, and for intermittent streams is 100-feet. The Northwest Forest Plan, however, stipulates that Riparian Reserve widths could be modified by recommendations made in watershed analysis as well as during specific project planning (ROD page 9 to 10). The Northwest Forest Plan also states the Riparian Reserve width should be greatest of the widths proposed therein or of the following site specific land features (ROD page C-30 to C-31):

- From the edge of the channel to the top of the inner gorge;
- From the edge of the channel to the edge of the 100-year floodplain;
- From the edge of the channel to the outer edge of riparian dependent vegetation; or
- From the edge of the channel outward one (perennial non-fish or intermittent) or two (fish bearing) site potential tree height.

Streams in the project area are generally confined with gorges, floodplains and riparian vegetation strips that are narrower than the default widths outlined in the Northwest Forest Plan. However, there are several plant communities with different site potential tree heights ranging from 95 (only one unit) to 130 feet. These site potential tree heights are shorter than default widths for fish bearing and perennial non-fish bearing streams, but longer than the 100 foot default width for intermittent streams. As such, Riparian Reserves associated with intermittent streams in the Red Hill Restoration Project planning and project area were assigned a 130-feet width to encompass the entire variation of site potential tree heights in the area. Choosing the widest width ensures consistent description, direction, and management throughout the life of the Red Hill Restoration Project. See the Red Hill Restoration Fisheries Biological Assessment available in the project record for more information.

The West Fork Hood River Watershed Analysis indicated the site potential tree height for the "West Fork sub-watershed" was 150-feet. This was based on the best information available at the time, but the site potential tree heights described above are based on site-specific field measurements and up-to-date modeling, and thus are considered more accurate. The Watershed Analysis also recommended other riparian reserve widths in the watershed and portions of the project area, but the authors noted that recommendations required field validation. Fisheries, soils, silviculture, and hydrology personnel visited virtually all proposed units during planning and the resultant Riparian Reserve widths reflect the assessment of the Interdisciplinary Team.

Other considerations for designing thinning prescriptions in Riparian Reserves include:

1) The planning unit is in the West Fork Hood River Tier I Key Watershed;
2) Ladd Creek and McGee Creek are listed as "Category 2 – Attaining" on the DEQ 2010 Integrated Report for stream temperature;
3) Both of these streams are listed as "Category 3 – Insufficient Data" on the same report for sedimentation;
4) West Fork Hood River has an approved Total Maximum Daily Load (TMDL) for stream temperature;
5) Federally listed fish species, including Threatened Lower Columbia River Chinook and Threatened Lower Columbia River steelhead are present in the West Fork Hood River, Redhill Creek, and McGee Creek;
6) Critical Habitat has been designated in the West Fork Hood River, Redhill Creek, McGee Creek for Chinook salmon, steelhead, and bull trout;
7) Rainbow trout, a Management Indicator Species (MIS), occupy many of the streams within the planning area; and,
8) Columbia duskysnail, a Region 6 Sensitive and Survey & Manage species, has been found within the Upper West Fork Hood River Watershed.

Based on this management direction, the Proposed Action is treating riparian forests where there is a silvicultural prescription that is likely to 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 forest 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. 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 needed to meet riparian and wildlife needs. 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 size of downed wood needed to meet the Forest standard.

Riparian treatments would be designed to maintain and improve stream and wetland conditions. Perennial streams, wetlands, lakes, and ponds would all have a minimum of 60-foot no-cut protection buffer and intermittent streams, non-perennial channels with evidence of annual deposition and scour would have a minimum 30-foot no-cut protection buffer. Protection buffers would serve to 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 60-foot no-cut protection buffer has been determined to be adequate to maintain shade to prevent water temperature increase for streams that are water quality limited (Bureau of Land Management and Forest Service 2005). Although no streams in the project area are water quality limited for temperature, this standard would still be applied to all perennial streams to prevent increases to water temperatures. The buffer would also provide effective sediment filtration from project generated surface erosion (Rashin et al. 2006, Lakel et al. 2010) and protect sources of coarse wood to streams and adjacent riparian areas.

Riparian thinning treatments have been identified in 25 units within 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.

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

Unit	Acres	Riparian Reserve Acres	Riparian Reserve Treatment Purpose				
			Downed Wood	Snags	Instream Large Wood	Species Composition	Structural Diversity
1	17	0.1	X	X		X	X
2	23	5.9	X	X		X	
3	20	3.1	X	X		X	X
5	27	0.9	X	X	X	X	X
6	115	20.6	X	X	X	X	X
7	15	8.8	X	X		X	X
9	38	28.3		X	X	X	X
12	22	10.1		X	X	X	X
15	29	8.5	X	X		X	X
17	20	1.2	X	X		X	X
18	120	5.1	X	X	X	X	X
20	75	29.0	X	X	X	X	X
21	108	17.5	X	X	X	X	X
22	73	25.1	X	X	X	X	X
23	49	5.7	X	X	X		X
26	66	18.3	X	X		X	X
27	91	6.5	X	X		X	X
29	24	14.8	X	X	X	X	
31	19	11.2	X	X	X	X	
36	71	4.5	X	X		X	X
44	116	4.1	X	X		X	

Unit	Acres	Riparian Reserve Acres	Riparian Reserve Treatment Purpose				
			Downed Wood	Snags	Instream Large Wood	Species Composition	Structural Diversity
50	79	19.5	X		X	X	X
58	28	6.0	X	X	X	X	X
73	22	1.7	X	X	X	X	X
TOTAL	**1267**	**256.5**					

2.2.6 Road Decommissioning and Road Closures

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. This project would decommission approximately 12 miles of unneeded roads over several years, as implementation funding becomes available. The roads would not be decommissioned until the proposed thinning has occurred. Forest Service Road 1670 (2.4 miles) has already been decommissioned and only needs to be removed off the official Forest Transportation layer. In addition, 8.4 miles of road would have a year round closure. Lastly, 5.6 miles of road would be storm proofed, where the roads are upgraded to minimize the aquatic risk associated with the road by improving the road conditions. The roads activities are summarized in Table 2-5.

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.

Table 2-5: Road Activities for Project

Road Number	Length (Miles)
Decommission	
1600690	0.8
1600720	0.7
1640670	1.6
1640671	0.3
1650640	0.8
1650650	0.4
1650651	1.4
1650660	0.5
1660000	1.8
1670000*	2.4
1800008	0.3
1811000	1.0

Road Number	Length (Miles)
Total	**12**
Road Closure	
1340000	4.5
1600018	1.3
1640000	2.2
1640660	0.4
Total	**8.4**
Storm Proofing	
1600020	3.0
1811000	2.6
Total	**5.6**

*Already decommissioned on-the-ground

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 2-2: 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 2-3: Example of entrance treatment method.

2.2.7 Road Reconstruction/Maintenance

Road reconstruction and maintenance 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 2-5 lists four 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. 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. Blading work consists of surface blading the traveled way to a condition that facilitates traffic and provides proper drainage. Blading includes shaping the crown or slope of travel way, 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 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	Length (Miles)	Description of Proposed Work
1300000	1.2	Medium brushing; Clean culvert inlets (10 per mile), Fall danger trees (6 per mile)
1340000	3.0	Blade and shape; Medium brushing; Surface rock (150 cubic yards); Clean ditch line and culverts inlets (12 culverts), Fall danger trees (12 per mile), Replace culvert at milepost (MP) 0.35
1340000	1.8	Unsuitable excavation and pit run for stabilization (200 cubic yards of each); Medium brushing; Fall danger trees (12 per mile); Grind pavement
1600000	10.5	Medium brushing; Clean culvert inlets (4 per mile); Water bar on powerline road at junction near MP 0.05; Repair multiple edge failures [140 cubic yards pit run, 50 cubic yards 3-inch minus, 11.5 ton Asphaltic Concrete (AC)]; Repair sunken grade with unsuitable excavation (excess moisture, muck, frozen lumps, roots, sod, or other deleterious material) and back fill at 1650 Junction (20 cubic yards unsuitable excavation, 10 cubic yards backfill ,10 cubic yards base rock, 2.5 ton AC); Fall danger trees (12 per mile)
1600018	1.3	Light clearing; Roadbed reconditioning; Fall danger trees (12 per mile)
1600020	2.1	Roadbed recondition as needed (Processor access only)
1600670	0.2	Light brushing; Blade and shape; Fall danger trees (12 per mile)
1600720	0.7	Remove and replace berm; Light clearing

Road	Length (Miles)	Description of Proposed Work
1650000	3.5	Medium Brushing; Blade and shape; Unsuitable excavation from ditch cleaning (260 cy with disposal at MP 1.00); Clean culvert inlets (4 per mile); Surface rock (140 cubic yard); Road reconstruction at MP 0.20 and deep patch at MP 1.77; Fall danger trees (10 per mile)
1650640	0.2	Heavy brushing; Blade and shape; 12 Danger trees per mile; Decommission at completion
1650650	1.0	Medium brushing; Blade and shape; Clean six culverts; 15 cubic yards surface rock; 12 Danger trees per mile; Decommission beyond stumps creek at completion.
1650660	0.5	Native surface with 8 to 10% grades; Light clearing; Roadbed reconditioning; Blade & shape; Drainage maintenance (four water bards); 18 Danger trees per mile; Decommission at completion.
1660000	0.5	Medium brushing; Blade and shape; Ditch cleaning (600 feet); Fall danger trees (12 per mile)
1800000	8.1	Light brushing; Clean ditch line (1800 feet) and culverts inlets (10 per mile); Fall danger trees (7 per mile)
1811000	3.5	Heavy brushing; Blade and shape; Surface Rock (230 cubic yard); Clean ditch line (1400 feet) and 20 culvert inlets; Fall danger trees (7 per mile)

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

Vegetation Management

1. Patch opening size (gaps) needs to be sufficient to provide for conditions suitable for early seral species establishment and growth (normally at least 1-acre in size). Openings should be irregular shaped with scattered retention trees in openings larger than 3-acres. Openings in this project vary from 1 to 5-acres in size.

2. Skips and gaps sizes and distribution should be determined based on individual stand conditions.

3. Western white pine planting should occur in large enough openings (at least 1.5 acres) to enhance species diversity.

4. A priority on heavy thins and opening locations should be where there are existing big leaf huckleberry plants.

Fuels

1. Pile fuels on landings and in units using machinery where the down woody tons per acre standards and guidelines are exceeded.

2. Purchaser should pile all sale generated and previously created slash that has been disturbed by harvesting activities.

3. Piles should be as compact as possible and free of non-combustible material. Height should not be less than 6-feet nor greater than 20-feet. Diameter should not be less than 5-feet nor greater than 15-feet. Logs should not be placed in piles. After pile is formed, protruding ends greater than 2-feet in length should be bucked off and placed in the pile.

4. Piles should be located at least 20-feet inside the unit boundary. Outside edge of piles should be a minimum of 25-feet from the base of any tree within the unit or in a location that should not cause undue scorching of trees. Piles should not be placed on or in the following areas: pavement, road surface, ditch lines, or within 100-feet of a stream course. Piles should be a minimum of 25-feet apart.

Roads

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

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.

3. National Forest System Roads that are open to the public and which have asphalt or bituminous surfacing would have the traveled way cleared of materials that pose a hazard to safe travel. The purchaser should be responsible for clearing away all such materials. These materials include, but are not limited to, mineral soil, rock, limbs, bark, wood chips, or any material resulting from the purchaser's operations.

4. 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.

5. 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.

6. 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.

7. 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.

8. 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.

9. 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.

10. 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.

11. Temporary roads would not cross streams except at locations approved by the Forest Service. Approved crossings would incorporate measures that protect water quality and aquatic habitat by implementing a designed crossing structure or device such as a temporary bridge, temporary culvert, log ford, plastic road, or filter fabric wrapped French drain as appropriate for the site. Stream crossing structures or devices would not be set in place without prior approval of the Forest Service.

12. Unsuitable excavation resulting from ditch cleaning and other operations would be disposed of only at Forest Service approved sites. 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.

13. Stockpiles of aggregate intended for use on the project would be staged only at Forest Service approved sites. Materials should be placed in non-conical shaped piles with a maximum layer thickness of 3-feet. Stockpiles should be covered with weighted plastic sheeting when inclement weather is expected to protect it from precipitation and to prevent water quality degradation from runoff.

14. 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.

15. Scheduled soil disturbing road maintenance or reconstruction should occur during the Normal Operating Season, unless a waiver is obtained.

16. Follow the appropriate Oregon Department of Fish and Wildlife (ODFW) guidelines for timing of in-water work. Exceptions to the ODFW in-water work windows must be requested by the Forest or its contractors, and subsequently approved by ODFW.

Log Hauling

1. Log haul and snowplowing would be restricted to operating within the Normal Operating Season 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.

2. Log haul outside of normal operating season should not occur on native surface and temp roads that are hydrologically connected.

3. Log haul and timber transportation may be allowed outside the Normal Operating Season on aggregate surface roads if the following criteria are met:
    a. Aggregate surface haul routes must not cross any streams that are within 1,000 feet along the stream path of LFH or segments listed on the DEQ 2010 Integrated Report for sediment. The haul route must not be closer than 500 feet direct distance from LFH or stream segments listed for sediment at any given point if hydrologically connected to that waterway. Log haul may occur from units 2, 3, 5, 8, 13, 15, 18, 21, 22, 23, 26, 27, 29, 30, 31, 36, 58, 59, and 61. If landings are located outside of units, those haul routes must also meet this criteria**.**
    b. Haul routes must be inspected weekly, or more frequently if weather conditions warrant. Inspections would focus on road surface condition, drainage maintenance, and sources of erosion and sediment delivery to streams.
    c. Sediment traps would be installed where potential sediment inputs to streams. Sediment traps would be inspected weekly during the wet season and entrained soil would be removed when the traps have filled to 3/4 capacity. Dispose of these materials in a stable site not hydrologically connected to any stream.

4. Log haul of included timber on paved and aggregate roads shall be prohibited when the temperature of the road surface, as measured both at the origin and hauls end at the lowest elevation along the haul route on National Forest system lands, is between 28 F and 38 F and there is 1.5 inches of precipitation within any given 24-hour period as measured at the lowest elevation or at any time when the designated Timber Sale Administrator determines that freeze-thaw conditions along the haul route exist or that the subgrade on the paved and aggregate road is saturated. 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; otherwise, precipitation would be measured according to a running average of the data measured from the Log Creek RAWS station (LGFO3) and the Parkdale RAWS station (PARO). Data for these RAWS stations can be found at: "http://raws.wrh.noaa.gov/roman/cwafwz/PQR_fwz_frame.html".

Aquatic Resources

1. No ground based mechanized equipment such as tractors or skidders may be within 100-feet of streams, seeps, springs or wetlands while conducting logging operations.

2. No tree felling or removal or hand piling slash would occur within protection buffers as shown in Table 2-7 (except if trees must be felled for skyline yarding corridors, follow PDC 6 and 7). Trees felled to create yarding corridors within the buffer must be left where they fall. Buffers are measured from the edge of the active channel on both sides of the stream. Minimum buffers should be expanded to include slope breaks where appropriate.

Table 2-7. Minimum Protection Buffer Widths by Aquatic Feature Type and Proximity to Listed Fish Habitat (LFH).

Perennial Streams	Intermittent Streams	Wetlands and ponds
Maintain a minimum 60-foot wide buffer	Maintain a minimum 30-foot wide buffer	Maintain a minimum 60-foot wide buffer

3. Ground-disturbing logging activities outside the Normal Operating Season would not be allowed in Riparian Reserves.

4. Locate new temporary roads and landings outside of Riparian Reserves[1]. Use of existing facilities 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.

5. 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. Each fueling area should have a Forest Service approved spill kit on site.

6. Skyline yarding may not occur over streams with Listed Fish Habitat (LFH). Skyline yarding may occur over streams outside of LFH, but trees must be fully suspended within

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

the no-cut buffers and must have at least one end suspension within the remaining the Riparian Reserve.

7. 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. Corridors must be spaced at least 100-feet apart.

8. 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.

9. Install sediment and stormwater controls prior to initiating surface disturbing activities to the extent practicable.

10. Install suitable stormwater and erosion control measures 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.

11. Monitor disturbed areas, as needed, to verify that erosion and stormwater controls are implemented and functioning as designed and are suitably maintained.

12. Maintain erosion and stormwater controls as necessary to ensure proper and effective functioning. Prepare for unexpected failures of erosion control measures.

13. No expansion of the Forest Service Road 1340 footprint for use as a landing would be allowed on Units 9 or 50.

14. Road maintenance would protect the wet ditch area located at approximately milepost 2.75 of the Forest Service Road 1340 to protect Columbia duskysnail. Ditch would not be cleaned or dewatered in the area and efforts should be made to minimize excessive sedimentation to the area.

15. Piling of fuels and pile burning is not allowed within 100 feet of stream channels or wetlands. Lop and scatter may occur anywhere outside of protection buffers (see Table 1).

Soils

1. All skid trails would be rehabilitated immediately after harvest activities. Landings and temporary roads normally would have erosion control measures installed following fuels 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.

2. Ground-based harvest systems should not be used on slopes greater than 30 percent to avoid detrimental soil and/or watershed impacts. Processors only are allowed to operate on slopes up to 40 percent in conjunction with non-ground based yarding systems.

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

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.
    - The use of chainsaws and heavy equipment would not take place between March 1 and July 15 in units 18, 44, and 56.
    - The use of helicopters would not take place between March 1 and July 15 in units 1,18, 19, 43, 44, and 56

2. No activities would take place in B10 Deer/Elk Winter Range between December 1 and April 1. Unit 1 is within B10 winter range and a portion of the Forest Service Road 1340 (<¼ mile) are also within B10.

3. To enhance diversity, variable-density thinning would include the retention of snags and wildlife trees where possible. The snags within plantations are small planted trees that have died. Few if any legacy snags are currently present.

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.

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.

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

1. It is recommended that "pre-treatment" occur in the locations listed in Table 2-8 before any harvest activities are implemented.

Table 2-8: Invasive Species Treatments

ROAD # /LOCATION	UNIT #
1600-018 / end	18, 27
Junction of 1600, 1620-630, 1612	Haul Route
1600	5
Junction of 1811 and 1811-011	15
1340	9
1800	6
1800	Edge of 6
1340	44

2. If possible schedule implementation of work from infestation-free areas into infested areas, rather than vice-versa. Incorporate the standard contract provision that require cleaning of equipment.

3. The process for locating all new skid trails and landing locations would be coordinated with a noxious weed specialist so as to insure these locations are not within any currently established noxious weed populations. If necessary, pre-treat existing landings and skid trails that may be used for project implementation where existing infestations present an unacceptable risk of spreading established invasive plant populations.

4. If the need for restoration/revegetation of skid trails and landings is identified, the use of native plant materials are the first choice for meeting this objective where timely natural regeneration of the native plant community is not likely to occur. Non-native, non-invasive plant species may be used in any of the following situations: 1) when needed in emergency conditions to protect basic resource values (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.

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

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

Heritage Resource Sites

1. All designated cultural resource sites requiring protection would have a 100-foot buffer zone where heavy machinery and timber harvest would be excluded. Trees would be felled directionally away from the buffer zone. Hand treatment of vegetation could occur within the buffer zone. Piling is excluded from within the buffer zone, but low temperature broadcast burning could occur.

Recreation

1. Visible stumps within 100-feet of roads used for recreation would be cut to 6-inches or less. This applies to Forest Service Roads 1800 and 1600.

2. Sale Administrator would coordinate road closures and associated signage with recreation personnel to lessen impacts to Special Use Permit events.

3. No log hauling would be permitted during the Mt. Hood Classic cycling event, which normally occurs in June.

4. Winter hauling and associated plowing that would affect snowmobile routes would be published in regional and local newspapers at least two weeks in advance. Key representatives of snowmobile organizations should be informed of affected snowmobile routes.

5. No road maintenance, yarding or log haul activities located on or adjacent to Forest Road 1300 and 1800 from Friday, 12 P.M. through Monday, 12 A.M. between Memorial Day and Labor Day.

6. No road maintenance, yarding or log haul activities shall occur on Forest Road 1300 and 1800 on Federal holidays.

7. Leave groups of low-branched trees in the immediate foreground or in the harvest unit itself, and create a transition from surrounding stands at the edges as viewed from roads open during the summer.

2.3.2 Design Criteria/Mitigation Measures for Road Decommissioning

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.

2. Follow the appropriate Oregon Department of Fish and Wildlife (ODFW) guidelines for timing of in-water work. Exceptions to the ODFW in-water work windows must be requested by the Forest or its contractors, and subsequently approved by ODFW.

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.

4. All equipment used for restoration work shall 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.

5. Spill Prevention Control and Containment Plan (SPCCP) – The contractor would be required to have a written SPCCP, which describes measures to prevent or reduce impacts from potential spills (fuel, hydraulic fluid, etc). The SPCCP shall 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.).

6. All trucks used for refueling shall 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 state laws.

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. Each fueling area should have a Forest Service approved spill kit on site.

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

9. Dispose of slide and waste material in stable sites out of the flood prone area. Waste material other than hardened surface material (asphalt, concrete, etc) may be used to restore natural or near-natural contours.

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.

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.

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.

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

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.

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

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

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

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.

19. When removing a culvert from a non-fishing bearing stream, aquatic specialists shall determine if culvert removal should follow design criteria outlined below in the Culvert Replacement section. Culvert removal on fish bearing streams shall adhere to the Culvert Replacement design criteria.

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 & Implementation Crosswalk Form. The purpose of the crosswalk is to ensure that all components of the NEPA Decision, including the project design criteria/mitigation measures, best management practices and terms and conditions from consultation, are incorporated into the timber/stewardship contract. For each required component of the NEPA decision, the crosswalk identifies how and what stage in the process the component will 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.

Prior to advertisement, a final review is conducted by the Resource Specialist 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 project design criteria/mitigation measures 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 will 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 best management practices. The monitoring of noxious weeds and invasive plants would be conducted where appropriate to track changes in populations over time and corrective action would be prescribed where needed. Best Management Practices (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.” 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.

2.5 Alternatives Considered, but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received as well as the preliminary effects analysis conducted by the interdisciplinary team suggested alternative methods for achieving the purpose and need. Some of these alternatives were outside the scope this analysis, did not meet the purpose and need for action, were not reasonably feasible or viable, were duplicative of the alternatives considered in detail, or were determined to cause unnecessary environmental harm. One alternative was considered, but eliminated from detailed

consideration for reasons summarized below.

Higher Retention Density within Riparian Reserves:
An alternative was considered that would retain higher tree densities within riparian reserves and Deer/Elk Winter Range (B-10 Land Use Allocation). The intent of this alternative would be to maintain down wood and snags within Riparian Reserves to meet Forest Plan standards (DW-215, FW-219, B10-014) and also achieve canopy cover of 70 percent within 10 years of treatment within B10-Deer/Elk Winter Range, while still meeting the purpose and need for action (see Section 1.3).

More down wood would be maintained in Riparian Reserves under this alternative, but the snag and down wood standards would not be met regardless because the stands do not currently meet the standards and they do not have large enough trees to meet these standards over time without treatment. For Deer/Elk winter range a 70 percent canopy cover could not be achieved in 10 years with a higher retention level while still meeting the purpose and need for action. There would be a short-term gain in canopy cover, but a long-term reduction in stand health and viability resulting in less canopy cover long-term. Overall, a higher retention prescription would not result in substantial differences in stand characteristics compared to the Proposed Action (refer to Table 2-9).

Table 2-9: Comparison of Proposed Action vs. Higher Retention alternatives after the treatments have been completed.

Density Measurements	Immediately after treatment		50-years after treatment		100-years after treatment	
	Proposed Action	Higher Retention	Proposed Action	Higher Retention	Proposed Action	Higher Retention
Basal Area	120	170	230	300	320	390
Trees Per Acre	200	570	190	240	165	180
Height	80	80	134	133	157	156
QMD	11	11	17	16	22	20
Canopy Cover	50	65	60	70	70	70
Snags (12"+ DBH)	2	2	2	3	3	4

In addition, the Proposed Action includes PDC that protect decadence features including dead trees, downed logs and large woody debris. The PDC include that 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. Also, the primary goals of the riparian treatments are to improve species composition, enhance structural diversity, and improve future quality of downed wood and in-stream large wood. Lastly, skips associated with variable density thinning and riparian protection buffers would provide down wood.

As such, this alternative would not fully meet the purpose and need for action and would not be substantially different than the Proposed Action. Specifically, this alternative would not meet the purpose to "increase health and vigor, and enhance growth by releasing trees through a variable density thinning from below treatment to increase diameter and height growth of selected stands" (Section 1-3). As a result, this alternative was not analyzed in detail.

2.6 Mt. Hood Land and Resource Management Plan Consistency

There are several 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 comment 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.

  Overall, this standard 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 Resources.

- 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.

  Currently, most areas are below 4.5 percent cover of down wood and therefore are below the 30 percent tolerance level for wildlife habitat. As a result of this project, the recruitment of down wood would be delayed because of the reduction in density of the stands which would reduce the levels of suppression mortality. Although some trees with elements of wood decay would be left to provide habitat for snag-dependent species; fewer new snags, trees with elements of wood decay, or down wood would be recruited for the short to mid-term. In the long term, trees would be larger compared to no action, and some would eventually die and become large snags and some would eventually fall naturally to create large coarse woody debris. See Section 3.8, Wildlife Resources for more details.

- Deer and Elk Winter Range (B10-014): Forest canopy closure should reach at least 70 percent canopy closure within 10 years of the last commercial thinning activity.

  This standard cannot be met given the current conditions on-the-ground. An alternative was considered and eliminated from detailed study (see Section 2.5) to meet this standard, but it was not possible. Even though this standard is not being met, the Proposed Action improves 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.

National Forest Management Act, Findings for Vegetation Manipulation:
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) [Forestwide Standards (FW) 316 and 317, C1-019 thru 021, and C1-024]. Created openings should be no more than 2 acres (FW 323 and 324) and should be focused in areas of stands that are diseased, infested with damaging insect populations, or damaged by storms (C1-022). 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.

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)

Northwest Forest Plan, Best Management Practices
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 judgement. 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 2.2.3 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.” 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.

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 Environmental 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 Environmental 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
Blue Ridge Trench
City of Hood River Waterline Replacement
Construction of Bonneville Power Administration (BPA) Powerline
Dollar Lake Fire, including burn area rehabilitation
Instream Restoration (McGee and West Fork)
Past timber harvests on Federal and private lands
Road Decommissioning and Road Closures
Ongoing Activities
Dollar Lake Fire Burn Area Rehabilitation
Aquatic Organism Passage on McGee Creek
Bonneville Power Administration maintenance, including herbicide treatments
County and Private Timber Sales, including activity fuels reduction (burning)
Firewood and Special Forest Products
Instream Restoration on West Fork
Lakebranch Timber Sales (Faller, Ax and Wedge Timber Sales)

Ongoing Activities Continued . . .
McGee Creek Riparian Thinning
Pre-commercial thinning
Road and Trail Maintenance within project area
Red Hill Bridge on Lolo Pass Road (Forest Service Road 1800)
Raker Bridge Replacement on Forest Service Road 1330
City of Hood River Pipeline on 1300 Road
Snowplowing of Forest Service Roads 1300 & 1800 by Confederated Tribes of Warm Springs
Snowplowing of Forest Service Roads 1300 by Lost Lake Resort
Recreation Events (e.g., Mt. Hood Classic Bike Race)
Site-Specific Noxious Weed Treatments
Future Activities
Hazard Tree Removal Along Roads
Land Exchange between Longview Fibre and Western Rivers Conservancy

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 section is to analysis how the vegetation 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. Effects analyses were based on several components listed below.

Landscape Scale

Information on the vegetative conditions of the larger landscape within which the Red Hill Restoration Project lies is provided largely by West Fork of Hood River Watershed Analysis, an analysis 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 West Fork of Hood River Watershed Analysis 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 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 West Fork of Hood River Watershed Analysis (http://www.fs.usda.gov/main/mthood/landmanagement/planning/West Fork 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 is 12,064 acres. The analysis area boundary for disclosing effects at this more site-specific level is the West Fork subwatershed (includes Elk, McGee, Ladd, Jones, Red Hill, Tumbledown, Marco, Camp Creeks, and West Fork Hood River sixth field watersheds), where stands were evaluated for possible treatment actions. The project provides detailed documentation of individual stand conditions and the selection process. Information sources included stand records and field surveys conducted in the 1980s, 1990s, as well as field reviews conducted in the year 2011 (available in the project record, located at the Hood River Ranger District in Mount Hood/Parkdale, Oregon).

Common Stand Exams
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 in 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. The combinations 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) and the West Fork of Hood River Watershed Analysis 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 these stands would be to move the stands 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 a more multi-storied uneven-aged stand 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 West Fork of Hood River Watershed Analysis describes the landscape on the north side of Mt. Hood and along the Cascade crest. Sixty-five percent of the subwatershed is National Forest System lands with Hood River County and Longview Fibre as the other principal landowners. The two dominant vegetative zones within the subwatershed include Pacific silver fir and western hemlock.

The analyses completed at the larger landscape scale (refer to West Fork of Hood River Watershed Analysis) noted that there have been some definite 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-Indians 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 dominated the uplands. The species mix is similar today in both the understory and overstory. Due to the disturbance regimes on the uplands, only two structure types (see from Table 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. Within the southern portion of the watershed, the dominant forests structure contains equal proportion of Late Seral Multistory, Mature Stem Exclusion, Stem Exclusion, and Stand Initiation structural stages on the uplands. In the central portion of the watershed, the dominant forest structure is dominated by the Late Seral Multistory and Stem Exclusion stages. Common to both the central and southern portions of the watershed is the absence of the Understory Reinitiation stage. Finally, the northern portions of the watershed dominant forest structure consists primarily of Mature Stem Exclusion stand types with little to no Stem Exclusion and Late Seral Multistory present.

Site-Specific Scale

The project area occurs within the West Fork subwatershed. The project area is dominated by two plant associations, Pacific silver fir/Alaska huckleberry-salal (A2) and Western hemlock/dwarf Oregon grape-salal (A1). Common to these plant associations is an overstory dominated by Douglas-fir (*Pseudotsuga menziesii*) and Western hemlock (*Tsuga heterophylla*). They both are moderately productive with site indices for Douglas-fir between 90 to 130 feet and Western hemlock between 100 to 120 feet. They are usually found on moderate to steep slopes with an average elevation between 1,900 to 2,400 feet. There are other plant associations in proposed treatment areas within the project area (refer to Table 3-3)

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

STAND Group	Plant Association	Acres within proposed treatment areas
A1	Western hemlock/dwarf Oregon grape-salal	631
A2	Pacific silver fir/Alaska huckleberry-salal	445
A3	Pacific silver fir/rhododendron	19
A4	Western hemlock/rhododendron	125
A5	Mountain hemlock/rhododendron	50
A6	Pacific silver fir/vanilla leaf	70
A7	Pacific silver fir/big huckleberry/bear grass	25
TOTALS		**1536**

Acreages are rounded and not agree with overall acreage due to approximations from GIS.
Units may have more than one plant association within them

Within proposed treatment areas there are 7 dominant plant associations (refer to Table 3). The plant associations are western hemlock/dwarf Oregon grape-salal (A1), Pacific silver fir/Alaska huckleberry-salal (A2), Pacific silver fir/rhododendron (A3), western hemlock/rhododendron (A4), mountain hemlock/rhododendron (A5), Pacific silver fir/vanilla leaf (A6), and Pacific silver fir/big huckleberry/bear grass (A7).

A1 has an overstory dominated by Douglas-fir with a large component of western hemlock and western red cedar. On average, stands have a 70 percent canopy closure and 5 percent understory cover. This plant association has a well-developed shrub layer dominated by dwarf Oregon grape, salal, and vine maple (*Acer circinatum*).

A2 has an overstory dominated by Douglas-fir and western hemlock with Pacific silver fir (*Abies amabilis*) and western red cedar (*Thuja plicata*) as a minor component. On average, stands have 60 percent overstory canopy closure and 12 percent understory tree cover. This plant association often has a high percentage of shrub cover dominated by Alaska huckleberry (*Vaccinium alaskense*), dwarf Oregon grape (*Mahonia nervosa*), rhododendron (*Rhododendron macrophyllum*) and salal (*Gaultheria shallon*)

A3 should have an overstory dominated by Douglas-fir, Pacific silver fir, and western hemlock with a minor component of mountain hemlock and noble fir (*Abies procera*). On average, stands have a 61 percent canopy closure and 13 percent understory cover. This plant association has a moderate shrub layer dominated by rhododendron.

A4 should have an overstory dominated by Douglas-fir with a minor component of western hemlock and western red cedar. On average, stands have a 77 percent canopy closure and 8 percent understory cover. This plant association has a moderate shrub layer dominated by rhododendron.

A5 should have an overstory dominated by mountain hemlock with a large component of Douglas-fir. On average, stands have a 62 percent canopy closure and 17 percent understory cover. This plant association has a well-developed shrub layer dominated by rhododendron and huckleberry.

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 Pacific silver fir and Douglas-fir with a minor component of western and mountain hemlock, noble fir, and western white pine. On average stands have a 62 percent canopy closure and 18 percent understory cover. This plant association has a low developed shrub layer dominated by huckleberry and beargrass (*Xerophyllum tenax*).

Currently, the majority of the project are contains stands of immature stands less than 100 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). The stands lack species diversity in the overstory and understory with key plant species absent. Average QMD for the project area is 11 inches diameter at breast height (DBH) and average height is 87 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 0.5 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.

Figure 3-1: Stand Re-initiation Stage Photos

Table 3-4: Current percent of age class within the project area

Age Class	Percent
< 20 Years	13%
21-40 Years	14%
41-60 Years	15%
61-80 Years	17%
81-100 Years	14%
101-120 Years	9%
121-140 Years	5%
141-160 Years	3%
161-180 Years	2%
181-200 Years	2%
200 + Years	5%
Unknown	1%

Table 3-5: Current percent of stand structure within the project area

Stand Structure	Percent of the Project Area
1: Sparse <10% Cover	7%
2: Stand initiation	21%
3: Stand Reinitiation	0%
4: Stem Exclusion	55%
5: Mature Stem Exclusion	12%
6: Late Seral Multistory	4%
Unknown	1%

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 and timber harvest. 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). There is also non-native insect, balsam woolly adelgid (*Adelges piceae*) species impacting the project area and it has the potential to slowly eliminate true fir species from the ecosystem.

Balsam Wooly Adelgid

The balsam woolly adelgid is a tiny sucking insect that was introduced into North America from Europe. In North America, it has caused significant 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. Symptoms of the adelgid attack appears as stunting of terminal growth, swelling around buds and branch nodes, dying foliage, and the trees turn yellow then red or brown. 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. Weather and environmental factors are important factors in affecting the insect survival. Cold winters and high elevation where there is rarely 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 that given site.

Douglas-fir beetle

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 treatment area, but with the existing conditions of highly stocked Douglas-fir plantations, the project area is at a higher risk for Douglas-fir beetle outbreak.

Dwarf Mistletoe

Dwarf mistletoes are small, leafless, parasitic plants that extract water and nutrients from live conifer trees. They are generally host specific, occurring on one principal species. They cause decreased height and diameter growth, reduction in seed and cone crops, and direct tree mortality or 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 plants. 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 is 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 agents processing downed wood and creating a variety of structure in the forest. Though the 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 Upper West Fork of Hood River watershed. This has altered the normal functioning of ecosystem processes. Past practices of regeneration harvest has impacted stand structure and species diversity within the project area.

In the project area, records show about 4,473 acres that have previously been treated, during the period from 1950 to 1999 (see Table 3-6 below) on both federal and private. 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 the Red Hill Restoration Project Area

Decade	Regeneration Harvest	Thinning
1950-1959	660	0
1960-1969	1,306	0
1970-1979	1,780	0
1980-1989	132	482
1990-1999	30	83
Total	**3,908**	**565**

3.1.3 Effects Analysis/Environmental Consequences

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 trees, and insect and disease processes.

Due to the limited size of the proposed treatment 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 (from 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 3-2). 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 diversity and structural.

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 or if drought conditions persist, they are more likely to blow down in large groups. 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	7%	5%
Stand Initiation	15%	12%
Stem Exclusion	46%	28%
Stand Reinitiation	5%	15%
Late Seral Multistory	17%	40%

*(Wimberly, 2002 & North 2004)

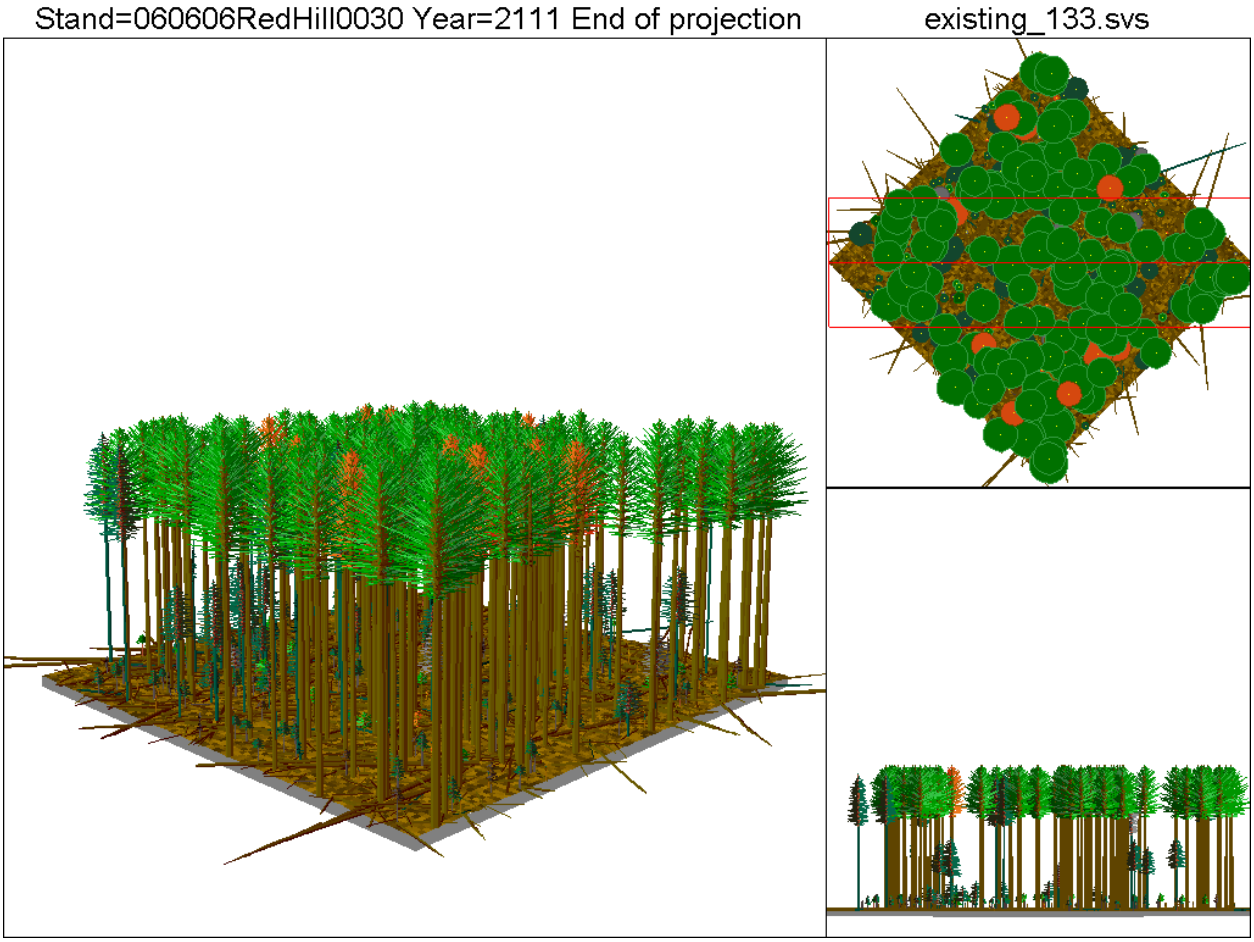

Figure 3-2: Projected stand structure 100 years after no treatment is applied

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 more typical plant association species composition, the spread of western hemlock dwarf mistletoe would be limited, due to the lack of western hemlock regenerating. The risk of balsam wooly adelgid remains moderate to low in stands dominated by Douglas-fir. Any susceptible species that 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 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 3-8: Resulting density levels from Forest Vegetation Simulator (FVS) modeling of the no action alternative

Time After Treatment	[1]Basal Area (BA)	[2]Trees per Acre (TPA)	[3]Quadratic Mean Diameter	[4]Average Stand Height (feet)
2012	244	412	11.0	78
2051	374	453	12.6	110
2101	392	355	14.4	112

1. Basal Area is the cross-sectional area of all stems of a species or all stems in a measured at breast height and expressed per unit of land area
2. Trees per acre is a 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.

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 action alternative is 1,536 acres. This is less than 15% of the proposed project area and represents less than 5% of the West Fork of Hood River watershed. 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 in these areas. 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 1,448 acres. Approximately 1,448 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 7 plant associations present in the treatment area. In the short-term, overstory species diversity would still be limited. With the use of larger (1 to 2 acre) openings, more shade-intolerant trees and shrubs species can get 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 3-3).

With vegetation treatments the stand would be less dense with a more 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 11.0 to 14.9 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 131 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	Average Stand Height (Feet)
2012	128	197	12.1	78
2051	223	185	16.2	127
2101	342	238	14.0	131

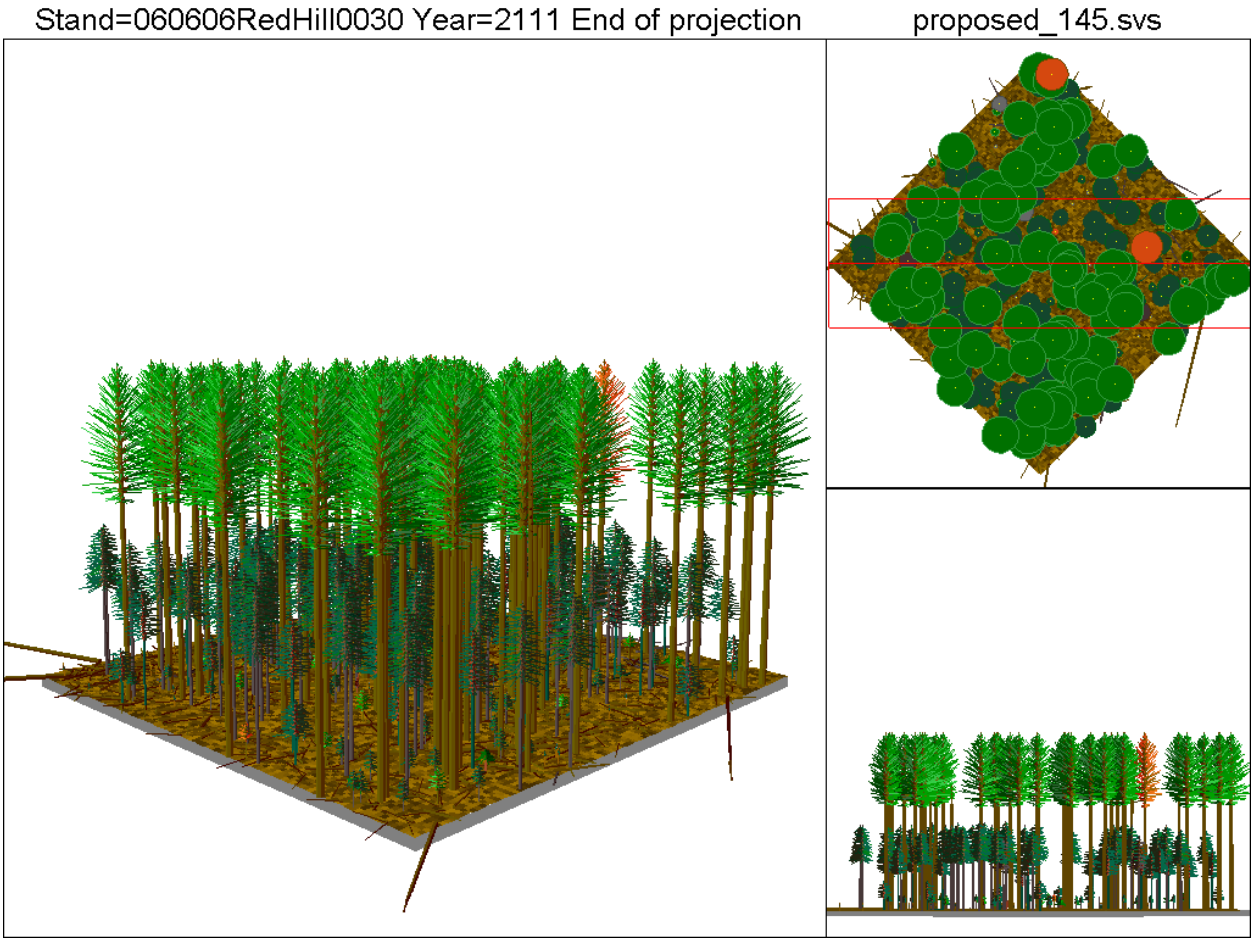

Figure 3-3: Projected stand structure 100 years after treatment is applied

Residual Stand Conditions

There is a short-term increased risk of blowdown, 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 significant 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.

With the use of mechanized equipment there is some risk of damage to residual trees from these activities. However, residual tree spacing would be quite wide, allowing machinery to have adequate room to maneuver; and therefore, should be able to avoid any appreciable damage to residual trees.

There would be little direct effects on existing conditions because suitable snags (11-inch dbh and 10-feet tall) would be maintained unless they pose a health and safety risk. In the long term,

with the proposed treatments, stands would provide greater number of green retention trees for snag recruitment in the future. Snag densities of trees 20-inch DBH and greater would increase in the future, and move the stands closer to Forest Plan standards for snag densities (FVS runs).

Ecological Processes and Disturbances

Within the proposed treatment areas the canopy closure would be reduced from 89% to 53% 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 not make the outbreak worse. Also, with healthier more vigorous trees, mortality would be more endemic to small scale disturbances.

A direct reduction in dwarf mistletoe populations would occur with 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 (dominant overstory tree within the proposed treatments) is not a susceptible species for western hemlock dwarf mistletoe and would effectively block most of the spread of the parasite.

The effects of thinning and small gap openings would be to 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 resistance (Carlson et al. 1995). Treating the rot pockets with small gap openings 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 resilience and forest health.

Cumulative Effects

Discussions of the cumulative effects are limited to those past, present and reasonably foreseeable activities that have been determined to have a cumulative effect on the vegetative resource. Refer to Table 3-1 for evaluation of all possible activities that were considered in this cumulative effects analysis for vegetative conditions. Only the vegetation proposed projects in the Red Hill 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 – if there is an overlap in time from an effects perspective then it is included.

There are no direct or indirect effects that would cumulate from other projects due to the minimal amount of area being treated. Therefore, the total cumulative effects for this project would be

very nominal, and no detrimental 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 lower 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 vegetation conditions 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. As a result, the QMD of the Proposed Action becomes lower because of the variability in thinning and because openings that were created have more smaller-sized trees that are contributing to the overall stand BA. 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		Average Height	
	No Action	Action	No Action	Action	No Action	Action	No Action	Action
2012	244	128	412	197	11.0	12.1	78	78
2020	374	223	453	185	12.6	16.2	101	122
2100	392	342	356	328	14.3	14.0	102	131

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 West 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 2011 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 (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 Mount Hood/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 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 represented as follows:

A9 – Key Site Riparian;
B5 - Pileated Woodpecker/Pine Marten Habitat;
B10 – Deer and Elk Winter Range; and,
C1 – Timber Emphasis.

Target Densities per the Forest Plan are:

A9 - Key Site Riparian	= Not Defined
B5 - Pileated Woodpecker/Pine Marten Habitat	= 2.0 miles/sq mile
B10 – Deer and Elk Winter Range	= 1.5 miles/sq mile
C1 – Timber Emphasis	= Not Defined

The following table presents data for the road densities in each category as it exists in the field as of June 2012. The target densities for each category, as prescribed by the Mt. Hood Forest Plan, are presented below the table.

Table 3-11: Existing Road Densities Data Table

Unit of Measure	Land Ownership			Land Use Allocation			
	Project	Private	Combined	A9	B5	B10	C1
Acres	10,202*	2,235	12,437	659	1001	92	9,545
Square Miles	15.9	3.5	19.4	1.0	1.6	0.1	14.9
Total Road Linear Miles	42.1	5.3	47.5	0.0	2.7	0.0	39.5
Open Road Linear Miles	37.6	5.2	42.8	0.0	2.7	0.0	35.0
Total Miles / Square Mile	2.6	1.5	2.4	0.0	1.7	0.0	2.7
Open Road Miles / Square Mile	2.4	1.5	2.2	0.0	1.7	0.0	2.4

Unit of Measure	Land Ownership			Land Use Allocation			
	Project	Private	Combined	A9	B5	B10	C1
Forest Plan Max. Miles / Square Mile	2.5	NA	2.5	NA	2.0	1.5	NA

*Acreage includes Bonneville Power Administration land that is included within "Project" boundary.

Notes:

1. There are no roads on this project that land within the A9 allocation.
2. There are no roads on this project that land within the B10 allocation.
3. Open road miles per square mile are within the allowable range as defined by the Forest Plan, Mt. Hood National Forest, 1990, for B5 allocated lands on this project.
4. There are no defined limitations on open road miles per square mile for the C1 allocation.

As demonstrated in the preceding table, the road system within the project area are within the road density targets for each Land Use Allocation as established by the Forest Plan.

Road and Trail Use Designations (Motorized Traffic)

Recently the Regional Forester for Region 6 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 3-12: Existing Motorized Route Designations

Route Miles, Stream Crossings, and Routes in RHCAs	Existing Condition
Project Action Area - Non-Wilderness (Acres)	**10,202**
Action Area Open to Motorized Cross-country Travel (Acres)	**0**
Grand Total Motorized Route: System Miles	**47**
1. Total Miles of Roads	**47**
a. Miles designated as open yearlong	42
b. Miles designated as open seasonally	0
c. Miles designated as closed yearlong (ML1)	5
2. Total Miles of Motorized Trails	**0**
a. Miles of designated roads open year round for use of OHVs	0
b. Miles of designated road open seasonally for use of OHVs	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

Route Miles, Stream Crossings, and Routes in RHCAs	Existing Condition
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	**40**
a. Total number of open OHV trail stream crossings	0
b. Total number of open road stream crossings	40
c. Total number of closed OHV trail stream crossings	0
d. Total number of closed road (ML1) stream crossings	0
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 in the Water Quality and Fisheries Specialist Reports for this project.

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. Vegetative growth along roadsides 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 roads with paved sections such as NFSR 1340 and 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. These roads, and others like them, have multiple fill slope failures and full width failures resulting from inadequate drainage, organic material in the subgrade, and from vegetation growing up through the paved surface. In more extreme cases, native surface roads such as NFSR 1600020, NFSR 1600018, NFSR 1650651, and other similar roads have eroded and degraded to a point where the road is untraversable even in a high clearance vehicle. These roads are well rutted, exhibit signs of severe erosion, and have large boulders protruding up to 12 inches from the road surface.

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 will 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 minimal road maintenance and none of the 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 (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 decommissioning, 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 undue 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 (PDC) 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 PDC provide restrictions to the road use outside the normal operating season.

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

Table 3-13: System Road Reconstruction and Maintenance

Road	Road Length	Required Road Maintenance Dollars	Description
1300	1.2	$2,052	Medium Brushing, Clean Culvert Inlets (10each/mile), 6 Danger Trees per mile.
1340.000	3.0	$31,912	Blade & Shape, Medium Brushing, 150 cubic yards Surface Rock, Clean Ditch line and Inlets for 12 culverts, New Squash Pipes at Mile Post 0.35, 12 Danger Trees per mile, Administrative Closure at Completion with New Gate
1340.000	1.8	$34,785	Grind Pavement, +/- 200 cubic yards each of Unsuitable Excavation and Pit Run for stabilization, Medium Brushing, 12 Danger Trees per mile
1600.000	10.5	$42,217	Medium Brushing, Clean Culvert Inlets (4 each/mile), Water Bar on Powerline Road above Junction @ Mile Post 0.05, Repair Edge Failure @ Mile Post 6.8 required (20 cubic yards Pit Run, 10 cubic yards 3" minus, and 3.5 ton Asphalt) Repair Multiple Edge Failures (120 cubic yards Pit Run, 40 cubic yards 3" minus, 8 ton Asphalt) Repair Sunken Grade @ Junction 1650 Road (20 cubic yards Unsuitable Excavation & 10 cubic yards Backfill, 10 cubic yards Base Rock, 2.5 ton Asphalt patch), 12 Danger Trees per mile
1600.018	1.3	$9,366	Light Clearing, Roadbed Reconditioning, 12 Danger Trees per mile, Storm proof and ML1 Closure at Completion
1600.020	2.1	$2,100	Processor Access Only; Roadbed Recondition as needed
1600.670	0.2	$1,901	Light Brushing, Blade & Shape, 12 Danger Trees per mile, Decommission at Completion
1600.690	0.8	$10,000	Road Not Used for Haul, Decommission (Remove 1 Large Pipe, 4 Cross Drains)
1600.720	0.7	$9,524	Currently Maintenance Level 1 -> Remove & Replace Berm, Light Clearing, Cat Access Only, Decommission at Completion (Remove 7 Cross Drains)
1640.000	2.1	$750	Road Not Used for Haul, Administrative Closure of Road with Gate
1640.660	0.4	$0	Maintenance Level 1 Closure

Road	Road Length	Required Road Maintenance Dollars	Description
1640.670	1.6	$15,950	Road Not Used for Haul, Decommission (Remove 1 Squash Pipe, 12 Cross Drains)
1640.671	0.3	$2,000	Road Not Used for Haul, Decommission
1650.000	3.5	$109,417	Road Ends at Trail Head, Distance Matches INFRA Roads Database; Medium Brushing, Blade & Shape, 260 cubic yards Unsuitable Excavation from Ditch Cleaning (Possible Disposal @ Mile Post 1.0?), 140 cubic yards Surface Rock, Clean Culvert Inlets (4 each/mile), 10 Danger Trees per mile Road Reconstruction Right @ Mile Post 0.20 Deep Patch @ Mile Post 1.77
1650.640	0.2	$1,624	Heavy Brushing, Blade & Shape, 12 Danger Trees per mile, Decommission at Completion
1650.650	1.0	$5,440	Medium Brushing, Blade & Shape, Clean 6 Culverts, 15 cubic yards Surface Rock, 12 Danger Trees per mile, Decommission beyond Stump Creek at Completion (0.40 miles).
1650.651	1.4	$0	Road is Currently Maintenance Level 1 in INFRA, but is Actively Decommissioned in the Field; Road Not Used for Haul
1650.660	0.5	$8,489	Native Surface with 8%-10% grades -> Light Clearing, Roadbed Reconditioning, Blade & Shape, Drainage Maintenance (4 water bars), 18 Danger Trees per mile, Decommission at Completion
1660.000	0.5	$25,209	Medium Brushing, Blade & Shape, 600 Linear Feet Ditch Cleaning, 12 Danger Trees per mile, Decommission 1.85 miles at Completion (Removal of 1 Squash Pipe, Removal of 20 - 18" x 30ft Cross Drains)
1800.000	8.1	$16,025	Light Brushing, 1800 Linear Feet Ditch Cleaning, Clean Culverts (10 each/mile), 7 Danger Trees per mile
1800.008	0.3	$8,750	Road Not Used for Haul, Decommission (Remove 1 Large Culvert, Remove 3 - 18" x 30ft Cross Drains, Dispose of Bituminous Surfacing)
1811.000	3.5	$32,295	Heavy Brushing, Light Blade & Shape, 230 cubic yards Surface Rock, Clean 1400 Linear Feet Ditch line, Clean 20 Culvert Inlets, 7 Danger Trees per mile, Decommission 0.95mi at Completion (Culverts Unknown - No major crossings, Assume 15 Cross Drains per mile)

In addition to National Forest System Roads, the project intends to utilize approximately 4.0 miles of temporary roads as described in Section 2.2.4. The following table and accompanying

notes present the proposed temporary roads to be utilized by timber unit (road lengths are approximate).

Table 3-14: Roads Costs of Temporary Road Construction

Unit #	Temporary Road		Notes	Cost
	Road #	Miles		
1	1	0.6	Existing on Private Land	$ 2,725
17	2	0.4	New	$ 6,260
17	3	0.1	New	$ 1,120
2 & 26	4	0.1	Existing	$ 1.400
23	5	0.5	Existing	$ 3,760
4 & 30	6	0.3	Existing	$ 2,720
31	7	0.2	Old NFSR 1670 (Previously decommissioned)	$ 3,920
58	8	0.4	Old NFSR 1600.680 (Previously decommissioned)	$ 5,690
58	9	0.1	New	$ 2,080
12	10	0.5	Existing on Private Land	$ 2,223
12	11	0.2	New	$ 3,040
12	12	0.3	New	$ 5,280

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. Road closure – Install a berm or gate (remains a system road at maintenance level 1).
2. Storm proofing – Install water bars or other structures to provide drainage (remains a system road); Retain culverts unless specified; Reduce the depth of fill material over culverts, where appropriate.
3. 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.
4. 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 3-15: Road Treatments within Project Area

Road Number	Length	Treatment
1340000	4.5	Maintenance Level 1, Install New Gate
1600018	1.3	Maintenance Level 1, Berm at Entrance
1600020	3.0	Storm proofing
1600670	0.2	Passive Decommission - Entrance Management
1600690	0.8	Active Decommission – Stabilization
1600720	0.7	Passive Decommission - Entrance Management
1640000	2.2	Maintenance Level 1, Install New Gate
1640660	0.4	Maintenance Level 1, Storm proof

Road Number	Length	Treatment
1640670	1.6	Passive Decommission - Entrance Management
1640671	0.3	Active Decommission – Stabilization
1650640	0.8	Passive Decommission - Entrance Management
1650650	0.4	Active Decommission - Entrance Management Beginning at Stump Creek, Remove Culvert at Creek
1650651	1.4	Active Decommission - Stabilization
1650660	0.5	Passive Decommission - Entrance Management
1660000	1.8	Passive Decommission - Entrance Management
1670000	2.4	Passive Decommission – No Treatment Required (Already Decommissioned in the Field)
1800008	0.3	Active Decommission - Stabilization
1811000	1.0	Active Decommission – Stabilization, Storm proofing
1811000	2.6	Storm proofing
TOTAL	**25.7**	

These road closures and decommissioning, 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 beneficial 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. 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. NFSR 1340 provides access to land that may be subject to a land exchange in the future and also provides an emergency egress route for the Lost Lake Resort area. For this reason, the determination was made to affect the proposed closure with a gate in order to provide ready access when needed. NFSR 1640 provides access to ongoing seismic and volcanic study and monitoring. For this reason, the determination was made to affect the proposed closure with a gate in order to provide ready access when needed. Access to management areas by commercial and administrative users would be the use categories most heavily affected by the changes.

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 in the Proposed Action.

Table 3-16: Project Road Densities as a Result of Proposed Action

Unit of Measure	Land Ownership			Land Use Allocations			
	Project	Private	Combined	A9	B5	B10	C1
Acres	10,202*	2,235	12,437	659	1001	92	9,545
Square Miles	15.9	3.5	19.4	1.0	1.6	0.1	14.9
Total Road Linear Miles	22.1	5.3	27.5	0.0	2.6	0.0	19.5
Open Road Linear Miles	22.1	5.2	27.3	0.0	2.6	0.0	19.5
Total Miles / Square Mile	1.4	1.5	1.4	0.0	1.7	0.0	1.3

Unit of Measure	Land Ownership			Land Use Allocations			
	Project	Private	Combined	A9	B5	B10	C1
Open Road Miles / Square Mile	1.4	1.5	1.4	0.0	1.7	0.0	1.3
Forest Plan Max. Miles / Square Mile	2.5	NA	2.5	NA	2.0	1.5	NA

This change represents a 36 percent reduction to the combined road density for the project area, and is within the Forest Plan target by 1.09 miles per square mile. When measured strictly on National Forest lands, the Proposed Action would reduce road density by 42 percent overall with the A9 - Key Site Riparian remaining at 0.00 road miles; a 2 percent road density reduction in the B5 - Pileated Woodpecker/Pine Marten Habitat; B10 – Deer and Elk Winter Range remaining at 0.00 road miles; and, a 45 percent road density reduction in the C1 – Timber Emphasis lands. In all areas, the final densities are within the established Forest Plan direction.

Cumulative Effects

The spatial scale analyzed for cumulative effects is the planning area, and the temporary scale is five to ten years based on the anticipated effects associated with road maintenance activities. No wood fiber harvest activities have taken place in the project area within the last four years on federal lands and no wood fiber harvest in the project area is planned within the next five to ten years at this time. That being the case, effects generated as a result of government harvest activities are limited to the Proposed Action presented in this report.

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. Therefore, it is assumed this type of haul will have similar or identical effects with respect to the transportation resource.

Roads require regular maintenance to function effectively because maintenance work, by definition, has a limited effect over time. The duration of these effects will 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 years, in this area, before some road functions begin to deteriorate appreciably. 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.

None of the transportation effects from the other projects listed at the beginning of Chapter 3 overlap in time and space with the direct and indirect effects associated with the Proposed Action. As such, there are no cumulative effects associated with these projects.

3.2.4 Consistency Determination

The Proposed Action plan, 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; FW-407 through FW-417, FW-419 through FW-436, FW-441, FW-451, and FW-452, pages Four–95 through Four–97.

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 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/Mitigation Measures.

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 decommissioning.

Minimal 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 funding.

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/Mitigation Measures (PDC) 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 (BMP) associated with this project together with the applicable road maintenance specifications (USDAFS, 2008) meet 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.

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, recreational users, and trans-forest travelers, while decreasing the potential for contamination and sediment delivery to streams and waterways. 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. 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 thinning timber harvest unit is determined by inspection of the slope by a slope-stability specialist. All but two of the proposed thinning units 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.

Two of the proposed thinning units are located in old burned areas (Units 44 and 50). Areas within these units that show post-fire signs of instability were dropped from consideration for thinning.

The determination of landslide incidence after the original unit harvest or after fire 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 most prominent geographical feature in the Red Hill Restoration planning area is the long, straight, U-shaped valley of the upper West Fork Hood River. This valley was occupied and shaped by a large valley glacier during a major ice age about 100,000 years ago. Smaller glaciers advanced down the flanks of Mt. Hood, following the Ladd Creek, McGee Creek, and Elk Creek valleys. These glaciers coalesced to form the West Fork Hood River Glacier. The glaciers left behind typical glacial landforms, including relatively wide valley bottoms and oversteepened valley side slopes.

The ridge system to the west and north of the West Fork valley, including Sentinel Peak, Butcher Knife Ridge, and the northeast extension of Lost Lake Butte, is comprised of older volcanic rocks, mostly basalt lava flows and pyroclastic flows. Blue Ridge, the broad ridge east of the West Fork valley, was formed by multiple older basalt flows that erupted from at least four vents along the ridge top and western ridge flank, including Red Hill. These vents are still preserved as cinder cones. The lower extension of Cathedral Ridge, the ridge between Ladd Creek and McGee Creek, is comprised of Mt. Hood andesite flows mantled by glacial till.

After the glaciers retreated, removing lateral support to the valley walls, many landslides collapsed down onto the valley floors, particularly along the west valley slopes. One large landslide, about 160 acres in surface area, dropped into the lower Elk Creek valley, about mid-way between Lolo Pass and Sentinel Peak. Another even larger landslide came off the west valley slope opposite Tumbledown Creek. This landslide temporarily blocked the West Fork Hood River and created a lake before the river eroded through the deposit on the west side. In addition, many debris slide and debris flow deposits mantle portions of the west valley slope.

Ladd Creek is the only creek in this planning area that is still fed by glacier meltwater. Ladd Creek has a history of large, destructive, weather-induced debris flows. These landslides have created a huge fan deposit near the mouth of Ladd Creek that extends far out into the West Fork valley. The most recent large debris flow event in Ladd Creek occurred September 1, 1961. This debris flow deposited material down to 2300-feet elevation, destroying the Lolo Pass Road crossing, damaging the road, threatening the powerlines, and relocating the lower Ladd Creek channel about 600 feet to the west. On November 7, 2006 a smaller Ladd Creek debris flow deposited material down to 2500-feet elevation and part of Ladd Creek temporarily flowed into Red Hill Creek.

Within the area covered by this Environmental Assessment, the highest landslide hazards are: 1) along the steep western valley slopes of the West Fork Hood River, and, 2) on the Ladd Creek debris flow fan deposit. The hill slopes of Blue Ridge are mostly less than 50 percent and any landslide occurrence there is unusual.

The steep western valley slopes of the West Fork Hood River contain numerous steep, straight channels. The landslide types likely to occur here are debris slides and debris flows. Debris slides typically occur on hill slopes that are greater than 60 percent. Debris flows typically originate in channels that have a gradient that is steeper than about 35 percent. Many of the channels on this valley wall are very broad swales and some of these swales have little or no surface water flow. This suggests that debris flows are infrequent in these swales. Massive debris flows in Ladd Creek are capable of travelling anywhere on the broad debris flow fan deposit and destroying anything in its path.

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 hill slope. More recently, road decommissioning projects have removed many problem areas 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 proposed thinning units determined to be most likely to contain unstable or potentially unstable slopes. These four units (Units 7, 9, 44 and 50) were all located along Forest Service Road 1340, along the western valley slope of the West Fork Hood River. A portion of one unit was judged to be unstable or potentially unstable. The unit boundary of Unit 50 was modified to exclude most of the original unit that was below Forest Service Road 1340. In addition, the five swales that bisect the unit above the road and exhibit little to no surface water flow would be treated as intermittent creeks and protected with no-treatment buffers.

Additional 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.

Direct and Indirect Effects of Alternatives

No Action

No thinning would occur under the no-action alternative. The overcrowded trees would continue to grow slowly. Existing shallow landslide scars within the project area would slowly heal as vegetation became denser. 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 Alternative

Under the Proposed Action, thinning would occur in areas that are considered to be stable by a slope stability specialist. Known unstable or potentially unstable areas have already been deleted from the proposed thinning units. Additional 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. Existing shallow landslide scars within the project area would be protected and would continue to slowly heal as vegetation on the scars became denser. The level of instability of any deeper-seated landslide areas would be unaffected by the thinning.

Under this alternative about 1.1 miles of new temporary roads would be constructed and 2.7 miles of existing road alignments would be reused as temporary roads. Of the 2.7 miles of existing road alignments, 2.1 miles are previous temporary roads that would be reconstructed for this project and 0.6 miles are on previously decommissioned 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 12.0 miles; closed system roads would total 3.3 miles; and, another 5.6 miles of road would be storm-proofed.

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, miscellaneous facilities projects, and Dollar Lake Fire. 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.

All projects and activities listed above have either been individually considered regarding their effect on slope stability or they obviously have no effect. Any potential adverse effects to slope stability have mitigation measures in place. All thinning projects in this area have been previously examined by a slope stability specialist and the unstable portions of the thinning units have been dropped from the project. The thinning projects would result in a temporary reduction in the tree canopy, which would very slightly increase peak stream flows in the project area. Stream channels would be protected with buffers that would mitigate against increases in channel bank instability caused by the slightly higher peak flows. The longer term effect would be an increase in slope stability and water quality. Private lands are located downslope and downstream from the Red Hill Restoration project. No activities on private lands overlap with

this project in either time or space within the analysis area. Therefore, no cumulative effects are expected.

Past, current, and future road repair, maintenance, decommissioning, and closure projects would 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.

These projects and activities combined would have a net beneficial effect on slope stability and water quality regardless of the impacts of other nearby past, present, or reasonably foreseeable future actions. The beneficial effect will 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 that long.

3.3.4 Consistency Determination

All proposed thinning units, totaling approximately 1536 acres, are within Forest Plan (Mt. Hood Land and Resource Management Plan) land use allocations where Forestwide Geology standards and guidelines apply. The Red Hill Restoration project is consistent with Forestwide Geology Forest Plan standards and guidelines FW-001 through FW-021 since all unstable and potentially unstable areas have been dropped from this project. 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 and landslides as a result of postponed road maintenance and road repairs. Under the Proposed Action alternative, there would be no perceptible effect on hill slope stability and project-related road rehabilitation, maintenance and repair 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 planning area is complex. Over two dozen different soil types are mapped within the overall planning area; the vast majority has 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 was taken to the field and validated, and ultimately altered to reflect what was observed on-the-ground. Some map units were changed and lines on the map moved in order to accurately characterize field conditions.

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 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 Environmental Assessment (EA) are the proposed treatment boundaries. A comparison of alternatives will be conducted using applicable Forest Plan standards and guidelines (Table 3-17) 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 3-17. 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.

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

<table><tr><th>Soil Erosion Hazard Class</th><th>Effective Groundcover</th></tr><tr><td>Slight to Moderate</td><td>60%</td></tr><tr><td>Severe</td><td>75%</td></tr><tr><td>Very Severe</td><td>85%</td></tr></table></td></tr>
<tr><td>FW – 022, 023
(Page 4-49)</td><td>The combined cumulative detrimental soil impacts occurring from both past and planned activities should not exceed 15% of an activity area (paraphrased).</td></tr>
<tr><td>FW – 032, 033, 034
(Page 4-50)</td><td>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).</td></tr>
</table>

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) 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.

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 planning area, ranging for unvegetated talus slopes to wetlands and everything in between. They have been derived from old glacial deposits 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, but for the most part soils are freely and well drained. Soil types 333, 376, 377, and 378 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 3-18 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 run 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 3-18: Summary of soil types in the analysis area and associated management interpretations from Mt Hood Soil Resource Inventory.

SRI Soil Map Units	Compaction Hazard	Erosion Potential (bare soil)
333	Low-Moderate	Slight
334*	Low	Moderate
335*	Low	Moderate
376	Moderate	Slight
377	Low-Moderate	Moderate
378	Low-Moderate	Slight

* 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 will 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 will be severe unless tractor yarding is curtailed until the soil has dried adequately.

3.4.3 Effects Analysis

No Action Alternative – Direct and Indirect Effects

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.

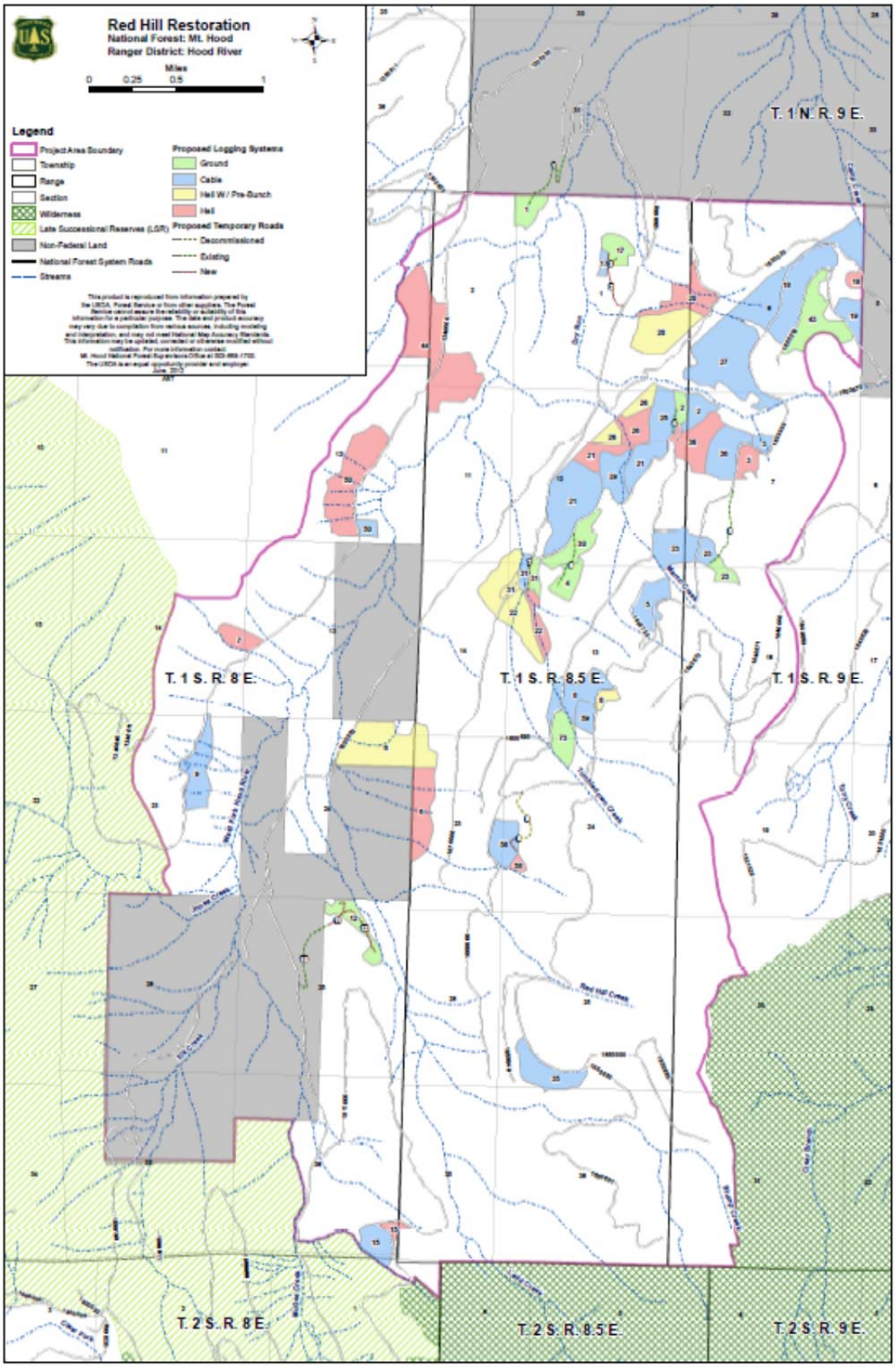

Figure 3-4: Soil map units overlaid with proposed treatment areas (in green).

Proposed Action – Direct and Indirect Effects

Current and Predicted Changed Conditions Caused by the Proposed Action

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 3-19. Monitoring occurred on glacial soil types that exist adjacent to the planning area, or on soil types expected to respond in a similar fashion. All areas listed as proposed were either been 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 3-19: 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	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	1999	Proposed	N/A	N/A	1

Sale Name and Unit Number or Planning Unit Number	Year	Silvculture Treatment	Logging System	Fuel Treatment	% Monitored Detrimental Soil Impacts
169		Thinning			
Juncrock 8	1999	Proposed Thinning	N/A	N/A	3
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

*Proposed thinning treatment was never implemented. .

A total of 188 acres are proposed for standard ground based thinning. 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 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 virtually no damage at all.

A total of 209 acres are proposed for 'prebunching' on some of the proposed helicopter logging units, where a feller-buncher machine would cut and stack the trees in bundles so they can be more quickly yarded out to a landing. Since there is no skidding involved, the impacts from one pass of a feller-buncher is not expected to measurably increase the percent of detrimental soil condition in these areas.

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.

Effects Resulting From Changing Conditions

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, 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 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 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 and PDC, 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 cumulative effects project list in Chapter 2 has been reviewed and no activities are overlap in either time or space within the soils analysis areas. Therefore, no adverse cumulative effects are expected. The method of soils analysis is cumulative by nature as explained in the Mt Hood Forest Plan (specifically FW-22). More clearly stated, an area (proposed unit) is evaluated by considering previous damage (if any) that still meets the detrimental condition definition, plus any expected detrimental soil impacts caused by the Proposed Action.

3.4.4 Consistency Determination

The proposed action is consistent with all applicable laws, regulations, and Forest Plan guidance.

3.4.5 Summary of Effects by Alternative

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

- Soil erosion risk was assessed by ensuring effective groundcover standards were met per erosion hazard ratings in Table 3-17. 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 planning 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 Mount Hood/Parkdale, Oregon.

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

Table 3-20: Strengths and Weaknesses of the Water Quality Analysis Approach

Analysis Method	Strength	Weakness
Aggregate Recovery Percentage (ARP)	Gives a good general idea about potential hydrologic recovery in a	Model utilizes a number of GIS results and a growth simulation

Analysis Method	Strength	Weakness
Model	basin. Model works well when followed up with field data such as stream surveys.	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 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 Environmental Assessment (EA), Chapter 2 would be fully implemented and effective.
- The areas of impact outlined in EA, 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 Red Hill Restoration project is located primarily in the West 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 90 inches on the east side to 130 inches on the west side of the planning area, occurring mostly during the fall and winter months. Elevation in areas proposed for treatment ranges from 1,800 feet to approximately 4,400 feet. The primary aquatic feature in the project area is the West Fork Hood River.

The Red Hill Restoration project is located primarily within portions of seven 7th field watersheds, 12I (Camp Creek), 12M (Ladd Creek), 12J (Marco Creek), 12O (McGee Creek), 12L (Red Hill Creek), 12K (Tumbledown Creek), 12Z (West Fork Hood River). All of the above mentioned 7th field watersheds are located within the Upper West Fork Hood River 6th field sub-watershed and the West Fork Hood River 5th field watershed. The analysis area 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.

There are many streams, springs and wetlands located within these sub-watersheds. The primary streams include West Fork Hood River, Ladd Creek, Red Hill Creek, Tumbledown Creek, Marco Creek, McGee Creek , and Camp Creek. There are approximately 109 miles of stream in the National Forest portion of these 7th field watersheds in the following categories: 53 miles of perennial streams (flow year around) and 56 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 throughout the Forest 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.

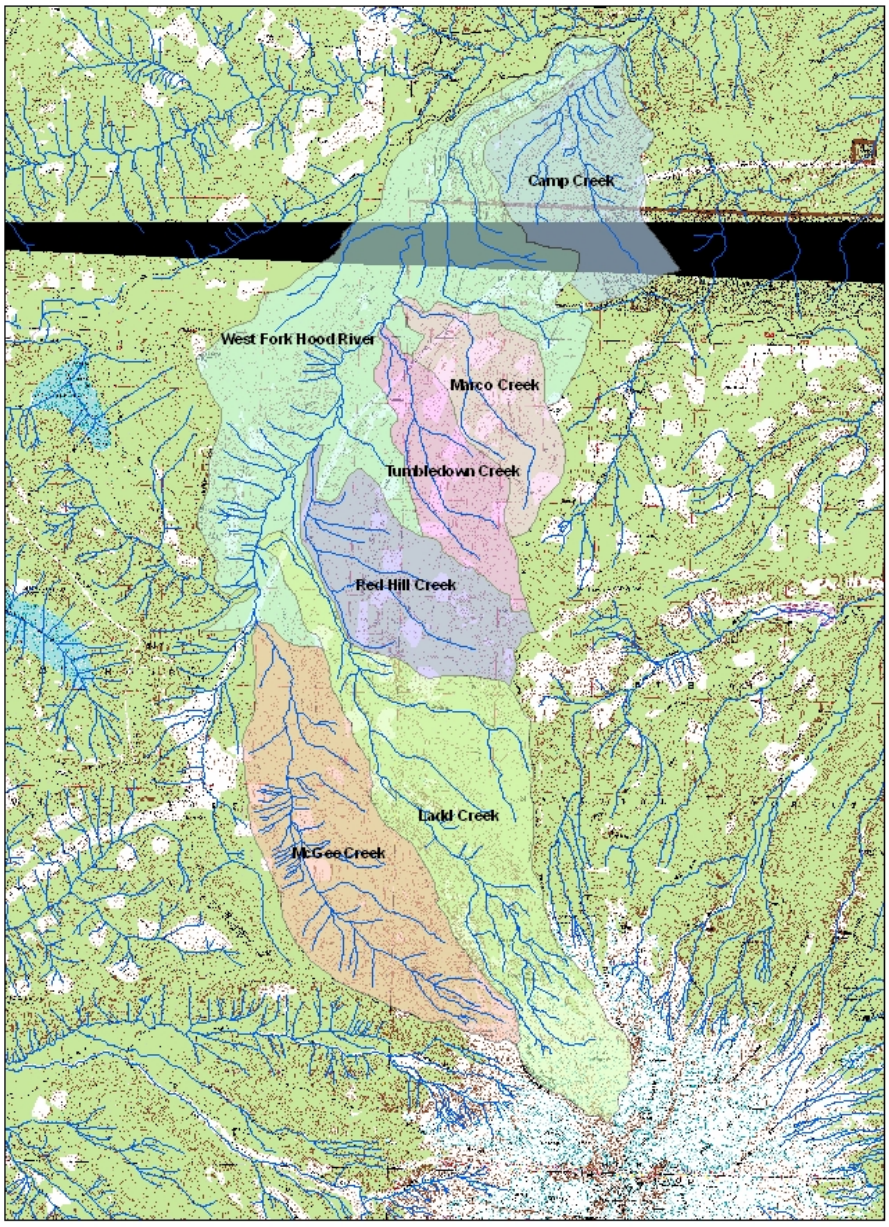

Figure 3-5: Map of the Water Quality Analysis Area showing 7th field sub-watersheds.

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.

A portion of the planning area is located on the City of Hood River Drinking Water Protection Area (DWPA). The drinking water protection area is approximately 4485 acres in size and the planning area intersects approximately 1095 acres along the eastern edge. The groundwater source comes from three springs that are approximately 1.5 miles away from the northern edge of the planning area. A source water assessment report was prepared by Oregon Department of Human Services and DEQ in June 2005. The report delineated the DWPA and identified potential risks by risk type and location. The only potential contaminant source associated with this project is Partial Harvest (< 10 years old). This is listed as a "Moderate" relative risk level due to potential turbidity in the shallow, unconfined aquifer.

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 four locations within or directly adjacent to the planning area (see figure below).

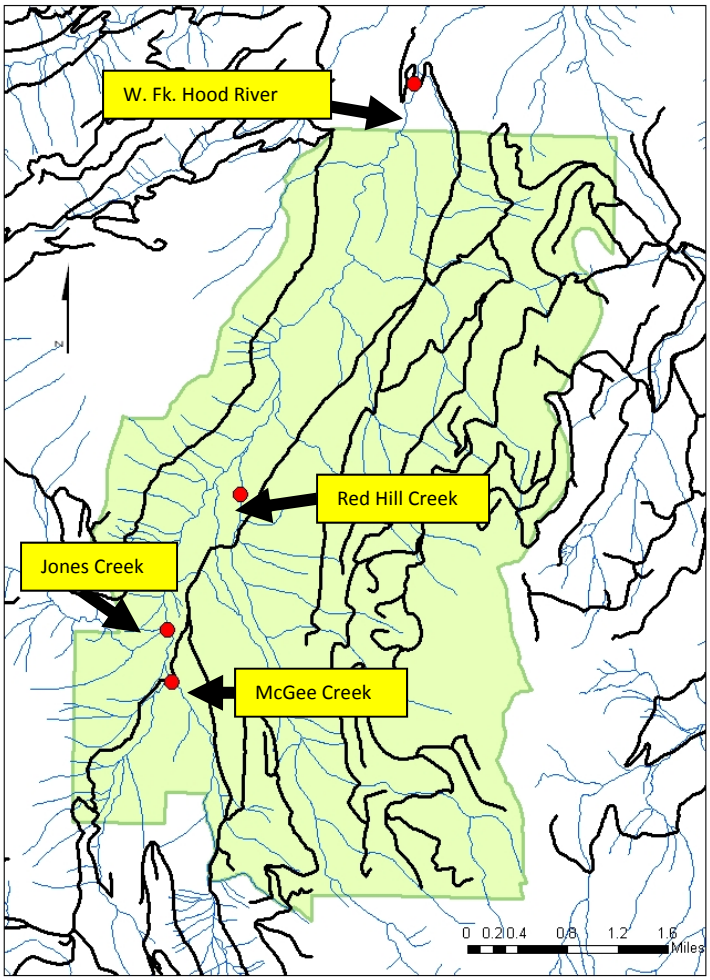

Figure 3-6: US Forest Service Water Temperature Monitoring Sites. Sites are red circles and the Red Hill Planning Area is shown in green.

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

Table 3-21: Highest 7-Day Average Maximun Stream Temperatures in the Analysis Area

Stream	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
W. Fork Hood River	13.4˚	11.7˚	13.5˚	11.9˚	13.4˚	12.0˚	13.0˚	13.8˚	12.6˚	13.7˚	13.9˚	14.0˚	13.9˚	13.5˚
Red Hill Creek	ND	ND	ND	ND	ND	11.4˚	11.5˚	12.5˚	11.0˚	ND	ND	ND	ND	ND
Jones Creek	ND	ND	ND	ND	ND	ND	ND	ND	13.2˚	13.4˚	14.7˚	13.5˚	ND	ND
McGee Creek	ND	ND	ND	ND	ND	ND	12.3˚	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 planning area, due primarily to a large contribution of surface flow from groundwater and glacial sources. A July 1997 stream survey in McGee Creek identified 23 tributaries in the 4-mile survey. These tributaries ranged from dry to contributing 10 percent of the total McGee Creek stream flow. Temperatures of the tributaries ranged from 6˚ to 11˚ Centigrade, with a majority of the small streams ranging from 7˚ to 10˚ Centigrade suggesting a large groundwater flow influence. A similar relationship was found during a July 1996 stream survey in Red Hill Creek. Eight tributaries were identified in the 2 mile survey, with temperatures ranging from 7˚ to 11˚ Centigrade. Four of these tributaries were contributing 10 to 15 percent of the total Red Hill Creek flow, and their temperatures ranged from 7-9˚ Centigrade. As mentioned above, all streams in the planning area are listed as either Category 2 – Attaining Some Criteria or Category 4A – Water Quality Limited, 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 planning 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 due to 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. Upper reaches of some of the tributary streams such as Red Hill and McGee 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. Most of these portions of the channels are within the Mt. Hood Wilderness Area.

Stream surveys conducted in Red Hill Creek, McGee Creek and West Fork Hood River support the characterization of stable stream banks and channel bed in "B" type channels and fairly stable "A" type channels. Both McGee Creek and West Fork Hood River had 1.8 percent and 3 percent respectively identified as unstable. The stream survey for Red Hill Creek stated that "Overall, banks were stable with minimal erosion and stream sedimentation."

Natural turbidity in the form of glacial meltwater is present in at least one of the West Fork tributaries, Ladd Creek. 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 3-22: 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 Increase
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. 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.

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 planning area.

Table 3-23: Sub-watershed Road Density

Sub-watershed	Road Density (mi/mi^2)
Camp Creek	1.9
Ladd Creek	1.0
Marco Creek	4.4
McGee Creek	1.5
Red Hill Creek	2.1
Tumbledown Creek	3.0
West Fork Hood River	1.8

All but one of the 7^{th} field sub-watershed road densities are at or below 3 mi/mi^2 (miles per square mile) due in part to past road decommissioning efforts. A total of 8 miles of road have been decommissioned to date in these 7^{th} field sub-watersheds. Higher road densities in Marco Creek are due to Forest Service Road 16 switchbacks that climb through the area. The majority of road surface through this sub-watershed is comprised of less erosive asphalt material (58 percent) indicating surface erosion is not a major concern despite the high road density. The Forest Service Watershed Erosion Prediction Project (WEPP) Model was run on an example road segment to illustrate different erosion rates for these different road surface types. Local soil types and weather conditions were used in the model run. A 200-foot, high use native surface section of road generated 274 pounds of eroded material while a paved surface road generated approximately 128 pounds of eroded material for the same section.

3.5.3 Effects Analysis

No Action

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

Water Quality – Stream Temperature

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.

Water Quality – 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. The following analysis utilizes tools contained within the *Northwest Forest Plan (NWFP) Temperature TMDL Implementation Strategies: Evaluation of the Northwest Forest Plan Aquatic Conservation Strategy (ACS) and Associated Tools* (2005) document to identify necessary shade so that stream temperatures within treatment areas would not increase as a result of the proposed vegetation treatments. The previously mentioned document is the result of work between the US Forest Service and the 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 State of Oregon DEQ conditionally approved the Strategy in September 2005 as the temperature TMDL implementation mechanism under the Clean Water Act.

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 current height of the trees and the hill slope. This relationship is shown in the table below.

Table 3-24: 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 1 site potential tree (130 feet) adjacent to a perennial stream. These units are within 1 mile of listed fish habitat. 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 "no entry" area next to them. The value in the table shows what is recommended according to the Sufficiency Analysis. For example, the Unit 6 recommendation is a 50 foot "no entry" primary shade zone which is 10 feet less than the prescription for the Red Hill 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 have 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 remove vegetation 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 planning 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 3-25: 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)
6	50	7	N-S	Unknown	130/2,080
7	55	2	N Only	Unknown	1,980
9	60	5/ 2	N-S	Unknown	1,080
12	50	22	SW Only	Yes	5170
15	55	7	NE Only	Unknown	2,040
20	55	2	N-S	Yes	5,020
21	60	14	W only	Yes	4,080
22	50	5	SW-NE	Yes	4,630
26	60	14	SW-NE	Yes	4,100
29	60	14	E-W	Yes	5,060
31	55	5	E-W	Yes	4,850
58	33	6	N Only	Unknown	4,900

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

All units except Unit 9 have additional factors that help protect stream temperature. Although not considered in the analysis, streams in Unit 9 are two and five feet wide which suggests that stream shading can be accomplished by shorter trees and shrubs. Due to meeting or surpassing primary shade width recommendations in the Sufficiency Analysis plus the existence of additional factors that help protect stream temperature, treatments associated with the Red Hill Restoration Project are expected to maintain existing stream temperatures.

Sediment

Some ground distubing activites 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 this document. The impacts of road decommissioning associated with this project are discussed in the next section. 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/Mitigation Measures (PDC) as they are referred to in this document.

The Proposed Action would re-open approximately 2.7 miles of old existing temporary or decommissioned roads and would construct approximately 1.1 miles of new temporary roads. The 0.2 mile section of decommissioned road that would be reopened in Unit 31 was rated as a low to moderate aquatic risk in the Mt. Hood Roads Analysis document. The reason for the

moderate risk rating in a short section of this road (600 feet) is a stream crossing that would not be reopened with this project. The other decommissioned road that would be reopened was not rated for aquatic risk during the roads analysis. The 0.4 mile section of temporary road accessing Unit 58 is not within any Riparian Reserve.

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 not pose a risk of introducing sediment to streams because almost all of these roads would be outside of the Riparian Reserves. Approximately 2000 feet of a new temporary road would skirt the outer portion of a Riparian Reserve along Ladd Creek. This section of temporary road is within Unit 12. The new temporary road stays at least 200 feet away from Ladd Creek, is located on flat ground and would not cross stream channels. As a result, there would be a very low probability of any sediment from temporary road surfaces reaching streams. In addition, approximately 1000 feet of temporary road would be reopened in a Riparian Reserve along a previously decommissioned road. This road is near Tumbledown Creek and accesses Unit 31. As described in the previous paragraph, this reopened road would not cross any streams so it poses a low risk of sediment introduction to adjacent surface water. 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 road and re-opened temporary 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.

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 native surface road (road is made from native soil) and a gravel surface road. All of the model inputs stayed the same except surface material, which was changed from native to gravel surface.

Table 3-26: 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	277 lbs.	99 lbs
Gravel Surface Road	144 lbs.	65 lbs.

Results from the WEPP model runs show that in this situation, the native surface road produced 277 pounds of eroded soil while the gravel surface road produced 144 pounds of eroded soil which is a 50 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. 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. 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 24 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 ditch lines that allow eroded soil to be stored adjacent to the roads.
- Eighty eight 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 undisturbed vegetative buffers of 60 feet along perennial streams and 30 feet along intermittent streams, keeping large mechanized equipment away from surface water, use of erosion control (e.g., ditch line sediment traps, straw wattles, water bars) where necessary, and lower impact road maintenance techniques (leaving vegetated buffer strips in ditch lines 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.

Road Decommissioning, Road Closures and Road Storm proofing

Twelve miles of road is proposed for decommissioning in the Red Hill Restoration Project. One road, Forest Service Road (FSR) 1670, has already been decommissioned and only needs to be removed off the official Forest Transportation layer. The effects of decommissioning this road would not be included in the analysis below since the decommissioning work has been completed on-the-ground.

There would be some turbidity increase when water is returned to areas where culverts have been removed in stream channels. The area with the highest number of crossings removed and likely location of short-term turbidity is FSR 1660. Based on previous monitoring and personal observations, the majority of turbidity should last several minutes and would return to background levels rapidly. These culvert removals would occur during the dry time of the year

when Ladd Creek has increased natural turbidity in the West Fork Hood River so the effects of culvert removal should not be detectable in the West Fork. 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 1.2 miles of road removed from Riparian Reserves equating to approximately 7.3 acres or Riparian Reserve restoration. This would improve local aquatic conditions including long-term sediment reduction and recovery of riparian vegetation.

Approximately 8.4 miles of road is proposed for closure and approximately 5.6 miles of road is proposed for storm proofing. 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. FSR 1340 has numerous stream crossings that are directly upslope of the West Fork Hood River. The first three miles of road is currently gravel surface so closure after project completion would result in sediment reductions to West Fork Hood River due to a reduction in use. 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 as much due to road traffic. FSR 1640 is a gravel road that crosses the very upper reaches of Marco Creek, so there would be some sediment reduction by closing this road.

City of Hood River Drinking Water Protection Area

As mentioned in the Existing Condition section, a portion of the project area is in the City of Hood River Drinking Water Protection Area (DWPA). Specifically, Units 1, 7, 44 and 50 are in the eastern edge of the DWPA. Turbidity was identified in the source water report as a potential threat to the protection area. As described above, sediment amount is anticipated to be minimal due to PDC and inclusion of BMP identified in the draft "EPA Region 10 Source Water Protection Best Management Practices for USFS, BLM". In addition, this area drains into the West Fork Hood River, away from the springs that serve as the source for the City's drinking water.

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 alternative 2. The only project that may have some 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 Red Hill Restoration Project, whether these projects overlap in time and space and an assessment if a measureable cumulative effect is expected. 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.

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 streams. As described in the direct and indirect effects section, this project would maintain existing water temperatures.

Sediment
Some detrimental cumulative effects may occur as a result of sediment introduction, primarily in the section of Ladd Creek below the power line corridor. Sediment from culvert removal along FSR 1660 may mix with sediment from the Dollar Lake Fire and BPA maintenance activities if these activities occur at the same time. This risk would be greatest the year following the road decommissioning work. As described in the water quality analysis, Ladd Creek has high natural turbidity due to glacial melt water, so this effect would likely not be measurable. Regardless, the cumulative effect is expected to be very small and localized due to the small amount of sediment expected. As described in the direct and indirect effects section, PDC aimed at minimizing erosion and sedimentation reduce the potential of erosion and delivery of the material to adjacent surface water.

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.

Table 3-27: 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 Red Hill 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 Red Hill 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 Red Hill Restoration project.
	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. The Red Hill Restoration project would maintain the primary shade zone so there should be no 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 Red Hill Restoration Project.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
Private Land and BPA activities (past timber harvest, power line maintenance activities)	Coarse and Fine Sediment	Yes	Yes	Possible	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 only fine sediment producing activity in the Red Hill Restoration project is culvert removal during road decommissioning. The highest potential location for sediment mixing is Ladd Creek below the power line corridor. This is where sediment from culvert removal on the FSR 1660 could mix with sediment from BPA maintenance and the Dollar Lake Fire. Other activities would be well downstream from the Red Hill Restoration project.
	Stream Temperature	Yes	Yes	No	Some projects are completed so there are no remaining stream temperature effects due to natural recovery. The Red Hill Restoration project would maintain the primary shade zone so there should be no 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 Red Hill Restoration Project and natural recovery for some of the projects on private land.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
Dollar Lake Fire	Coarse and Fine Sediment	Yes	Yes	Possible	There may be an overlap in timing of effects from the Dollar Lake Fire and the Red Hill Restoration project. The only fine sediment producing activity in the Red Hill Restoration project is culvert removal during road decommissioning. The highest potential location for sediment mixing is Ladd Creek below the power line corridor. This is where sediment from culvert removal on FSR 1660 could mix with sediment from BPA maintenance and the Dollar Lake Fire.
	Stream Temperature	Yes	Yes	No	The Red Hill Restoration project would maintain the primary shade zone so there should be no 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 Red Hill Restoration Project.
Past Aquatic Restoration Projects (Road Decommissioning, McGee and West 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 Red Hill Restoration project.
	Stream Temperature	No	Yes	No	
	Water Quantity	No	Yes	No	
McGee Creek Riparian Thinning	Stream Temperature	Yes	No	No	The Red Hill Restoration project would maintain the primary shade zone so there should be no increase in stream temperature.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
Aquatic Organism Passage Projects (McGee Creek)	Suspended Sediment	Possible	No	No	There is a chance of some short-term introduction of fine sediment from the McGee Creek Aquatic Organism Passage Project, but it is unlikely that this would mix with any minor fine sediment from the Red Hill Restoration project due to the 2-mile distance from the passage project area and the confluence with Ladd Creek. This is where sediment from culvert removal on FSR 1660 could mix with sediment from the passage project.
Aquatic Organism Passage Projects (Red Hill Creek)	Suspended Sediment	No	Yes	No	For Red Hill Passage Project, no remaining sediment effects due to mitigation measures and design criteria implementation on the original project and natural recovery.
Invasive Plant Treatments	Coarse and Fine Sediment	Yes	Yes	No	There may be an overlap in timing of this project with the Red Hill 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	The Red Hill Restoration project would maintain the primary shade zone so there should be no increase in stream temperature.

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 (Miles Creeks) Subbasin TMDL. A summary of applicable water quality S&G and BMP from these documents are displayed below.

Forest Plan Standards and Guidelines (pages Four-53 through 63)

- Standards and Guidelines dealing with BMP – 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 for this project. Those BMP 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 this project. 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, so total road mileage would decrease to 106 miles in the Key Watershed after implementation of this project.

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 Red Hill Restoration Project is reduced to 12.7 percent compared to a pre-project value of 12.3 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 BMP 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 Red

Hill Creek, McGee Creek and Mitchell Creek are about 30 feet wide. The only work proposed in floodplain areas are 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.

National Pollution Discharge Elimination System (NPDES)

At this time it is uncertain whether this project would require a National Pollution Discharge Elimination System (NPDES) permit, due to several factors.

In Northwest Environmental Defense Center v. Brown, 640 F.3d 1063 (9th Cir. 2011) ("NEDC"), the Ninth Circuit Court of Appeals held that stormwater runoff associated with two logging roads that flows into systems of ditches, culverts, and channels before being discharged into forest streams and rivers is a point source discharge for which a National Pollutant Discharge Elimination System (NPDES) permit is required. The Court of Appeals then remanded to the district court for further proceedings consistent with its opinion. The State of Oregon and other parties filed petitions for certiorari with the U.S. Supreme Court to review the Ninth Circuit's decision and on June 25, 2012, the U.S. Supreme Court granted certiorari. The United States was not a party to litigation.

NEDC v. Brown involved a citizen suit; thus any available relief on remand would be limited to addressing the violation in question and is only binding on the involved parties. Because the USDA Forest Service was not a party, the Ninth Circuit's decision did not impose any affirmative duties on it. However the case has implications for federal land management agencies.

In response to NEDC v. Brown, EPA issued a formal notice on March 23, 2012 in the Federal Register (77 FR 30473) indicating its intent to expeditiously propose revisions to its Phase I stormwater regulations (40 C.F.R. §122.26) to specify that stormwater discharges from logging roads are not stormwater discharges "associated with industrial activity." The notice also states that EPA intends to further study and seek public comment on alternative approaches for addressing stormwater discharges from forest roads.

Additionally, following the Ninth Circuit's decision, Congress took legislative action suspending any potential permitting requirement imposed by the decision:

> From the date of enactment of this Act until September 30, 2012, the Administrator of the Environmental Protection Agency shall not require a permit under section 402 of the Federal Water Pollution Control Act (33 U.S.C. 1342), nor shall the Administrator directly or indirectly require any State to require a permit, for discharges of stormwater runoff from roads, the construction, use, or maintenance of which are associated with silvicultural activities.

Consolidated Appropriations Act, 2012, § 429, Pub. L. No. 112-74, 125 Stat. 786, 1046-1047 (Dec. 23, 2011). Thus, until September 30, 2012, no NPDES permits are required for stormwater discharges from roads associated with silvicultural activities.

Permanent legislation is also pending in both the U.S. Senate and the House of Representatives that would amend Section 402 of Clean Water Act to exempt stormwater discharges resulting from silvicultural activities from NPDES permit requirements.

Due to these factors, it is uncertain at this time whether any NPDES permitting requirements apply, or would apply in the future to stormwater discharges from logging roads. Should it be determined that an NPDES permit is required for this project, the Forest Service would comply with any applicable NPDES permitting requirements.

3.5.5 Summary of Effects by Alternative

Water temperature would be maintained under both the No Action and Proposed Action alternatives. 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 is 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 1340 where sections of cracked road fill pose a threat of sediment introduction into the West Fork Hood River. 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, storm proofed 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, biological evaluation, and biological assessment 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 EA, Chapter 2 would be fully implemented and effective.
- The areas of impact outlined in the EA, 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.

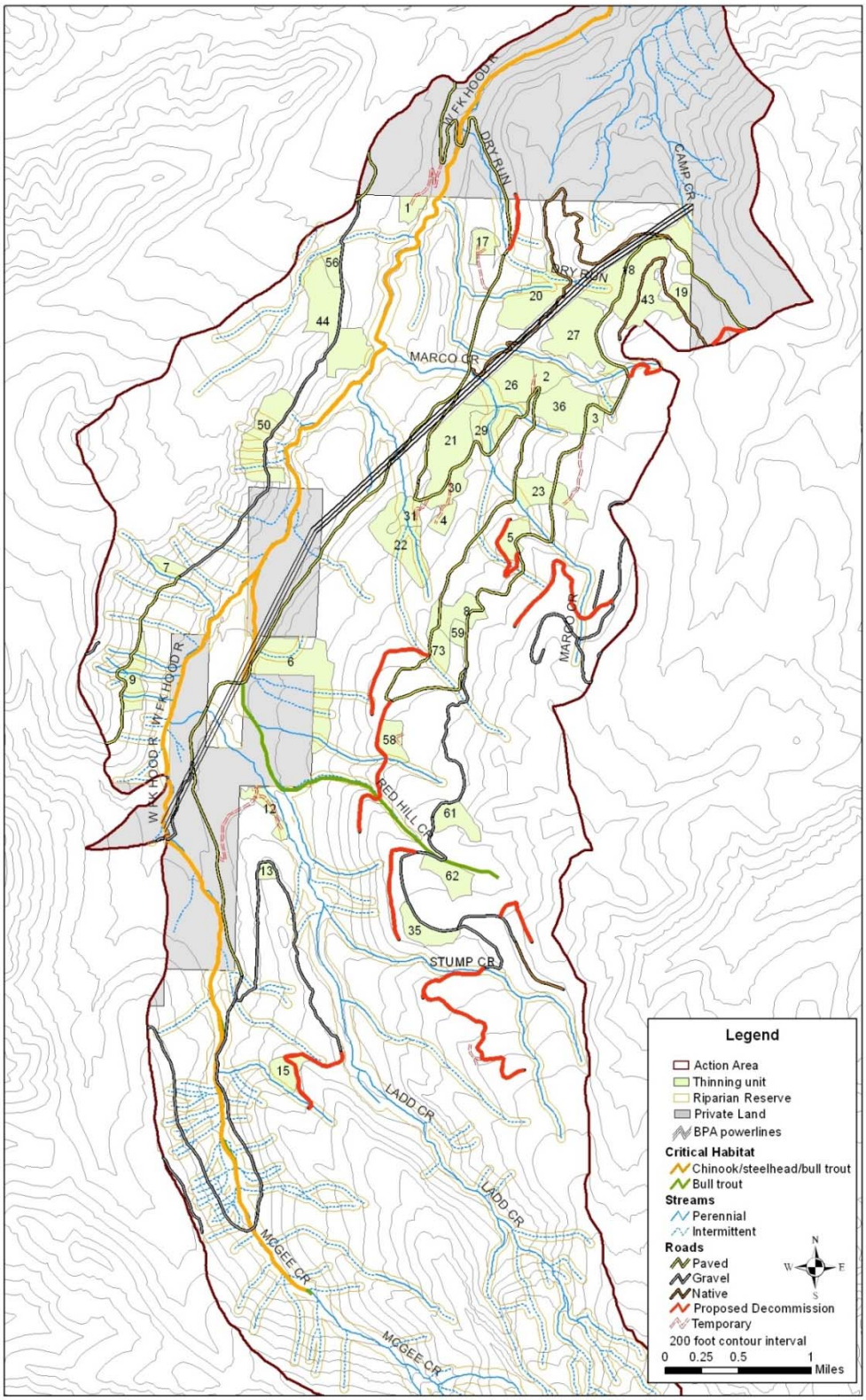

Figure 3-7. Map of the Red Hill Restoration Project action area including streams, roads, designated Chinook salmon, steelhead trout, and bull trout critical habitat, and proposed vegetation treatment units.

3.6.2 Existing Condition

Overview

The project is located on the Mt. Hood National Forest (Forest) in Hood River County. The action area is approximately 19,625 acres (30.6 sq. mi.) in size and lies entirely within the Upper West Fork Hood River 6th field watershed. Proposed activities are spread throughout the project area within the following 7th-field sub-watersheds: McGee Creek, Ladd Creek, Red Hill Creek, Tumbledown Creek, Marco Creek, Camp Creek, and a portion of the West Fork Hood River (see Figure 3-5). A portion of the West Fork Hood River watershed is a Northwest Forest Plan Tier 1 Key Watershed which has an emphasis on management of anadromous salmonids (USFS and BLM 1994).

Within the project area, there are about 109 stream miles, 53 miles with perennial flow and 56 miles with intermittent flow. Drainage areas occupied by individual streams within the Upper West Fork Hood River are generally small (less than 3 square miles) and are steep in the headwaters and moderately sloped closer to the West Fork Hood River. The West Fork Hood River itself lies in a relatively confined canyon in the lower portion of the 6th field watershed and as such many tributaries entering the West Fork in the section are very steep near their mouths as they fall over the canyon wall. Streams are generally well-defined and typically moderately to deeply incised.

Water quality is generally good, with water temperatures well below Oregon Department of Environmental Quality standards. The only stream with a glacial source is Ladd Creek and it carries a significant amount of natural bedload and fine sediment that alters habitat conditions in the West Fork Hood River downstream from the mouth of Ladd Creek. Other streams in the area are all spring fed and thus run clear and cold.

A 2011 analysis of watershed condition conducted at the 6th field level determined that overall physical aquatic habitat in the Upper West Fork Hood River 6th field watershed was given a classification rating of 1.5, which is between "Properly Functioning" and "Functioning at Risk". Watershed condition analysis was not conducted at a finer watershed scale.

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. In this case the action area for the aquatic fauna and habitat analysis is outlined below.

The action area from the aquatics perspective lies wholly within the Upper West Fork Hood River 6th field watershed boundary (except for a potential rock haul route as described below) and the action area includes all of the land area within the 7th field watersheds listed above except in the West Fork Hood River (Figure 3-7). This 7th field watershed was adjusted to reflect proposed activities and potential effects. Elk Creek and Jones Creek are not included in the action area because there are no actions proposed. This analysis focuses on 7th field watersheds

for site specific analysis (e.g. direct and indirect effects) and the 6th field watershed scale is the focus for cumulative effects analysis and compliance with the Northwest Forest Plan (NWFP) Aquatic Conservation Strategy Objectives.

If required government, supplied crushed or pit run rock would come from Dollar Quarry located in the Tony Creek 7th field watershed. Tony Creek is part of the Lower Middle Fork Hood River 6th field watershed. The only portion of this watershed included in the Red Hill Restoration Project Action Area is the quarry itself and the rock haul route from the quarry into the Upper West Fork Hood River 6th field watershed (FSR 1631630 → 1631 → 1630 → 1600).

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 West Fork Hood River and some of its tributaries. 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 12.7 miles of designated critical habitat (also referred to as listed fish habitat, LFH) for Lower Columbia River steelhead (*Oncorhynchus mykiss*) and Lower Columbia River Chinook salmon (*O. tshawytscha*) habitat in the project area and 15.1 miles of Critical Habitat for Columbia River bull trout (*Salvelinus confluentus*). Both summer-run steelhead and spring-run Chinook are present in the action area but bull trout do not occupy habitat in the action area. Coho salmon (*O. kisutch*) are also present in the action area, but critical habitat for this species has not been designated. Other native fish species present include resident rainbow trout (*O. mykiss*) and sculpin (*Cottus spp.*).

Lower Columbia River steelhead are found in the West Fork Hood River and tributaries within the action area (Figure 3-8). Spawning and rearing have been documented in McGee Creek and the West Fork Hood River, and is suspected in Red Hill Creek, Jones Creek and Elk Creek. Although there are both summer and winter runs of steelhead present in the Hood River Basin, only summer steelhead are present in the West Fork. Adult summer steelhead typically enter the Hood River from July to early October before spawning from March to July the following year. Most juvenile steelhead emigrate as age-2 or age-3 smolts and spend 2 years rearing in the ocean before returning as adults. The mean abundance of returning adult summer steelhead in the Hood River from 2000 to 2010 was 390 (range 149 to 1,025) individuals. The mean number of smolts emigrating from the West Fork Hood River during that same period was 709 (range 194 to 1434).

Chinook salmon utilize habitat within the action area for spawning and rearing (Figure 3-9). Although there are both spring and fall Chinook in the Hood River, only the spring run utilize habitat in the West Fork Hood River. Most spawning occurs in the West Fork Hood River, but some spawning has been documented in lower McGee Creek. Juvenile Chinook salmon have

also been found in lower Jones Creek, but whether adult spawn there is unknown. It is possible that Chinook spawn and/or rear in lower Red Hill Creek although the stream has a higher gradient (>3 percent) than is typically utilized by Chinook salmon. 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.

Coho salmon are a minority anadromous species in the Hood River compared with Chinook salmon and steelhead. A common belief until recently was the native coho salmon population in the Hood River was extinct, but the fact that unmarked, presumably wild, coho show up in the Hood River almost every year has led some fish biologists to believe a remnant native population exists. Coho distribution in the Hood River, and especially in the action area, is not as well understood as Chinook salmon and steelhead, but their distribution is likely very similar to Chinook salmon (Figure 3-10). Juvenile coho have been found in the West Fork Hood River and lower reaches of Jones and Red Hill Creeks. It is likely the adults spawn in the West Fork Hood River nearby as it is low gradient with suitable resting and spawning areas. Coho enter the Hood River beginning in early fall and spawn in late fall or early winter.

The West Fork Hood River watershed is unoccupied by bull trout (USFWS 2010) and only the short reach of the West Fork Hood River below Punchbowl Falls was historically accessible. The Hood River has two core populations of bull trout: one is an isolated population located upstream of Clear Branch Dam in the Middle Fork Hood River watershed, and the other is located in the Hood River, Middle Fork Hood River, and tributaries below the Clear Branch Dam (USFWS 2002). There are two records of bull trout occurrence in the West Fork of Hood River. The earliest available documentation is from 1963 of one fish in a trap in the Punchbowl Falls fish ladder and another bull trout was captured at the mouth of Lake Branch, a tributary to the West Fork of Hood River, in the fall of 1997 by the Oregon Department of Fish and Wildlife (USFWS 2002).

No other Endangered Species Act (ESA) listed anadromous fish species that occur elsewhere on the Forest are found in the action area.

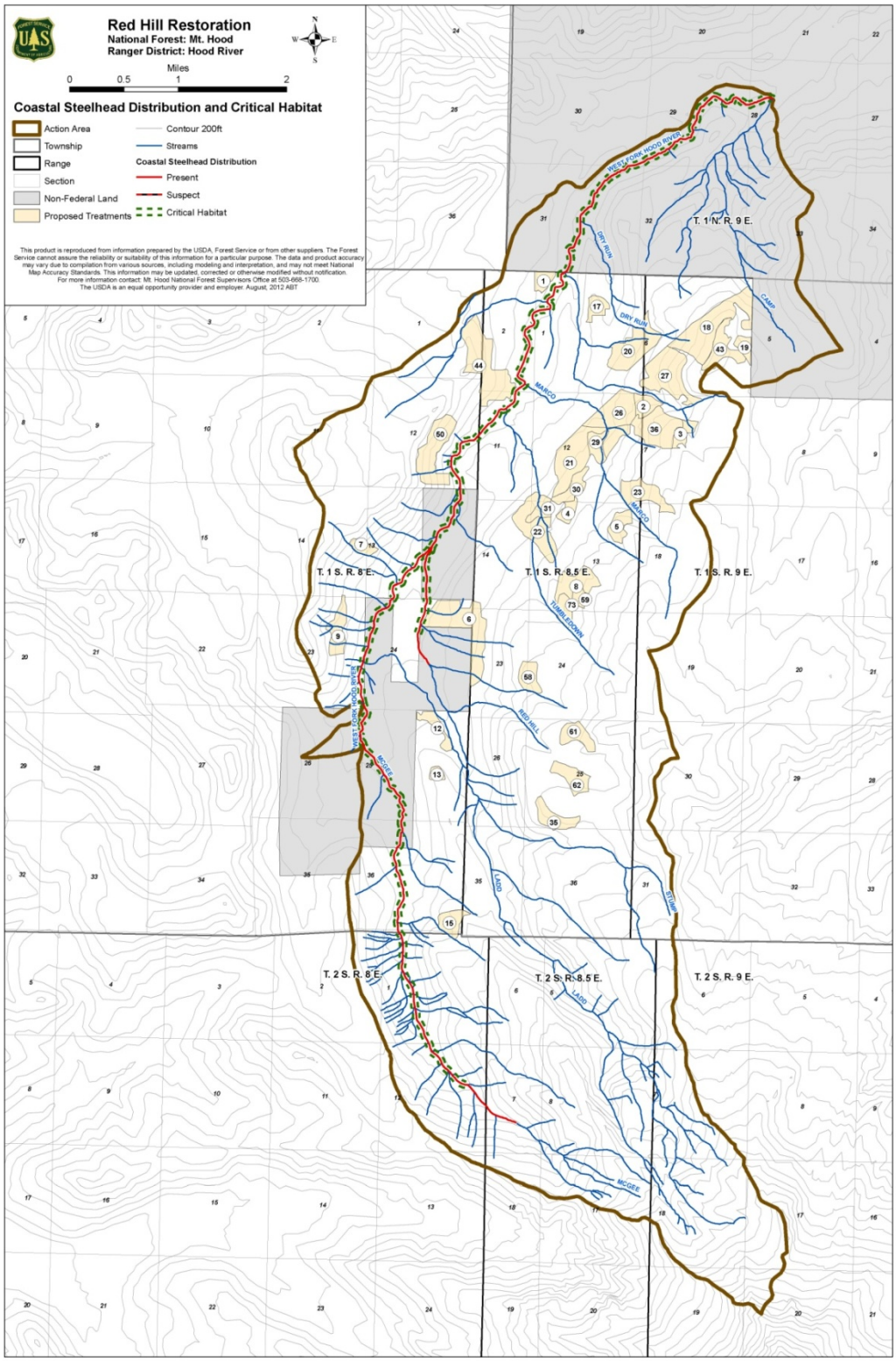

Figure 3-8. Map of known and suspected steelhead trout distribution and designated critical habitat within the Red Hill Restoration Project action area.

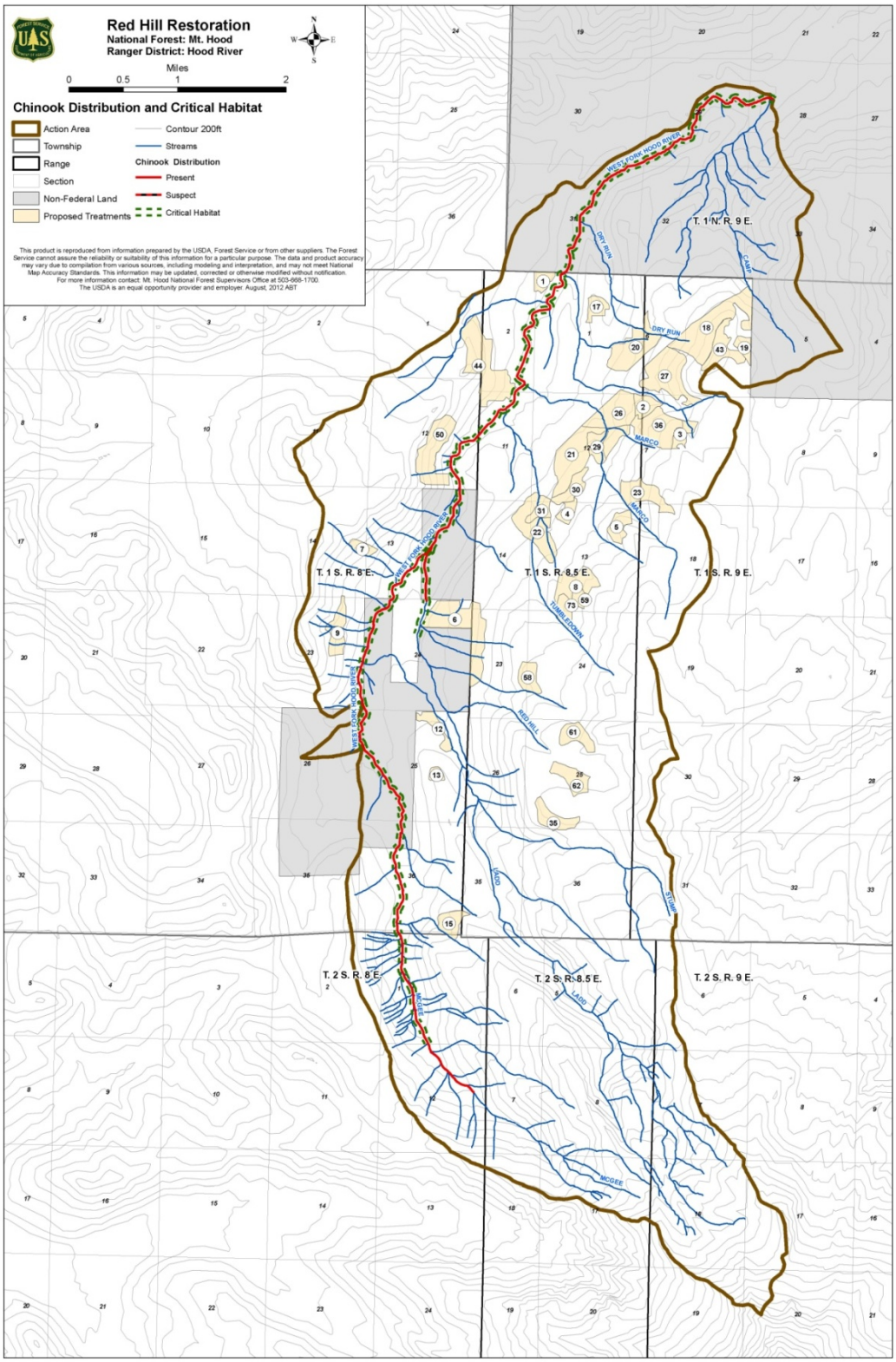

Figure 3-9. Map of known and suspected Chinook salmon distribution and designated critical habitat within the Red Hill Restoration Project action area.

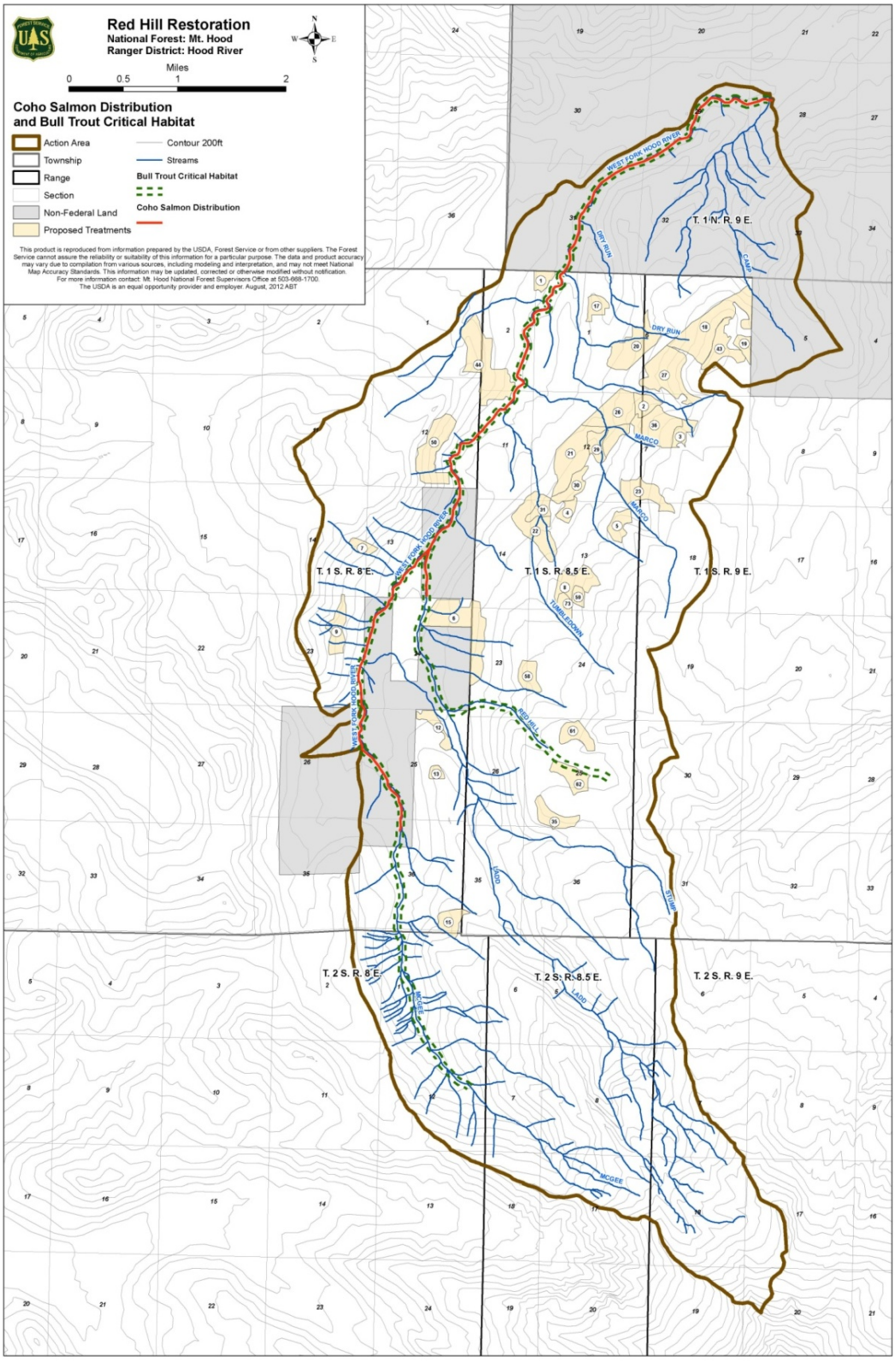

Figure 3-10. Map of known and suspected coho salmon distribution and bull trout designated critical habitat within the Red Hill Restoration Project action area.

Management Indicator Species

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. These requirements are restricted enough that it is reasonable to assume that if the life history needs of salmonids are met, the rest of other fish species found on the Forest will 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. The only MIS fish species in the action area are Lower Columbia River spring Chinook salmon, Lower Columbia River coho salmon, Lower Columbia River summer steelhead, and resident rainbow trout. Of these species, resident rainbow trout are the most widespread in the action area (Figure 3-11).

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.

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 3-28).

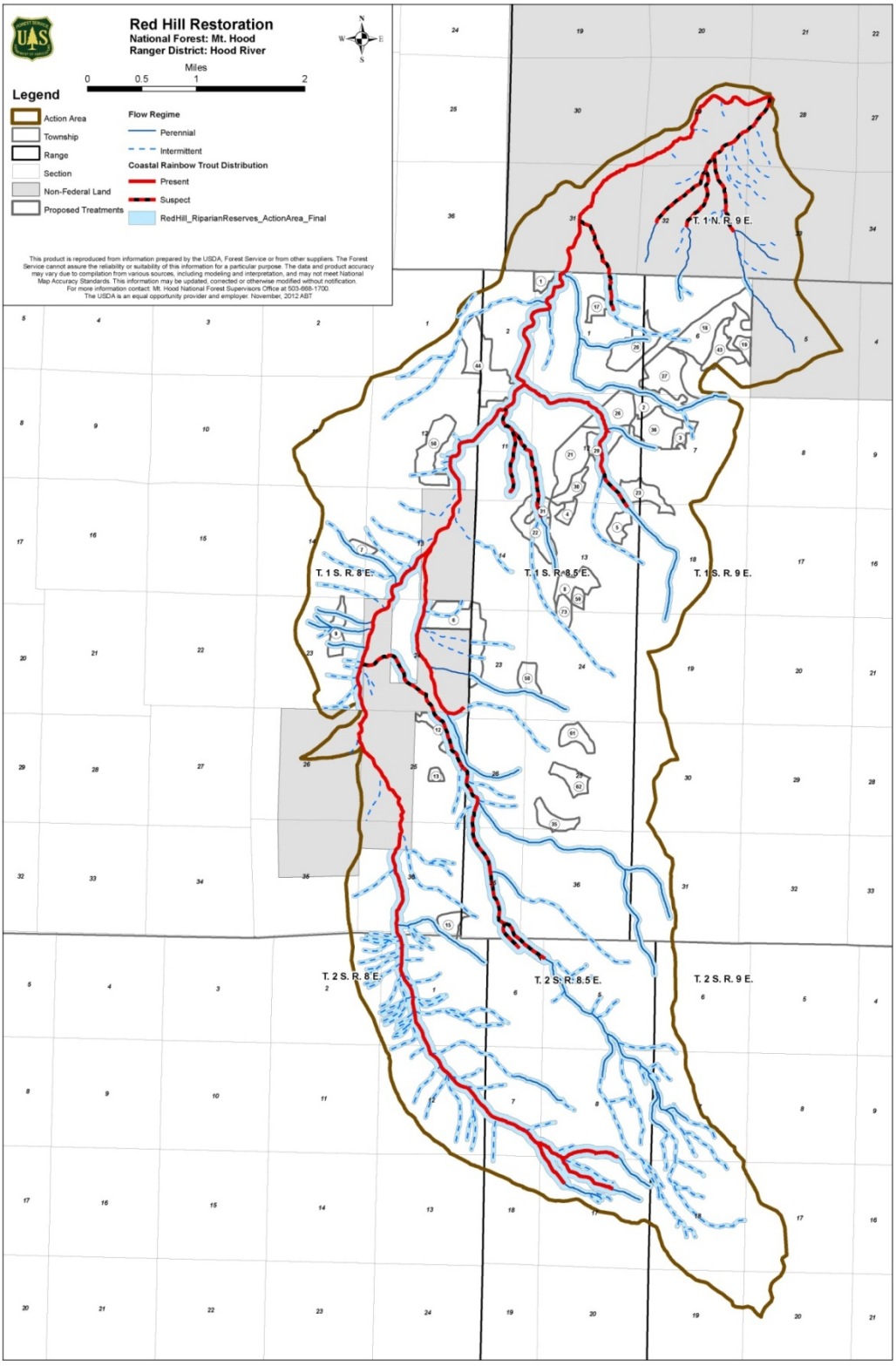

Figure 3-11. Map of known and suspected resident rainbow trout distribution within the Red Hill Restoration Project action area.

Table 3-28. A comparison of salmonid management indicator species 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 summer 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	12.0	8.4%
Coho salmon	193	9.0	4.6%
Steelhead trout	95	12.4	13.0%
Resident trout[1]	1370	21.6	1.6%

Aquatic Macroinvertebrate Presence/Absence

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 3-29). 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 3-29. Region 6 (R6) special status species either documented (D) or suspected (S) to occur within the Mt. Hood National Forest and within the action area (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*

[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 1.

Scientific Name	Common Name	Forest Presence	Action Area Presence
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 sp. nov. (Columbia)	**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.

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 planning area is outside of the known range of the Barren Juga, the habitat description of the species closely matches some locations in the planning area 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 planning area occurs in the headwaters of Ladd Creek and McGee Creek and is well upstream of any activities proposed under this project. Therefore, the Scott's Apatanian caddisfly may occur within high elevation streams within the Upper West Fork Hood River 6th field watershed and thus is presumed present in the action area.

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. Only one stand proposed for thinning treatment (Unit 44) is over 80 years old and thus was surveyed for potential aquatic survey and manage mollusk habitat; however, no springs, wetlands, or streams were found thus suitable habitat is not present.

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.

There are an estimated 31 acres of cleared land for temporary roads, landings, and staging areas throughout the action area, which equates to 2 percent of the total associated vegetation removal. This is double the 1 percent maximum of the total associated vegetation removal required to

qualify for no surveys as outlined in exemption 7 (Exemptions for Restoration Projects that May Involve Commercial Logging) listed in July 6, 2011, settlement agreement Conservation Northwest v. Sherman, Case No. 08-CV-1067-JCC. However, 29 of the 31 acres are estimated landings and PDC stipulate new landings would be located outside Riparian Reserves and existing landings would only be used if they were located a minimum of 100 feet from any surface water. As such, there would be no expected impact to aquatic habitat from landings. Temporary roads only account for 2 acres of openings, much less than 1 percent of the total associated vegetation removal.

This project complies with the court's survey and management direction in Northwest Ecosystem Alliance v. Rey and Conservation Northwest v. Sherman and/or there would be no expected impact to aquatic systems from created openings so surveys are not required. As such, this project is consistent with the survey requirements in the 2001Record of Decision and Stands and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines.

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), but few surveys have been conducted in the vicinity of this project. In 2000 a small tributary to Lake Branch, the largest tributary to the West Fork Hood River located north of the action area, was surveyed and the Columbia duskysnail was found. Mollusks believed to be the Columbia duskysnail were found in spring fed side channel of the West Fork Hood River within the action area during surveys conducted for another project (Darcy Saiget, Forest fisheries biologist, personal communication, 6/27/2012). Although samples of the mollusks were not collected for positive identification the combined mollusk survey experience of the field personnel suggests they were the Columbia duskysnail. 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 throughout the action area and thus the Columbia duskysnail is presumed present.

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

The planning area has been impacted over the past century by timber harvest, road building, fires, fire suppression, 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 PDC 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 at three monitoring locations within the action area and at one location in the West Fork Hood River mainstem just below the project area (see Water Quality Specialist Report). Water temperature monitoring has focused on summer conditions since fall, winter, spring and early summer temperatures (spawning and incubation periods) in this high elevation 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 water temperature recorder in the West Fork Hood River immediately downstream of the action area recorded a maximum 7-day average of 14.0 degrees Celsius in 2005 from 14 years of monitoring (Table 3-21). McGee Creek had a maximum 7-day average of 15.0 degrees Celsius in 2004, based on ten years of monitoring split between two sites. Red Hill Creek had a maximum 7-day average of 12.5 degrees Celsius in 2001 based on four years of monitoring.

Most tributaries to the West Fork Hood River within the action area are primarily groundwater influenced, including McGee Creek, Red Hill Creek, Tumbledown Creek, Marco Creek, and unnamed perennial tributaries. These spring-fed streams maintain cool temperatures throughout the summer rearing period. Ladd Creek is glacially influenced, and it also maintains cool temperatures.

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. In the West Fork Hood River Watershed Analysis, a standard of less than 20 percent fine sediment less than 6 mm (millimeters) in streams is recommended, except for Ladd Creek which would naturally have a higher level of fine sediment due to the glacial origin of the stream (USFS 1996). The 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 within the Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) and recommended Watershed Analysis standards in all streams within the action area except the West Fork Hood River (Table 3-30). McGee Creek and Red Hill Creek generally had fines well below levels of concern except the lowest reach in Red Hill Creek had a relatively high amount of fines less than 6mm. The West Fork Hood River slightly exceeded the standard recommended in the Watershed Analysis but was at, or perhaps below, the Forest Plan standard. Stream surveyors combined all sediment less than 2 mm into one category

so comparing the values directly with the Forest Plan standard is impossible, however, in the case of the West Fork Hood River the percent fines less than 1 mm would not exceed 20 percent and is likely less than that. All the streams in the action area (and watershed) 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 West Fork Hood River, the level of fine sediment is also naturally elevated below Ladd Creek (its mouth is at river mile 13.2) due to its glacial source, but it is likely impacted by the BPA power line corridor as is the lowest Red Hill Creek reach.

Table 3-30. The percent of surface fine sediment measured by Wolman pebble counts in streams within the Upper West Hood River 6th field watershed. Note that neither Jones Creek nor Elk Creek are within the Red Hill Restoration Project action area but they are included for comparative purposes.

Stream	Year Surveyed	River Miles	Percent fines <6mm	Percent fines <2mm
West Fork Hood River	2002	8.3 – 13.2	22	20
West Fork Hood River	2002	13.2 – 14.0	21	20
McGee Creek	1997	0.0 – 3.3	10	8
Red Hill Creek	1996	0.0 – 0.7	10	5
Red Hill Creek	1996	0.7 – 1.1	11	4
Red Hill Creek	1996	1.1 – 1.85	6	5
Red Hill Creek	2011	0.0 - 0.9	20	9
Red Hill Creek	2011	0.9 - 1.5	4	4
Red Hill Creek	2011	1.5 - 2.4	Bedrock	Bedrock
Marco Creek	2011	0.0 – 1.0	1	1
Marco Creek	2011	1.0 – 2.2	0	1
Jones Creek	2000	0.0 – 1.8	4	2
Jones Creek	2000	1.8 – 2.8	12	7
Elk Creek	2006	0.0 – 1.1	2	0
Elk Creek	2006	1.1 – 1.6	6	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 streams within the action area is below Forest Plan standards although the West Fork Hood River approaches the standard (Table 3-31). 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 3-31. 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 3-31. Pool habitat summary for surveyed streams found within the Red Hill Restoration Project action area.

Stream	Year Surveyed	River Miles	Total Pools per Mile	Primary Pools per Mile	Forest Plan Pools per Mile Standard
West Fork Hood River	2002	8.3-13.2	11	11	14
West Fork Hood River	2002	13.2-14	21	12	18
McGee Creek	1997	0.0-3.3	21	14	61
McGee Creek	1997	3.3-3.9	22	15	68
Red Hill Creek	2011	0.0-0.9	18	5	75
Red Hill Creek	2011	0.9-1.5	16	2	62
Red Hill Creek	2011	1.5-2.4	13	0	168
Marco Creek	2011	0.0-1.0	26	4	130
Marco Creek	2011	1.0-2.2	34	1	210

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. Field observations conducted as part of this project indicated pools had minimal filling due to fine sediment. Large wood cover was adequate in McGee Creek, where restoration work in the form of large wood addition has occurred. In the West Fork Hood River, large wood cover is lacking in pools; however pools in the river tend to be very deep (averaging 4.0 to 4.6 feet deep in a 2011 survey conducted as part of a stream restoration project) which is itself a form of cover. Red Hill and Marco Creeks, which are deficient in large wood, did not have much cover in pools.

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 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 West Fork Hood River 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. As such, the ability of riparian stands 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 of these stands are relatively young, even aged, overstocked stands resulting in reduced growth rates and smaller trees than if past harvest had not occurred.

In short, riparian conditions and pathways for recruitment are recovering 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. In some areas, roads reduce the ability of the stream network to transport large wood through fluvial or colluvial processes, which limits accumulation of large wood in some streams or stream reaches in the action area. This is a relatively limited phenomenon because not all stream channels or valley slopes bisected by roads are prone to flooding or slope failure so the presence of a mid-slope road, in and of itself, does not automatically equate to a reduced large wood recruitment capacity to downstream channels.

In-stream Large Wood

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 enhances stream habitat for fish, other vertebrates, and invertebrates by providing physical cover, enhancing habitat features such as pools, backwaters, and secondary channels, and creating flow velocity 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. With the exception of McGee Creek in the lower 1.3 miles, none of the surveyed stream reaches in the action area met the standard (Table 3-32). The West Fork Hood River, Red Hill Creek and Marco Creek were well below Forest Plan standards; McGee Creek within the Forest (the Forest boundary is at river mile 1.3) was also below standard but not to the degree of the West Fork Hood River and Red Hill Creek. Restoration efforts in McGee Creek, the West Fork Hood River, and tributaries have begun to improve conditions; demonstrated by the increase in large wood in McGee Creek below the forest boundary between the 1997 and 2010 surveys.

Table 3-32. In stream large wood summary for surveyed streams in the Red Hill Restoration Project action area. Note that wood count information in McGee Creek in 2010 was collected as part of recent restoration project efforts and the survey protocol was not identical to the protocol used by Forest stream survey personnel.

Stream	Year Surveyed	River Miles	Number of Pieces		Pieces per Mile		
			Medium	Large	Medium	Large	Total
West Fork Hood River	2002	8.3-13.2	70	68	13.9	13.5	27.4
West Fork Hood River	2002	13.2-14.0	44	28	46.8	29.8	76.6
McGee Creek	1997	0-3.3	95	19	28.8	5.8	34.5
McGee Creek	1997	3.3-3.9	12	1	20.0	1.7	21.7
McGee Creek	2010	0-1.3	192	56	147.7	43.1	190.8
Red Hill Creek	2011	0-0.9	1	0	1.1	0.0	1.1
Red Hill Creek	2011	0.9-1.5	1	0	2.3	0.0	2.3
Red Hill Creek	2011	1.5-2.4	2	2	2.1	2.1	4.2
Marco Creek	2011	0.0–1.0	8	0	8.0	0.0	8.0
Marco Creek	2011	1.0–2.2	11	9	8.4	6.8	15.2

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]. Critical Habitat for steelhead is designated in McGee Creek, Red Hill Creek, and West Fork Hood River. Designated steelhead critical habitat is similar to the known current distribution (Figure 3-8) although the FSR 1800 culvert is a barrier to upstream passage so there are no steelhead beyond this point. A road culvert migration barrier was removed from Red Hill Creek during the summer of 2011 and steelhead may expand upstream in that stream as a result. Chinook salmon critical habitat is designated in the West Fork Hood River, McGee Creek and Red Hill Creek, but extends farther upstream in Red Hill Creek than occupied habitat based on the current known distribution of the population within the project area (Figure 3-9). Although mapped as occupied it is doubtful Chinook salmon ascend much further than the Forest boundary in McGee Creek due to steep gradient. Given habitat conditions in Red Hill Creek and habitat preferences of Chinook salmon, it is unlikely Chinook distribution would expand upstream as a result of the culvert barrier removal described above.

Primary constituent elements (PCE) for steelhead trout and Chinook 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:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
   Action Area conditions: Water quantity and quality are good. There are no irrigation diversions that reduce the quantity of water. Water quality, in terms of temperature, chemical contaminants, and nutrient loading is excellent. Other than Ladd Creek,

which carries a high amount of fine glacially derived sediment, and West Fork Hood River below Ladd Creek, the other streams in the action area generally have low amounts of fine sediment. The glacially influenced sections have higher amounts of fine sediment but Chinook salmon and likely steelhead trout spawn successfully in the West Fork Hood River.

(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: Water quantity is relatively unaffected by land management. Past timber harvest has likely resulted in higher peak flows and lower base flows than historic conditions but the amount of water is more than adequate to form and maintain habitat conditions. 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 larger, lower gradient streams (McGee Creek and West Fork Hood River) 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.

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

Action Area conditions: Water quality, as described above, is 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.

(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 and side channel and undercut bank habitat is not 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) and the West Fork Hood River, McGee Creek, and Red Hill Creek (Figure 3-9) were included in that designation even though the habitat is not currently occupied. The West Fork Hood River was included as bull trout critical habitat because it was determined to be necessary for population expansion for the Hood River Population to be recovered (USFWS 2010).

The PCE of bull trout critical habitat are derived from studies of bull trout habitat requirements, life history characteristics, and population biology. These PCE are:

1. Permanent water having low levels of contaminates such that normal reproduction, growth and survival are not inhibited.
   Action Area conditions: Contaminants and high nutrient levels are at low levels. There are no human sources of contaminants in the action area.

2. Water temperatures ranging from 36 to 59 ^{0}F, with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life history stage and for geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence.
   Action Area conditions: Water temperatures in many tributaries to the West Fork Hood River, including McGee Creek and Red Hill Creek, are well within the preferred range for bull trout. Springs are abundant in the action area and provide thermal refugia where temperatures overall exceed 59 ^{0}F, such as the West Fork Hood River.

3. Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.
   Action Area conditions: See 2. (c) above for steelhead trout and Chinook salmon PCE.

4. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo over-winter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.25 inch in diameter and minimal substrate embeddedness are characteristic of these conditions.
   Action Area conditions: Based on available data (Table 3-30) most streams have clean substrate with minimal fine sediment. The exception is the West Fork Hood River which is influenced by Ladd Creek. 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.

5. 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.

6. 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.

7. 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.

8. 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.

9. 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 critical habitat.

3.6.3 Effects Analysis

No Action

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 are roads, BPA power line corridor and natural sources such as eroding stream banks, and these 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 Marco, Red Hill, and McGee Creeks (see Figure 3-7 – proposed decommissioned roads).

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 Specialist Report 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 exactly 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 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 and shorter trees and, eventually, fewer live trees per acre but more snags (Table 3-33). The difference between untreated and proposed treatment conditions, except in trees per acre (especially after year 40), is relatively slight. However, smaller trees would not last as long once on-the-ground as they would decay faster and, depending on the stream they fall into or adjacent to, may be moved downstream faster and would also tend to break apart more readily.

Table 3-33. Modeled riparian stand characteristics comparing the No Action (NA) and Proposed Action (PA) alternatives. QMD is a measure of tree diameter. The information is a summary of all riparian stands proposed for treatment in the action area.

Years After Treatment	Trees per Acre		Height (ft.)		QMD (in.)		Snags >20" dia.	
	NA	PA	NA	PA	NA	PA	NA	PA
0	383	193	84	86	11.8	12.7	1	1
10	385	343	97	100	12.4	13.7	1	1
20	358	338	107	108	13.5	14.7	1	1
30	331	332	116	119	14.6	15.7	1	1
40	300	324	119	126	15.7	16.6	1	1
50	291	459	120	130	16	17.9	2	2
60	259	433	122	134	17.2	18	2	2
70	227	406	124	136	18.5	19.1	3	2
80	220	378	125	137	18.1	20.9	4	2
90	191	348	126	137	19.4	21.8	5	3
100	167	314	128	137	20.8	22.9	6	3

Interestingly, model results indicate that as the non-treated riparian stands begin to decay and trees die and fall the amount of down wood would probably increase compared to the treated stand. Almost 200 trees per acre would die in the first 100 years if the stands were not treated, compared to about 150 if the Proposed Action were implemented. Not all of these trees would fall to the ground immediately so the actual amount of down wood is difficult to estimate, but in smaller streams (where smaller sized wood can provide a larger habitat benefit) the number of down trees would likely be greater. Not all down trees would directly fall into a stream – most would not because of the Riparian Reserve width, tree height, stream incision, etc.

To summarize, over the next 50 years there would be more trees dying and then falling to the ground in Riparian Reserves as the stands decay. 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. 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 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: No-cut buffers of 60-feet for perennial and 30-feet for intermittent streams, springs, and seeps are in place in part to protect aquatic organisms and habitat from the direct effects of logging activities. Note that there are no fish bearing intermittent streams in the action area and based on surveys elsewhere intermittent streams are not usually occupied by special status aquatic macroinvertebrates. Project Design Criteria/Mitigation Measures (PDC) include directional tree falling away from no-cut buffers as well as leaving any portion of a tree that falls within a no-cut buffer. Despite this PDC, directional falling is not always possible and trees occasionally fall within the no-cut buffer. Depending on the location and tree size the falling tree could hit a stream channel, seep, or spring 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. None of the proposed riparian vegetation thinning would occur within one site potential tree height next to streams that harbor ESA listed fish species, thus there is no chance a felled tree would land in a stream and disturb/harm ESA listed fish.

Culvert removal/replacement: Culvert removal and/or replacement involves in-stream work 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 1340, but the stream is intermittent and does not provide habitat for fish or aquatic macroinvertebrates; no aquatic organisms would be directly affected by the action. Nine culverts in larger streams, four of which contain perennial streams, would be removed as roads are decommissioned. Many other drainage culverts would

also be removed, most are not connected to a stream, but only to the roadside ditch. Fish are not present in any of the streams crossed by roads proposed for decommissioning, but aquatic macroinvertebrates may be present. 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 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. Enough sediment would have to be deposited in a short period of time to bury individuals and either crush or suffocate them. Since adult and juvenile fish are mobile this is extremely unlikely. Smothering of aquatic macroinvertebrates, especially snails or other relatively immobile creatures, is somewhat more likely 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 have all been well below the UUILT for salmonids and were also within ideal growing conditions for Chinook salmon (Table 3-21) which is similar to ideal temperatures for most other salmonids. As explained in Water Quality Specialist Report, the no-cut 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 would 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 required brushing could occur near stream crossings, some shade producing vegetation could be removed. Brushing targets smaller vegetation (deciduous shrubs primarily and in some cases small coniferous trees) as such 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. 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 creatures directly or indirectly 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 living space, 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 and the West Fork Hood River below Ladd Creek (Table 3-22), streams in the action area are spring fed and generally quite clear. Naturally turbid conditions would only occur during high water periods. Given its glacial source Ladd Creek is naturally turbid in summer and fall, and it has a large impact on the West Fork Hood River 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 based on surveys conducted across the Forest to date; however, they are present in the action area in clear springs feeding the West Fork Hood River and likely in other clear water tributaries as well. Chinook salmon spawning has been documented in the West Fork Hood River below Ladd Creek 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 removal in perennial streams associated with decommissioned roads and possibly road maintenance could increase turbidity. When culverts are removed from perennial streams during the road decommissioning process turbidity would increase in those streams. Road maintenance, especially blading and ditch cleaning could increase turbidity in streams, but only after the first significant 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 BMP are in place to minimize the amount of sediment entering surface water resulting from these activities.

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 West Fork Hood River below Ladd Creek the increase would be immeasurable against background levels due to the high sediment load originating in Ladd Creek.

There would be little to no effect on fish from increased turbidity levels resulting from road decommissioning because none of the streams where culverts would be replaced/removed are fish bearing streams, the turbid conditions would not continue as far downstream as fish bearing streams, and/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, but the level of turbidity would likely be quite low given the small amount of suspended sediment and short duration. 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. Overall, the impact on fish from increased turbidity is

expected to be negligible. The impact on aquatic invertebrates would be minimal although slightly impaired feeding and possibly respiration are possible, especially immediately below culvert removal sites. Increased turbidity has little to no effect on habitat conditions.

Sedimentation

The soil erosion and delivery potential of proposed activities is detailed in the Soil Productivity and Water Quality Specialist Reports. PDC and BMP 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, and culvert removal/replacement associated with 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 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 significant 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 sediment 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 sediment. Experimental additions of clean cobble the following year resulted in a fivefold increase in winter fry densities.

Roads proposed for log or rock hauling, most of which would receive some sort of maintenance (see Transportation Specialist Report), are generally located outside Riparian Reserves and, with three exceptions, are not close to LFH/EFH (Table 3-34). The first exception is FSR 1650 which crosses the mapped headwaters of Red Hill Creek, which is bull trout designated critical habitat. However, the "stream" within Unit 62 and 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[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 to 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 and 8/22/2012). In short, the bull trout citical habitat PCE do not apply to this area.

The second exception is FSR 1800, which is a paved road, crossing or adjacent to sections of McGee Creek, Red Hill Creek, and West Fork Hood River. The final exception is FSR 1600 where it crosses Tony Creek in the Lower Middle Fork Hood River 6th field watershed. This section of Tony Creek is designated, but unoccupied, critical habitat for bull trout. FSR 1600 is paved at this crossing so sediment input as a direct result of hauling is unlikely and potential impacts to Tony Creek negligible. The rock haul route crosses three other intermittent streams; none are fish bearing and presence of R6 sensitive aquatic macroinvertebrates is unlikely.

[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 planning 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.

Table 3-34. Red Hill Restoration Project proposed haul road surface summary and haul road distances to listed fish habitat (LFH)/essential fish habitat (EFH) within the Action Area. Road surfaces are coded as follows: P – paved, A – aggregate, and N – native material. Blank spaces in the two columns dealing with proximity to LFH/EFH indicate that road does not cross or lie within 100 feet of LFH/EFH within the action area

Haul Road Number	Miles of Haul	Road Surface Type	Number of Crossings Over:				Distance from Nearest Crossing to LFH/EFH (mi)	Road Length Within 100' of LFH/EFH (ft.)	Haul Season
			LFH/EFH		Other Peren.	Inter.			
			Bridge	Culvert					
1300000	1.2	P	0	0	0	0			YR
1340000	3.0	A	0	0	0	5	0.2	0	D
1340000	1.8	P	0	0	4	3	0.4	0	D
1600000	12.5	P	0	1	5	6	0	200	D[1], YR
1600018	1.3	N	0	0	0	0			D
1600019	0.2	N	0	0	0	0			D
1600670	0.4	A	0	0	0	0			YR
1600680	0.3	N	0	0	0	0			D
1600720	0.7	N	0	0	0	1	2.1	0	D
1630000	1.2	A	0	0	0	0			D
1631000	0.7	A	0	0	0	2	0.6	0	D
1631630	0.1	A	0	0	0	1	0.8	0	D
1650000[2]	3.5	A	0	0	0	2	0.1	300	YR/D
1650640	0.2	A	0	0	0	0			D
1650641	0.4	A	0	0	0	0			D
1650650	1.0	A	0	0	1	0	2.8	0	D
1650651	1.4	A	0	0	0	0			D
1650660	0.8	A	0	0	0	0			D
1660000	0.5	A	0	0	1	1	0.9	0	YR
1800000	8.1	P	2	0	6	2	0	2050	YR
1811000	2.8	A	0	0	0	3	0.4	0	YR
Totals	**42.1**		**2**	**1**	**17**	**26**		**2550**	

[1] Two miles of FSR 1600 located within the Tony Creek 7th field watershed is a potential haul route for government supplied rock. This section of road would only be hauled on during dry periods.

[2] 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 and it is not fish bearing. 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. It is an intermittent stream for about one mile before becoming perennial. 1.4 miles of this road is suitable for year-round hauling, the remaining 2.1 miles is dry season only.

Road maintenace 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 sediment introduction include the 1340, 1650, 1811, and possibly the 1800 roads (Table 3-34). FSR 1800 is a paved road and it is unlikely maintenance would result in enough sediment to be measurable against background levels, especially in the late summer/fall when the West Fork Hood River is naturally turbid. Other roads, such as FSR 1660, are too far for potential sediment to reach LFH/EFH (fine sediment would not travel further than 0.5 to 1.0 miles downstream as described above). 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.

As mentioned above, none of the culvert removal/replacements would occur in fish bearing streams. The closest to a fish bearing stream reach a culvert is proposed for removal is 2750 feet above the West Fork Hood River is an intermittent tributary (Table 3-35). The culvert in a perennial stream closest to a fish bearing stream reach is 4200 feet upstream (McGee Creek tributary). The distance to listed fish habitat from proposed culvert removal/replacements ranges from 0 feet on FSR 1660 (bull trout, unoccupied) to over 3 miles.

Given the location of potential sediment producing activities (road maintenance, log haul, etc.) in relation to aquatic macroinvertebrate populations, which are located in all perennial streams, there is much greater potential for impacts to macroinvertebrates. 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.

Table 3-35. Summary of culvert removal and/or replacement projects proposed in the Red Hill Restoration Project. The culvert under FSR 1340 is the only replacement project proposed; the remaining culverts would all be removed as part of road decommissioning. Drainage relief culverts that do not drain directly into a stream would also be removed during road decommissioning but are not listed below.

FSR Number	Stream Name	Perennial or Intermittent	Distance to LFH	Distance to Fish Bearing Stream*
1340	WFHR tributary	I	2750 ft	2750 ft
1600720	Marco Cr. tributary	I	2.2 mi	4100 ft
1600720	Marco Cr. tributary	I	2.3 mi	4400 ft
1600690	Tumbledown Cr.	I	2.2 mi	1.0 mi
1640670	Marco Cr.	P	2.9 mi	4400 ft
1650650	Stump Cr.	P	3.3 mi	3.3 mi
1660	Red Hill Cr.	I	0 ft (BT) 1.6 mi (anad)	3900 ft
1660	Red Hill Cr. tributary	P	5100 ft (BT) 1.2 mi (anad)	5100 ft
1800008	Dry Run Cr. tributary	I	5100 ft	500 ft
1811	McGee Cr. tributary	P	4200 ft	4200 ft

*Throughout this document fish bearing streams include stream segments where fish presence is suspected as well as those where presence is confirmed; distances noted in this table are to whatever designation is closest.
BT = bull trout designated critical habitat (unoccupied), “anad” = anadromous fish (Chinook salmon and/or steelhead), WFHR = West Fork Hood River

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. Given the lack of a definable channel to route such sediment downstream where the true stream forms there would be a negligible impact to bull trout critical habitat PCEs.

Road maintenance would reduce erosion and potential sediment introduction as compared to unmaintained roads (see Table 3-26). Thus the overall effect of road maintenance as well as road closure and decommissioning is beneficial despite the potential short-term impacts. The beneficial effects of road maintenance would last varying amounts of time depending on the type of maintenance performed, road surfacing, traffic, and weather. It is difficult to predict how long erosion rates would be reduced on a given road because, over time, the road would revert back to a condition similar to the existing condition. It is anticipated that benefits would last from one to

five years beyond implementation but the inevitable degradation of the road and associated ditch lines depends on a variety of factors and how these factors interact[3]:

- Road surface: A native surface road would degrade faster than an aggregate surface road;
- Traffic: The more vehicle traffic the faster the road would degrade;
- Weather: The more precipitation a road receives, especially rain, the faster it would degrade. A particularly large rain event, a rain on snow event, or a series of heavy rain events could "undo" much of the maintenance in short order, especially if culverts become plugged;
- Type of maintenance: A lightly maintained road, for example one that was only bladed, would likely degrade faster than one that was bladed, had drain dips installed, and ditches cleaned; and,
- Road topography: Roads set at a steeper grade may be more susceptible to erosion than flatter roads.

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 would be minimal because most of the proposed riparian thinning would not occur near fish bearing streams. Only 10 units lie within Riparian Reserves adjacent to fish bearing reaches in West Fork Hood River, Marco Creek and Red Hill Creek (Table 3-36). Note that the two units (44 and 50) adjacent to the West Fork Hood River are further from the river than one site potential tree height (130 feet) thus large wood recruitment potential would be unaffected. Although reductions in pool habitat are unlikely any loss of pools 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

[3] This discussion focuses on aggregate and native surface roads only. Paved roads degrade over time but are more resistant to traffic and weather than the other two road surfaces.

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.

Table 3-36. Red Hill Restoration Project proposed treatment unit information relating primarily to Riparian Reserves (RR), including stream type within/bordering the unit, proximity to listed fish habitat/critical habitat, and tree size. All proposed units lie within the transient snow zone (1500'-4500' elevation).

Unit	Area (acres)	Total RR Area (acres)	RR Treated Area (acres)	Treated Area Within One Site Potential Tree Height (acres)	Perennial (P) or Intermittent (I) Stream	Proximity[1] to LFH (feet)	Overland Proximity[2] to LFH (feet)	Quadratic Mean Tree Diameter (inches)	Mean Tree Height (feet)
1	17	0.1	0.1	0.0	P	260	260	11	80
2	23	1.1	1.1	0.6	P	8,380	5,350	10	65
3	20	4.0	3.0	3.0	I	11,440	7,650	10	68
4	16	0.0	0.0	0.0		N/A	4,700	9	70
5	27	0.9	0.9	0.3	P & I	9,812/11,211	7,300	11	70
6	115	24.6	18.8	16.6	P & I	2,395/215	200	11	90
7	15	4.2	2.6	2.0	P	1,980	1,820	11	80
8	44	0.0	0.0	0.0		N/A	5,500	9	65
9	38	15.8	9.0	7.3	P	1,080	1,030	12	86
12	22	10.1	9.3	1.9	P	5,170	450	9	80
13	9	0.0	0.0	0.0		N/A	1,760	6	50
15	29	4.0	2.4	1.9	P	2,040	1,910	14	86
17	20	1.2	1.2	0.0	P	4,710	1,430	9	70
18	120	6.4	4.9	4.7	P & I	10,845/8,675	5,890	9	81
19	15	0.0	0.0	0.0		N/A	8,810	10	78
20	75	18.1	12.2	10.7	P & I	5,020/6,250	3,510	11	81
21	108	14.4	11.1	4.2	P	4,080	3,150	11	94
22	73	26.5	18.1	12.8	P & I	4,630	2,660	9	74
23	49	5.7	4.6	1.2	P	8,520	6,490	11	70

Unit	Area (acres)	Total RR Area (acres)	RR Treated Area (acres)	Treated Area Within One Site Potential Tree Height (acres)	Perennial (P) or Intermittent (I) Stream	Proximity[1] to LFH (feet)	Overland Proximity[2] to LFH (feet)	Quadratic Mean Tree Diameter (inches)	Mean Tree Height (feet)
26	66	14.1	11.2	3.9	P	4,100	3,430	17	87
27	91	2.1	1.4	1.0	P	7,960	5,440	13	79
29	24	14.8	10.1	4.0	P	5,060	3,870	7	69
30	27	0.0	0.0	0.0		N/A	4,430	10	73
31	19	11.3	8.8	2.8	P	4,850	3,330	13	88
35	35	0.0	0.0	0.0		N/A	1,900	10	58
36	71	1.1	1.1	0.7	P	10,260	5,510	11	70
43	44	0.0	0.0	0.0		N/A	7,810	7	61
44	116	5.0	4.8	2.4	P & I	150/3,920	150	13	104
50	79	25.5	19.9	19.8	P & I	250/700	250	17	87
58	28	2.4	1.8	1.4	P	4,900	1,180	12	54
59	12	0.0	0.0	0.0		N/A	6,020	3	30
61	32	0.0	0.0	0.0		N/A	650	5	45
62	35	0.0	0.0	0.0	Ephemeral	N/A	200	12	94
73	22	2.4	2.0	2.0	I	9,940	4,820	9	65
Total	1536	215.8	160.4	105.2					

[1] Proximity to LFH is the downstream distance through connecting stream channels to LFH from the closest point in the unit. Where the unit contains or borders both perennial and intermittent streams the closest distance is given for each as "P distance/I distance." The exception is unit 22 because the confluence of the intermittent and perennial streams is within the unit so only one distance is given. An N/A means there is no hydrologic connection.

[2] Overland proximity is the over ground distance from the closest point of the proposed unit to LFH.

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 the 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). 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).

Removal of trees could influence future wood supply adjacent to those tributary channels where harvest is proposed within one site potential tree height (Table 3-36) for a period estimated at about 40 years (Table 3-33). Debris torrents and material migrating to stream reaches downstream are not a prevalent habitat forming process in the action area due to the wide, glacial terraces found to the east of the West Fork Hood River and the generally low occurrence of slides and debris flows in the sub-watershed. Instead, the major component of contribution to West Fork Hood River and major tributaries habitat is stream adjacent recruitment.

Tree falling would occur within Riparian Reserves of 24 proposed units in the action area (Table 3-36). Most of these Riparian Reserve treatment areas are located adjacent to non-fish bearing streams, some of which are intermittent. Only Units 12, 21, 22, 23, 26, 29, and 31 are located adjacent to fish bearing stream reaches and each unit 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 would grow larger than if treatment did not occur (Table 3-33) and the overall health and diversity of the stands would improve. Under this scenario, when trees do fall, they would be larger and thus last longer on-the-ground.

Proposed silvicultural treatments within Riparian Reserves are the same as surrounding uplands because the stand characteristics are the same. From the outer edge of the protection buffer to the outer edge of the Riparian Reserve the canopy cover would be maintained at the same percent as the rest of the unit (50 percent except units 44 and 50 which are 40 percent) through leave tree retention (Table 2-3). Trees per acre, relative density, and basal area would follow the same pattern – no change within the protection buffer and the same change in the outer Riparian Reserve zone as the rest of the unit. All trees within the tree height of stream protection zones would be directional felled away from streams. Where a cut tree does fall within protection buffer, the portion of tree within the buffer would not be yarded.

No tree falling would occur within one site potential tree height of LFH/EFH in any unit. Unit 6 is near Red Hill Creek and thinning would stop at the one site potential tree height distance (130 feet). Units 44 and 50 both encroach into the West Fork Hood River Riparian Reserve but thinning closer than one site potential tree height would not occur in either unit. 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 one site potential tree height of tributary channels (Table 3-36).

Gap openings are proposed in Riparian Reserves associated with 16 units and would total 27 acres (Table 2-3 in Chapter 2 of the EA). The largest gaps in Riparian Reserves would be 3 acres. Many gaps would originate in existing openings and extend outwards away from surface water and it is unlikely they would significantly reduce large wood potential to nearby streams, but some reduction at the site-scale is possible. Other gaps would be placed in existing dense forest stands where disease or other environmental factors are causing stand decay. The gaps are small enough in relation to the rest of the unit that the potential tree recruitment reduction, if it occurs, would be limited to that area immediately adjacent to the gap. In addition, no-cut buffers would still apply so the inner Riparian Reserve zone where most large wood recruitment originates would remain intact.

To summarize, there are 160.4 Riparian Reserve acres proposed for thinning in the action area and 105.2 acres are located within one site potential tree height. These acres include gap openings. Therefore, Riparian Reserve acres account for only 10.4 percent of the total proposed silviculture treatment (7 percent within one site potential tree height) and at the action area scale only 5 percent of Riparian Reserves are proposed for treatment (3 percent within one site potential tree height). 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 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 no-cut buffer would maximize growth and increase the chance that a falling tree would be tall enough to fall within the stream channel. Gaps would target areas of poor health or disease and where possible expand upon existing, natural openings.

In-stream Large Wood

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 within one site potential tree height of the stream channel 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, no-cut buffers would provide a sustained source of large wood (Meleason et al. 2002) 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 LFH/EFH. Although debris flows are not the primary mechanism for large wood recruitment in the action area, they are the only potential large wood transport mechanism from treatment reaches to LFH/EFH. Potential reductions in large wood within LFH/EFH are not expected to be measureable for the following reasons.

- Most of the streams with treatments within one site potential tree height are intercepted by roads with culverts that would cause deposition of a debris torrent before reaching LFH/EFH.
- Only 160.4 acres out of the 3,196 Riparian Reserve acres (5 percent) on federal land in the action area would have thinning activity within one site potential tree height of the channel.
- For those units that have transport connectivity to LFH, there are only 10 acres of proposed treatment within one site potential tree height of the channel.

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.

Cumulative Effects

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 Red Hill Restoration EA 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 EA. 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 EA 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 3-27).

The analysis summary outlined in Table 3-40 below follows the same format as Table 3-38 in the Water Quality Specialist Report. 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.

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. As such, there are no temperature related cumulative effects on aquatic species or habitat.

Sediment
Some detrimental cumulative effects may occur as a result of sediment introduction, primarily in the section of Ladd Creek below the power line corridor. Sediment from culvert removal along FSR 1660 may mix with sediment from the Dollar Lake Fire and BPA maintenance activities if these activities occur at the same time. This risk would be greatest the year following the road decommissioning work. As described in the Water Quality Specialist Report, Ladd Creek has high natural turbidity due to glacial melt water, so this effect would likely not be measurable. Regardless, the cumulative effect is expected to be very small and localized due to the small amount of sediment expected.

Increased levels of fine sediment could reduce rearing habitat (see below) and potentially cover streambed substrate thus impacting aquatic macroinvertebrates either by forcing drift or causing injury or death. This latter scenario is very unlikely as the amount of fine sediment generated from all potential sources would be quite small and the major repository stream, Ladd Creek, already has a very high level of fine sediment. If impacts to aquatic macroinvertebrates occur as described there could be localized reductions in salmonid forage.

Pool Quantity and Quality
There could be some reduction in pool volume resulting from increased fine sediment levels. Given the low amount of sediment expected, coupled with high natural levels in Ladd Creek and the West Fork Hood River below Ladd Creek it is unlikely pool volume reductions would be measurable. 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 Red Hill Restoration EA would slightly increase the area within one site potential tree height of the channel where large wood recruitment potential would be reduced. In some stream sections where past restoration actions have occurred, this potential reduction has been mitigated by the addition of large wood. 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.

Table 3-40: A summary of cumulative effects on aquatic species and habitat resulting from proposed projects in the Red Hill Restoration Projects EA 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	Pool Quantity and Quality	No	Yes	Possible	Projects are completed. Since there are no remaining sediment effects due to mitigation measures and design criteria implementation on the original projects there would be no impact to pool habitat from a sediment perspective. However, past harvest in some 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 EA would add to large wood dependent pool reduction elsewhere.	Minimal effect throughout the action area. Some areas would experience a slight reduction in 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. These potential effects would primarily be in headwater streams involving resident rainbow trout. Impacts to aquatic macroinvertebrates negligible.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Existing Old Forest Service Timber Harvest Units Continued . . .	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 EA 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 (no more than 3 percent of Riparian Reserves affected). Given location of proposed units and lack of transport mechanisms downstream the effects would be localized in some headwater streams. 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		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Existing Old Forest Service Timber Harvest Units Continued . . .	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 EA 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 of minimal in-stream large wood over the next 40 years.	Minimal cumulative effect due to relatively little thinning in the SIZ proposed. In some headwater 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 would 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 resident trout in terms of rearing habitat, as described above. 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			
Forest Service Vegetation Treatment Activities Planned or Underway (Pre-commercial treatments)	Pool Quantity and Quality	Yes	Yes	No	There may be an overlap in timing of these projects with the Red Hill Restoration project; however, PDC in 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.	None
	Large Wood Recruitment Potential	Yes	Yes	No		
	In-stream Large Wood	Yes	Yes	No		

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Private Land and BPA activities (past timber harvest, power line maintenance activities)	Coarse and Fine Sediment	Yes	Yes	Possible	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 only fine sediment producing activity in the Red Hill Restoration project is culvert removal during road decommissioning. The highest potential location for sediment mixing is Ladd Creek below the power line corridor. This is where sediment from culvert removal on FSR 1660 could mix with sediment from BPA maintenance and the Dollar Lake Fire. Other activities would be well downstream from the Red Hill Restoration project.	The small amount of sediment generated from proposed activities in the Red Hill Restoration project would add to that described here within the action area. However, given that the “repository” of most of this fine sediment would be Ladd Creek, which is a glacial stream with naturally high levels of fine sediment, the impact to aquatic species and habitat would be immeasurable against background levels. Therefore, the cumulative effect from a sediment perspective would be negligible.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Private Land and BPA activities (past timber harvest, power line maintenance activities) Continued . . .	Pool Quantity and Quality	Yes	Yes	Possible	Some projects are completed, but others ongoing. Potential filling of pools with fine sediment would be centered in Ladd Creek as described above and given the natural sediment load this increase would be negligible. Sediment generated from other actions proposed in this EA, such as road maintenance, could increase fine sediment elsewhere in the action area, but those amounts would be quite small with minimal impact. 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 EA 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			
Private Land and BPA activities (past timber harvest, power line maintenance activities) Continued . . .	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 EA would increase the SIZ area that would not contribute as much large wood compared to a non-treatment scenario.	None.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Private Land and BPA activities (past timber harvest, power line maintenance activities) Continued . . .	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 EA 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 of minimal in-stream large wood over the next 40 years.	None.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Dollar Lake Fire	Coarse and Fine Sediment	Yes	Yes	Possible	There may be an overlap in timing of effects from the Dollar Lake Fire and the Red Hill Restoration project; The only significant fine sediment producing activity in the Red Hill Restoration project is culvert removal during road decommissioning. The highest potential location for sediment mixing is Ladd Creek below the power line corridor. This is where sediment from culvert removal on FSR 1660 could mix with sediment from BPA maintenance and the Dollar Lake Fire.	The small amount of sediment generated from proposed activities in the Red Hill Restoration project would add to that described here within the action area. However, given that the "repository" of most of this fine sediment would be Ladd Creek, which is a glacial stream with naturally high levels of fine sediment, the impact to aquatic species and habitat would be immeasurable against background levels. Therefore, the cumulative effect from a sediment perspective would be negligible.
	Pool Quantity and Quality	Yes	Yes	Possible	See above	See above. Increases in fine sediment could locally fill pools, particularly in Ladd Creek, but this slight decrease in pool volume would have little effect on rearing area for salmonids.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Dollar Lake Fire Continued . . .	Large Wood Recruitment Potential	Yes	Yes	No	No cumulative large wood recruitment potential effects due to the small area overlap between the Dollar Lake Fire and the action area. Although some riparian areas burned in the headwaters of Ladd Creek, this is not expected to significantly reduce large wood recruitment potential.	None
	In-stream Large Wood	Yes	Yes	No	No cumulative in-stream large wood reduction as a result of Dollar Lake Fire.	None
Past Aquatic Restoration Projects	Pool Quantity and Quality	No	Yes	Yes	Past road decommissioning sites have all recovered and thus produce little to no fine sediment that could fill pools. Past large wood addition projects in West Fork Hood River, McGee Creek, and Red Hill Creek have all created additional pool habitat in treated reaches, thus there is a beneficial cumulative effect. Future large wood addition planned in Red Hill Creek would further enhance pool habitat.	Beneficial effect. Pool quantity has been increased, and would increase further in Red Hill Creek upon project completion in 2013. Pool quality also enhanced due to increase in cover elements (large wood).
	Large Wood Recruitment Potential	No	Yes	No	Past restoration projects had no impact on large wood recruitment potential, thus there is no cumulative effect.	None

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Past Aquatic Restoration Projects Continued . . .	In-stream Large Wood	No	Yes	Yes	Past large wood addition projects in West Fork Hood River, McGee Creek, and Red Hill Creek have all increased the amount of in-stream large wood in treated reaches, thus there is a beneficial cumulative effect. Future large wood addition planned in Red Hill Creek would further increase large wood levels.	Beneficial effect. Increases in large wood have created additional pool habitat, increased slow water areas at stream margins, collected and sorted spawning gravel, and increased channel and floodplain connectivity. All of these habitat attributes improve habitat conditions for salmonids and aquatic macroinvertebrates.
McGee Creek Riparian Thinning	Pool Quantity and Quality	Yes	No	Yes	This riparian thinning project has the same objectives as proposed thinning in the Red Hill Restoration project. The silviculture treatments are similar; however, a big difference is that many trees along McGee Creek would be felled into the stream channel and floodplain, thus likely increasing pool habitat.	Beneficial effect. Pool quantity would be increased, and pool quality also enhanced due to increase in cover elements (large wood).

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
McGee Creek Riparian Thinning Continued . . .	Large Wood Recruitment Potential	Yes	No	Possible	Given the similar silvicultural prescriptions there could be a reduction in large wood recruitment potential along McGee Creek that would be in addition to those riparian areas treated in the Red Hill Restoration project.	Minimal cumulative effect throughout action area because the reduction in large wood recruitment potential resulting from proposed projects would be quite small (slightly more than 3 percent of Riparian Reserves affected with the McGee Creek thinning). Given location of proposed units and lack of transport mechanisms downstream, the effects would be localized in some headwater streams. 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. This effect would be mitigated to some degree in McGee Creek since some trees would be felled into the stream.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
McGee Creek Riparian Thinning Continued . . .	In-stream Large Wood	Yes	No	Possible	In the short-term, the McGee Creek thinning would increase the amount of large wood in the channel and floodplain. None of the actions proposed in the Red Hill Restoration project 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 of minimal in-stream large wood over the next 40 years.	Minimal cumulative effect due to relatively little thinning in the SIZ proposed throughout the action area. In some headwater 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 would 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 resident trout in terms of rearing habitat, as described above. Negligible impact to aquatic macroinvertebrate populations as a whole, but some localized habitat degradation possible. Beneficial effect in McGee Creek due to tree falling into stream.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Aquatic Organism Passage Projects (McGee Creek, Red Hill Creek)	Pool Quantity and Quality	Yes	Yes	No	For Red Hill Passage Project, no remaining sediment effects due to mitigation measures and design criteria implementation on the original project and natural recovery. There is a chance of some short-term introduction of fine sediment from the McGee Creek Aquatic Organism Passage Project, but it is unlikely that this would mix with any minor fine sediment from the Red Hill Restoration project due to the 2-mile distance from the passage project area and the confluence with Ladd Creek. This is where sediment from culvert removal on FSR 1660 could mix with sediment from the passage project.	None
	Large Wood Recruitment Potential	Yes	Yes	No	Neither passage project would affect large wood recruitment potential.	None
	In-stream Large Wood	Yes	Yes	No		

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?	Aquatic Species or Habitat Effect
		Time	Space			
Invasive Plant Treatments	Pool Quantity and Quality	Yes	Yes	No	There may be an overlap in timing of this project with the Red Hill 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.	None
	Large Wood Recruitment Potential	Yes	Yes	No	Invasive plant treatment would not affect large wood recruitment potential.	None
	In-stream Large Wood	Yes	Yes	No	Invasive plant treatment would not affect large wood recruitment potential.	None

The reduction in large wood recruitment could result in localized areas with less in-stream and floodplain large wood. 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. 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 3-41). Depending on the species and/or habitat direct, indirect, and cumulative effects are possible. PDC would greatly minimize potential effects, but not eliminate them altogether.

Potential effects center on potential disturbance, increased sedimentation, and potential reductions in large wood potential and in-stream levels. The only potential direct effects would be associated with 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 effects center on slight increases in fine sediment and reducing 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, some localized filling of pool habitat could occur and sediment deposition could also impact aquatic macroinvertebrate feeding and survival. This, in turn, could lead to slight reductions in salmonid rearing habitat and food supply, respectively. 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.

Proposed projects would have no immediate impact on in-stream levels of large wood. However, thinning conducted within one site potential tree height of stream channels 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 and, in some cases, roads that would likely halt a debris flow.

Table 3-41. The Red Hill 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	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	NE 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	Y	Y	NE	NLAA
Forest Service Region 6 Regional Forester's Sensitive Species					
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	MIIH
Caddisfly (*Namamyia plutonis*)	12/11	Y	Unk	NI	MIIH

NE	No effect
NLAA	May affect, not likely to adversely affect
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 listi or loss of viability to the population or species

Because the anticipated impacts summarized above could have some localized impact to stream reaches containing ESA-listed fish, particularly due to small increases in fine sediment from road maintenance and hauling, the Red Hill Restoration project **may affect, but is not likely to adversely affect** Lower Columbia River steelhead trout, coho salmon, and Chinook salmon. This

[4] Critical habitat for this species has not been designated on Federal lands.

effect determination also applies to steelhead and Chinook salmon designated critical habitat. There would be no effect to Columbia River bull trout individuals but proposed actions **may affect, but are not likely to adversely affect designated bull trout critical habitat**. Essential Fish Habitat would **not be adversely affected** as it overlaps Chinook salmon critical habitat.

Although MIS resident rainbow trout may be impacted by some project activities the impacts would be minimal and localized. This project potentially impacts less than 1.6 percent of occupied resident rainbow trout habitat across the forest (Table 3-28), thus impacts to habitat would be insignificant at the forest scale and therefore the EA is consistent with the Forest Plan. Given their limited distribution compared to resident rainbow trout, more summer steelhead trout and Chinook salmon habitat could be affected by project activities (Table 3-28). However, due to proposed activity locations along with PDC and BMP the actual area of impact would be far less than the total occupied habitat within the action area. For all three salmonid species the Proposed Action **may impact individuals or habitat, but would not threaten species viability**.

3.6.5 Consistency Determination

The Red Hill 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 significant 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 Specialist Report 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 Red Hill Restoration Projects Planning 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 planning 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 Forest Plan, 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 decrease in in-stream large wood and 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 PDC, 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 EIS.

Table 3-42: ACS Objective Indicators in the EA

Indicators	Analysis Found in the Effects Section of the EA
Water Temperature	Water Quality
Sediment	Soil Productivity, Water Quality, Fisheries
Chemical Contamination	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 3-43: 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	
	1	2
Water Quality: Temperature	M	M
Sediment	M	M
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 Long-term
Pool Frequency	M	Slight Restore over 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 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	Slight 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. 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, except ACS Objective 7 – Maintain the Timing, Variability, and Duration of Floodplain Inundation.

- 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.

3.8.1 Existing Condition

Two species of wildlife 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 3-44. Species that are not present or do not have habitat within the project boundary will not be discussed further in this biological evaluation.

Table 3-44. 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	-
R6 Sensitive Species		
Bald eagle (*Haliatus leucocephalus*)	no	-
Peregrine falcon (*Falco peregrinus anatum*)	no	-
Bufflehead (*Bucephala albeola*)	no	-
Harlequin duck (*Histrionicus histrionicus*)	no	-
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	-
Johnson's hairstreak (*Callophyrs johnsoni*)	no	-
Mardon skipper (*Polites mardon*)	no	-

Species	Habitat	Presence
Survey and Manage Species		
Great gray owl *(Strix nebulosa)*	no	-
Larch Mountain salamander *(Plethodon larselii)*	no	-
Dalles sideband *(Monadenia fidelis minor)*	no	-
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
Pine 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

There is no habitat present for Survey and Manage species. As such, no surveys are required for these species and this project is consistent with the survey requirements in the 2001Record of Decision and Stands and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines.

3.8.2 Threatened, Endangered and Proposed Species – Northern spotted owl

3.8.2.1 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 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.

Analysis 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 owls 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.

3.8.2.2 Existing Condition
The northern spotted owl (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 is greater than 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 *Status and Trends in Demography of Northern Spotted Owls* (Anthony et.al. 2006) states that spotted owl numbers have fallen by roughly half over the past decade in parts of Washington and Confederated Tribes of the Warm Springs Reservation in Oregon, and they have dwindled by nearly a quarter in sections of Oregon's Coast and Cascade ranges. In only a few areas are owls maintaining their numbers. This report stated that determining the cause of this decline is beyond the scope of this study, and they could only speculate among the numerous possibilities including competition from barred owls, loss of habitat from wildfire, timber harvest including lag effects from prior harvest, poor weather conditions, and defoliation from insect infestations. The *Scientific Evaluation of the Status of the Northern Spotted Owl* (Sustainable Ecosystems Institute, Courtney et al. 2004) indicated that population declines of the spotted owl over the past 14 years were expected, they concluded that the accelerating downward trends on some study areas in Washington where little timber harvest was taking place suggest that something other than timber harvest is responsible for the decline. Since the decline appears to be across the range of the spotted owl, it is likely that these same declines apply to the owls in the project area.

Analysis Area
There is one spotted owl home range that overlaps 10 of the treatment units. These treatment units within the home range are in dispersal habitat and total 396 acres. Currently, the core area for this territory is above the threshold level at 61 percent suitable habitat, but the home range is below the threshold at 23 percent suitable habitat (Figure 3-12).

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 Silviculture Specialist Report for more details).

Approximately 1,536 acres are proposed for treatments. All of these units are second-growth stands that range in age from approximately 35 to 99 years old. Approximately 1,500 acres are providing dispersal-only habitat for spotted owls. The remaining 36 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.

3.8.2.3 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 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. With no action, there would be no sound related disturbance to owls.

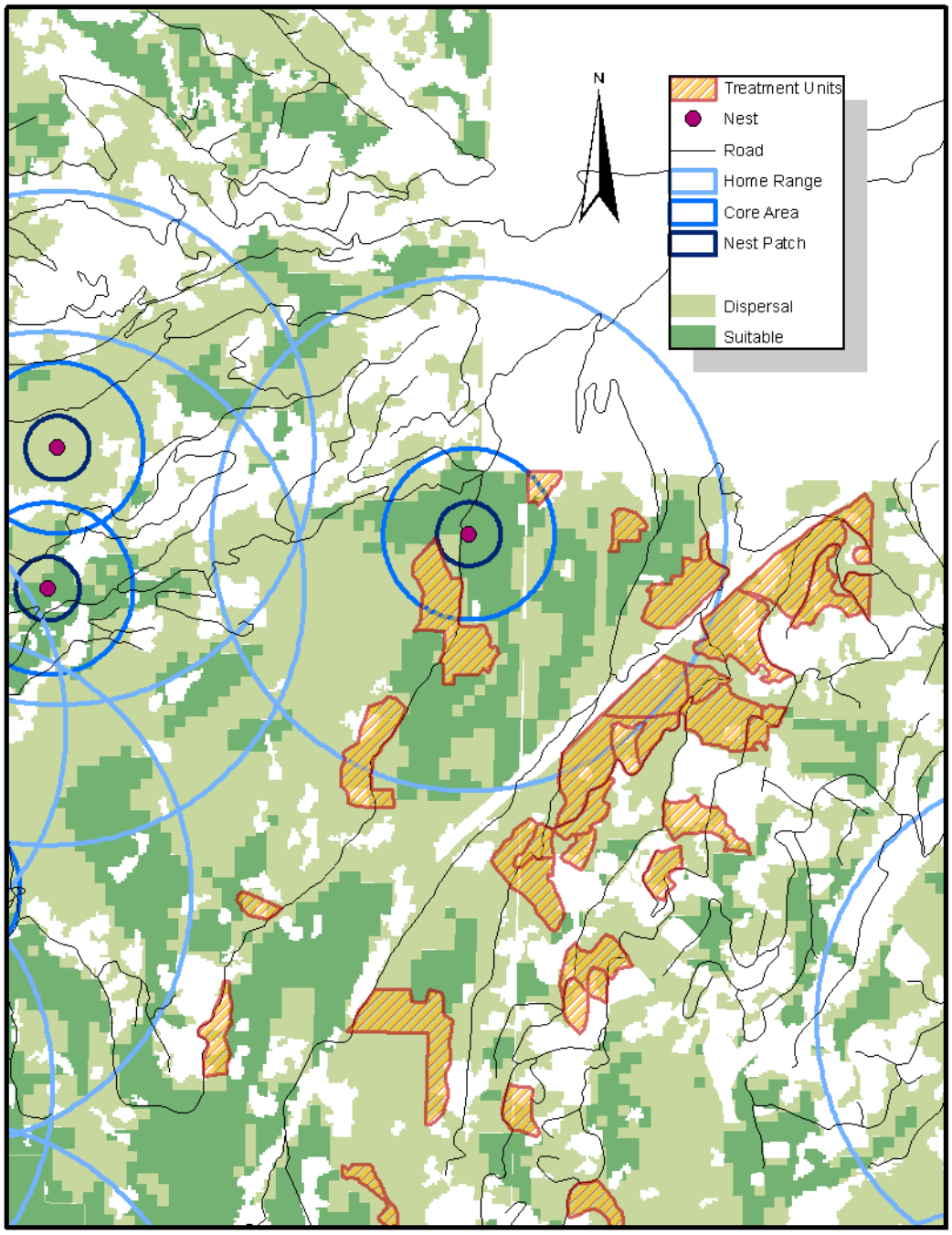

Figure 3-12: Spotted Owl Habitat and Treatment Units

Proposed Action – Direct and Indirect Effects

There would be no effects to spotted owls from road decommissioning, road closures, and storm proofing. The proposed treatments include a thinning prescription that would improve the growth rate of the stand. 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. The riparian 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 would temporarily impact approximately 1500 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 is one home range that overlaps with 10 of 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.

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.

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**, northern spotted owls.

Cumulative Effects
The activities analyzed in the cumulative effects for spotted owl are within the West Fork Hood River Watershed and include the construction of the Bonneville Power Administration (BPA) Powerline, past timber harvests on Federal and private lands, and the Lake Branch planning area.

The cumulative effects considered are to dispersal habitat and would be insignificant because dispersal habitat is not the limiting factor for owls in the watershed. In this analysis area, the more likely limiting factor for spotted owl occupancy is the lack of suitable habitat and lack of connectivity between these suitable habitat blocks. This project does not impact suitable habitat or the connectivity between suitable blocks.

3.8.2.4 Consistency Determination
The effects to northern spotted owls for this project were included in a programmatic informal consultation submitted to the U.S. Fish and Wildlife Service on April 10, 2012: Biological Assessment of NLAA Projects with the Potential to Modify the Habitat of Northern Spotted Owls Willamette Planning Province – FY 2013. A Letter of Concurrence was signed on June 14, 2012: Letter of Concurrence and Conference Concurrence Regarding the Effects of Habitat Modification Activities within the Willamette Province, FY 2013, proposed by the Eugene District, Bureau of Land Management; Salem District, Bureau of Land Management; Mt. Hood National Forest; Willamette National Forest; and the Columbia River Gorge National Scenic Area on the Northern Spotted Owl (*Strix occidentalis caurina*) and its' Designated and Proposed Critical Habitat (FWS Reference Number 01EOFW00-2012-I-0105).

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. There is no proposed Critical Habitat within the project area.

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 apply to the Proposed Action alternatives:

- 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.

All of these Forest Standards and Guidelines would be met under the Proposed Action alternative.

3.8.3 Region 6 Sensitive Species – Western Bumblebee

3.8.3.1 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.

3.8.3.2 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 Golden (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.

3.8.3.3 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 300 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 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 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 timber harvest (Ax, Wedge and Faller timber sales), 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). The cumulative impacts from these projects do not include any of these activities. Because some of the projects 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.

3.8.3.4 Consistency Determination
The Proposed Action alternative is consistent with the following Standards and Guidelines for sensitive species: (1) FW-174: Threatened, endangered and sensitive plants and animals shall be identified and managed in accordance with the Endangered Species Act (1973), the Oregon Endangered Species Act (1987), and FSM 2670; and, (2) FW-175: habitat for threatened, endangered and sensitive plants and animals shall be protected or improved.

3.8.4 Management Indicator Species

3.8.4.1 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 3-45).

Table 3-45: 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.

3.8.4.2 Mule Deer and Elk

Existing Condition

Black-tailed deer are common and relatively abundant in the spring, summer and fall within the watershed. Elk are also 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 type of habitat generally shows that elk spend most of their time in close proximity to a stream or wetland. Forage is widely available on the District, but is generally of low quality.

The low quality of the forage and the lack of wetlands and permanent low-gradient streams on the District are considered one of the limiting factors for elk and possibly deer.

The treatment units are located within summer and winter range. The West 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.

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 patches of old-growth habitat within the watershed 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 since plantations have grown dense with trees that shade out forage.

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. The open road density within the project area is 2.4 miles per square mile which is less than the 2.5 miles per square mile for the Forest Plan Standard. There are no open roads within B10 winter range which is less than the Forest Plan Standard of 1.5 miles per square mile.

No Action – Direct and Indirect Effects
Approximately 1,536 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 analysis area for deer and elk includes the Marco Creek, Tumbledown Creek, Red Hill Creek, McGee Creek, and Ladd Creek drainages. 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 to the point in which most forage benefits are lost, in approximately 15 years. Consequently forage levels would return to pre-treatment levels at this time. 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 sometimes 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.

There are potential haul routes that go through deer and elk winter range. All haul roads that go through the B10 winter range land us allocation would have their use restricted between December 1 and April 1, as description in the Project Design Criteria/Mitigation Measures (PDC). See Chapter 2 of the EA for a full list of the PDC.

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. Harvest operations and associated noise level producing activities would be restricted between December 1 and April 1 in all areas occurring within the B10 land allocation.

This seasonal restriction is expected to reduce disturbance effects created by the project. In addition, project activities would not all be occurring at the same time, but only in a few places at any one time. The remaining 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 accomplish the treatments in the Proposed Action. 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 would be no increase in the permanent roads open to the public, and therefore no increase in open-road density with this alternative.

This alternative proposes approximately 12 miles of road decommissioning and approximately 8.4 miles of road closures. 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.

Cumulative Effects
Since deer and elk move up and down the watershed depending on the season, the analysis area used for cumulative effects includes the private lands in the watershed in addition to the Marco Creek, Tumbledown Creek, Red Hill Creek, McGee Creek, and Ladd 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 42 percent forage and 58 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 Lakebranch planning area 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.

3.8.4.3 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 critical habitat components for pileated woodpeckers (Hartwig et al. 2004, Mellen et al. 1992).

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

overlap for pileated woodpeckers would be approximately 970 acres (Mellen et al. 1992).

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 2508 birds including adults and fledglings. Given the amount of habitat available, there may be up to two home ranges in the project area. While there is habitat within the watershed, there is no suitable habitat within the treatment units.

No Action Effects Analysis
There would be no short-term effects to pileated woodpecker 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 Effects Analysis
None of the proposed harvest units provide habitat for this species. All the stands proposed are young managed plantations and range in age from about 32 to 75 years. Unit 44 is approximately 99 years old, but none of the units contain sufficient numbers of large trees or snags to provide potential habitat for the pileated woodpecker. As such, the Proposed Action does not have any direct, indirect or cumulative effects for on pileated woodpecker.

3.8.4.4 American Marten

Existing Condition
The American marten is referred to as the pine martin in the Mt. Hood Land and Resource Management Plan (Forest Plan). Since the time the Forest Plan was written, the name of the species has been changed to American marten. The American marten is an indicator species of mature or older forests with dead and defective standing and down woody material. It has a feeding area that utilizes several stand conditions that range from poles to old growth. American martens often utilize higher elevation sub-alpine stands and prefer older habitat with a highly complex component of dead trees and down wood with cavities (Buskirk 1994). They prefer mature forests with closed canopies, but sometimes use openings in forests if there are sufficient downed logs to provide cover (Csuti 1997).

The Forest has approximately 21,553 acres of habitat that have a 30 percent or higher probability of supporting American marten. A home range of 173 acres was used in determining the number of home ranges on the Forest. There are approximately 63 to 125 home ranges for martens on the Forest. The original Forest Plan analysis for marten overestimated habitat at 231 home ranges. The current model is closer to predicting the actual population because it is supported by tracking information provided by Cascadia Wild (winter tracking data and camera stations).

Home ranges may contain two adults and up to three young. The estimated population on the Forest is 310 to 625 martens.

No Action Effects Analysis
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 Effects Analysis
None of the proposed harvest units provide habitat for this species. All the stands proposed are young managed plantations and range in age from 32 to 75 years. Unit 44 is approximately 99 years old, but none of the units contain the mature forest structure and sufficient downed logs to provide habitat for the pine marten. As such, the Proposed Action does not have any direct, indirect or cumulative effects for on pine marten.

3.8.4.5 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
The Forest Plan Standard of achieving a 70 percent canopy cover within 10 years would not be met (B10-014). A higher retention prescription would not result in substantial differences in stand characteristics compared to the Proposed Action and leaving the stand untreated would not meet the purpose and need of this project.

Pileated Woodpecker and American Marten
There are no applicable standards and guidelines for pileated woodpeckers or pine marten because none of the alternatives are within B5- Pileated Woodpecker/Pine Marten land allocation. Snags are discussed below under "Snag and Down Log Associated Species."

3.8.5 Snag and Down Log Associated Species

3.8.5.1 Methodology
The West 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.

3.8.5.2 Existing Condition
Some 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 usually less than 12 inches in diameter.

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 75 percent of the analysis area has been harvested in the past. The percent ground cover of wood $\geq$ 3 inches diameter is less than 5 percent; much less in many cases. The number of snags $\geq$ 10 inches diameter are less than 2.5 per acre, and in many cases less than 2 per acre.

The project area occurs within both the western hemlock and Pacific silver fir zones. The primary and secondary cavity nesting species for the western hemlock zone are: pileated woodpecker, northern flicker, hairy woodpecker, red-breasted sapsucker, and red-breasted nuthatch. In this zone, the 100 percent biological potential level is 3.7 snags per acre greater than 15 inches diameter (Austin 1995). The primary and secondary cavity nesting species for the Pacific silver fir zone are pileated woodpecker, northern flicker, hairy woodpecker, Williamson's sapsucker, red-breasted sapsucker, and the red-breasted nuthatch. In this zone, the 100 percent biological potential level is 4 snags per acre greater than 15 inches diameter (Austin 1995). The 60 percent biological potential level is 2.2 snags per acre in the western hemlock zone and 2.4 snags per acre in the Pacific silver fir zone.

3.8.5.3 Effects Analysis

Snags and Down Wood Levels Compared to DecAID Data
All of the units are located within the habitat type identified in DecAID as the Westside Lowland Conifer-Hardwood Forests of Western Oregon Cascades and vegetation condition of "small/medium trees." For this habitat type, the DecAID advisor identifies the 30 percent tolerance level for snags as 5.3 snags per acre greater than 10 inches with almost 5 per acre greater than 20 inches in diameter. It identifies the 30 percent tolerance level for down wood as up to 4.5 percent cover of down wood (including all decay classes) with sizes of logs averaging 8 to 12 inches in diameter. Most of the proposed treatment units contain snag and down wood numbers at less than the 30 percent tolerance level.

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 $\geq$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 (5.3 snags/acres).

In the short-term, plantations would provide low amounts of down wood cover. Most areas would be below 4.5 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 30 years to reach the 20-inch size class (USDA 2009).

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 the 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, punk knots, flattened stem faces, 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 riparian 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 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 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.

Cumulative Effects

Past harvest activities on approximately 75 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 (32.5 percent) currently contains no snags compared to the historic condition of 4.7 percent (Figure 3-13). While there are currently more snags per acre in the 0-6 category, the remainder of the watershed in this habitat type is well below historic levels for the number of snags per acre. Implementation of this project could result in the loss of some snags cut for safety concerns, but there are few snags 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 West Fork Hood River Watershed. Other projects in the watershed include: construction of the BPA Powerline, hazard tree removal, past timber harvest on federal and private lands, and the Lakebranch timber sales (Ax, Wedge and Faller). All these projects have the potential to reduce snags and down wood on the landscape.

It is not likely that the powerline and timber harvest on private lands would provide snags and downed wood in the foreseeable future. The remaining activities, including timber harvest on Forest Service land would have similar impacts as the Proposed Action. Structural diversity would be improved by initiating a new age class and by creating openings. Thinning would also have an indirect impact by releasing the green retention trees. These retention trees would later become the large diameter snags and downed wood. The blocks of unharvested habitat would provide large snags and down wood while the treated areas of the watershed move toward the mature forest state. The adjacent untreated areas would allow for snag and down wood-dependent species to recolonize habitat as snags and down wood increase in the treated areas.

The Dollar Lake fire increased the number of snags in the Watershed. The fire burned a total 6,287 acres, 1215 of these acres burned in the West Fork of the Hood River Watershed. These acres would increase the level of high density snags in the watershed by 2 percent. With the addition of these snags, the current percentage of snags in the 30 plus category would be 4.7 which is still be below the reference condition of 7.2 percent of the watershed in high density patches of snags.

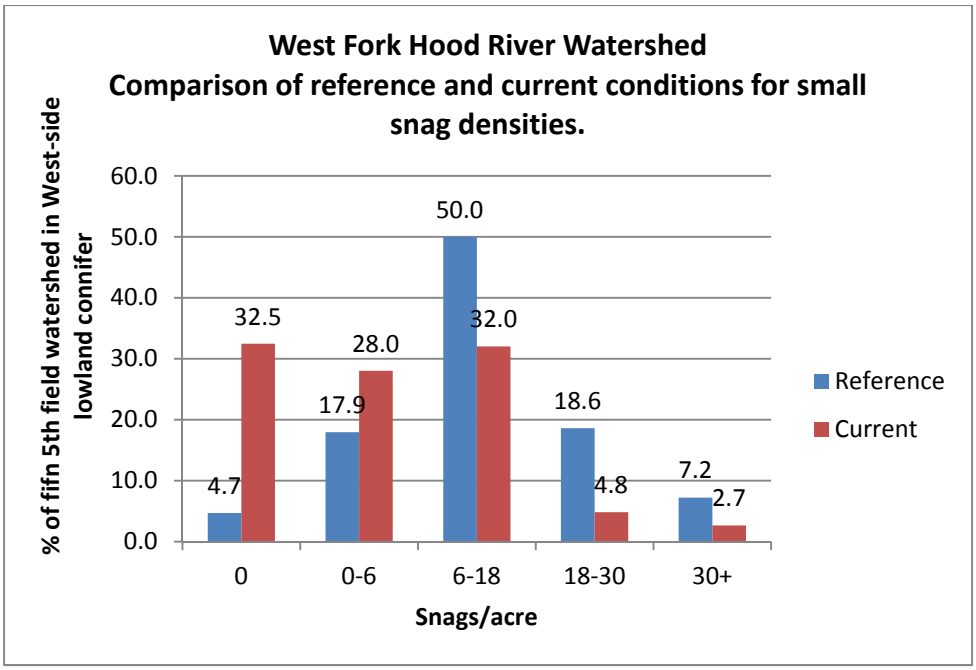

Figure 3-13: Comparison of Current and Reference Condition for Snag Densities

3.8.5.4 Consistency Determination

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 these cases, snags and green leave trees retained would be representative of the largest size class present in the stand.

FW-216 indicates that snags and wildlife trees at the landscape scale be at 40 percent of biological potential, which equates to about 1.5 in the western hemlock zone and 1.6 snags per acre in the Pacific silver fir zone. This level would be met because of the quantity of large snags present in mature stands scattered across the watershed.

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.

3.8.6 Neotropical Migratory Birds

3.8.6.1 Methodology

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 West Fork Hood River Watershed contains elements of both these physiographic regions.

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
Aspen	Large trees/snags, regeneration	Red-naped sapsucker
Subalpine fir	Patchy presence	Blue grouse*

*Significantly declining population trends in the Cascade Mountains Physiographic Region.

3.8.6.2 Existing Condition

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.

3.8.6.3 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. More structurally diverse conditions are expected to return and provide habitat for these species 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.

3.8.7 Summary of Effects by Alternative

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 to100 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 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. No other federally threatened, endangered and proposed species; Forest Service Region 6 Sensitive Species; and Survey and Manage Species in the Project Area (see Table 3-47).

For deer and elk, the timber removal, road maintenance and decommissioning activities in the Proposed Action could potentially disturb animals in the area at the time of implementation; however, the seasonal restriction is expected to reduce disturbance effects created by the project. 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. Lastly, 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 3-47: Summary of Effects to Wildlife Species by Alternative

Species	Habitat	Impact of No Action	Impact of Proposed Action
Federally Threatened, Endangered or Proposed			
Northern spotted owl (*Strix occidentalis caurina*)	yes	NE	NLAA
Canada lynx (*Lynx canadensis*)	no	NE	NE
R6 Sensitive Species			
Bald eagle (*Haliatus leucocephalus*)	no	NI	NI
Peregrine falcon (*Falco peregrinus anatum*)	no	NI	NI
Bufflehead (*Bucephala albeola*)	no	NI	NI
Harlequin duck (*Histrionicus histrionicus*)	no	NI	NI
White-headed woodpecker (*Picoides albolarvatus*)	no	NI	NI
Lewis' woodpecker (*Melanerpes lewis*)	no	NI	NI
Cope's giant salamander (*Dicomptodon copei*)	no	NI	NI
Cascade torrent salamander (*Rhyocotriton cascadae*)	no	NI	NI
Oregon spotted frog (*Rana pretiosa*)	no	NI	NI
Townsend's big-eared bat (*Corynorhinus townsendii*)	no	NI	NI
Fringed myotis (*Myotis thysanodes*)	no	NI	NI
Wolverine (*Gulo gulo luteus*)	no	NI	NI
Pacific fisher (*Martes pennanti*)	no	NI	NI
Western bumblebee (*Bombus occidentalis*)	yes	NI	MII-NLFL
Beller's ground beetle (*Agonum belleri*)	no	NI	NI
California Shield-backed bug (*Vanduzeenia borealis californica*)	no	NI	NI
Johnson's hairstreak (*Callophyrs johnsoni*)	no	NI	NI
Mardon skipper (*Polites mardon*)	no	NI	NI
Survey & Manage Species			
Great gray owl *(Strix nebulosa)*	no	NI	NI
Larch Mountain salamander *(Plethodon larselii)*	no	NI	NI
Dalles sideband *(Monadenia fidelis minor)*	no	NI	NI
Crater Lake tightcoil *(Pristiloma arcticum crateris)*	no	NI	NI
Evening fieldslug *(Deroceras hesperium)*	no	NI	NI
Puget Oregonian *(Cryptomastix devia)*	no	NI	NI
Columbia Oregonian *(Cryptomastix hendersoni)*	no	NI	NI

NI = No Impact
MII-NLFL = May Impact Individuals, but not likely to Cause a Trend to Federal Listing or Loss of Viability of the Species
NLAA = Not likely to adversely affect
NE = No Effect

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 EA (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 Red Hill Restoration project area, but were not detected during surveys, are discussed under Existing Conditions – Field Surveys.

Forest Service Direction

R6 Sensitive Species - The 5-Step Biological Evaluation Process

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" (FSM 2670.3). The 5-step process consists of: 1) Pre-field review of existing information; 2) Field reconnaissance if sensitive species or habitats are determined to be present and may be affected by proposed project activities; 3) An evaluation of project effects on sensitive species and habitats; 4) An analysis of the significance of the project's effects on local and entire populations of species; and 5) A biological investigation if needed (due to lack of information). A determination of No Impact for sensitive species can be made at any step in the process, at which time the BE is complete.

Survey and Manage Species – 2001 ROD Standards and Guidelines

Survey and Manage Categories for Rare and Uncommon Species discussed in this report 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; and,

- 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).

To help determine the need for a survey based on site-specific information, the 2001 ROD suggests "…line officers should consider the probability of a species being present on the project site as well as the probability that the project might cause a significant negative effect on the species habitat or the persistence of the species on the site" (ROD SG-22, pg. 2).

Prefield Review, Field Surveys, and Management of Known Sites

Determine the Need for Pre-disturbance Surveys
Prior to field surveys an office review of existing information is conducted to determine which R6 Sensitive species and Survey and Manage species are in range of the Mt. Hood National Forest, and if known sites and/or suitable habitats are present in the project area. To help determine which species are within range of the proposed project area and if pre-disturbance surveys are needed the following process is used.

Review Existing Data

1. Review NRIS - known site data/ habitat information for R6 Sensitive and Survey and Manage species that are documented and/or suspected to occur on or within range of Mt. Hood National Forest; review most current official Survey and Manage species list and information on http://www.fs.fed.us/r6/sfpnw/issssp and http://www.blm.gov/or/plans/surveyandmanage which includes survey protocols, Survey and Manage species fact sheets for vascular plants, bryophytes, lichens, and fungi, and Conservation Assessments and Management Recommendations (which also include habitat requirements for vascular plants, lichens, bryophytes, and fungi). Additional information available includes: Current Vegetation Survey (CVS) plot data, Random Grid data, Purposive Surveys in the vicinity of the Mt. Hood National Forest, local experts, and local university herbaria.
2. Identify areas of suitable habitat in the project area for R6 Sensitive species and Survey and Manage Category A and C botanical species that require pre-disturbance surveys (ROD SG-7, 8, 10); and for Category B species specifically identify areas of suitable old growth forest habitat (ROD SG-9). Sources of information include Forest Service GIS coverage (vegetation, riparian, soils layers), Late Successional Reserve (LSR) maps, aerial photos, topographic maps, District botany records and knowledge from past field visits and surveys in the area, communication with other resource specialists familiar with the project area, scientific literature. Survey protocols and Conservation Assessments and Management Recommendations (which include habitat requirements for vascular plants, lichens, bryophytes, and fungi) are also reviewed.
3. If suitable habitat is present, determine if activities are considered habitat-disturbing. For Survey and Manage species "habitat-disturbing" is not necessarily the same as "ground-disturbing." Habitat-disturbing activities are defined as "…those disturbances likely to have a significant negative effect on the species' habitat, its life cycle, its life cycle, microclimate, or life support requirements" (ROD SG-22).

Conduct Field Survey
Surveys are conducted according to applicable Survey and Manage protocols for Survey and Manage Category A and C species (including "equivalent effort" surveys for Survey and Manage Category B species if old-growth habitat is present). Survey guidelines for Survey and Manage species and R6 Sensitive species may vary, 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.

Manage Known Sites
If sites are found and if there are known sites present within the proposed project area manage sites according to applicable Conservation Assessments and Management Recommendations. Modify the project accordingly if necessary to prevent habitat disturbance and to provide for persistence of the species at the site and on the Mt. Hood National Forest.

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, Hatfield Wilderness, and riparian reserve areas within the West Fork and Middle 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 EA that have 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 Red Hill Restoration Project is within the West Fork watershed analysis area on the north side of Mt. Hood. Elevations in the project area range from 1800 to 4400 feet. Plant associations throughout the project area are typical of forests on the north side of Mt. Hood. Plant associations include Western Hemlock/dwarf Oregon grape-salal, Pacific silver fir/Alaska

huckleberry-salal, Western hemlock/rhododendron, Mountain hemlock/rhododendron, Pacific silver fir/vanilla leaf, and Pacific silver fir/big huckleberry. Overstory is predominantly Douglas-fir (*Pseudotsuga menziesii*), Western hemlock (*Tsuga heterophylla*), 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.

The 2001 Survey and Manage ROD defines late-successional forests as …"Minimum ages are typically 80-130 years, more or less, depending on the site quality, species, rate of stand development, and other factors" (2001 ROD SG-77). Forested stands in the proposed units range from approximately 32 to 99 years old and have been previously logged (i.e., plantation units). Current canopy densities range between 60 percent and 90 percent closure. Of all the units proposed for treatment, the following three units have marginally suitable mid-elevation mid-late-successional forest habitat for R6 Sensitive species and Survey and Manage species: Units 26 and 50 are both approximately 75 years old with a current canopy closure density of approximately 70 percent. Unit 44 is the oldest unit proposed for treatment; stand age is approximately 99 years old and current canopy closure is approximately 70 percent density. 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 (see Wildlife Specialist Report for more details). There are numerous riparian corridors in the analysis area, and there are moss covered boulder patches, and areas of exposed talus and volcanic rock that are of interest from a botanical standpoint.

If R6 Sensitive and Survey and Manage fungal species are present in the vicinity of the proposed project area they would be most likely to occur in Unit 44. Unit 44 is discussed further under Effect Analysis.

Past Field Surveys Analysis

Survey Results – No Known Sites

Botanical surveys were completed during early August through early October 2011; 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 (Tables 1 and 2). Survey and Manage Category B fungi are also listed as R6 Sensitive. Although the two year survey protocol required for Survey and Manage fungi is not required for R6 Sensitive fungi the same protocol is recommended in order to detect fungal species that emerge inconsistently during spring/summer and/or autumn year to year depending on seasonal conditions.

R6 Sensitive Species

The pre-field review process concluded that the following R6 Sensitive species might be present in the proposed project areas: Vascular plant species - *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 1 fungal species, *Bridgeoporus nobilissimus.*). R6 Sensitive botanical species listed above were not found during surveys conducted in 2011 and there are no known sites that require management.

There is one R6 Sensitive species, *Calamagrostis breweri,* known to occur in the vicinity of the analysis area*;* the species has been documented near the Mt. Hood Wilderness boundary and is outside of proposed project activities areas. There are no other known sites of R6 Sensitive botanical species in the proposed project area.

Survey & Manage Category A and C Species (Surveys Practical)
Surveys have been completed according to applicable protocols and guidelines for the following bryophyte species, lichen species, vascular plant species, and one fungi species; these species were not detected during surveys of suitable habitats present in the project area: Category A Bryophytes (No Cat. C) - *Schistostega pennata* (moss), *Tetraphis geniculata* (moss); Category A Lichens (No Cat. C) – *Hypogymnia duplicata, Leptogium burnetiae* var. *hirsutum, Leptogium cyanescens, Lobaria linita;* Category A Fungi (No Cat. C) - *Bridgeoporus nobillisimus.*

Vascular plant species - *Corydalis aquae-gelidae, Coptis trifolia, Cypripedium montanum;* Lichen species - *Pseudocyphellaria* rainierensis that are typically associated with these Category A and C species, within range of the Mt. Hood National Forest, are not present in the proposed project area and there are no known sites that require management:

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 plant species - *Corydalis aquae-gelidae, Coptis trifolia, Cypripedium montanum;* Lichen species - *Pseudocyphellaria rainierensis.*

Survey and Manage Category B Species
Forests in the proposed project area are between 32 and 99 years old (and lack multi-canopy stand structure and down woody debris); therefore, they do not meet the definition of old-growth. Surveys for Category B species are not required.

Survey & Manage Category D and E Species (Surveys Not Required)
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 SG-11, 12); however, the three species listed above are also R6 Sensitive therefore surveys were completed for lichen species *Chaenotheca subroscida* and *Tholurna dissimilis,* but surveys were not conducted for fungal species *Phaeocollybia attenuata* because surveys were not practical with a two year multi-season survey protocol. *Chaenotheca subroscida and Tholurna dissimilis* were not detected during surveys and there are no known sites that require management. Fungal species

Phaeocollybia attenuata is addressed below, as a R6 Sensitive Species, and also under Effects Analysis.

Fungi Species

Surveys Not Completed for R6 Sensitive Fungi and Survey and Manage Fungi in Unit 44
Surveys have been completed for one fungal species, *Bridgeoporus nobilissimus,* which is listed as a R6 Sensitive species and is also a Survey and Manage Category A species (surveys required under the 2001 ROD because the species is identifiable year around). The other fungi species (listed below) that have suitable habitat in the project area are also listed as R6 Sensitive and Category B Survey and Manage species. A two year multi-season survey protocol is only required for Survey and Manage Category B fungi in projects that might disturb old growth habitat (surveys are not required for projects in other stand types); old growth habitat is not present. Marginal mid- late successional forest habitat is only present in Unit 44 (Attachment C).

Forest Service Policy for Sensitive species does not require surveys to be conducted for projects; surveys are considered a tool to assist in determining the effect of a project upon the species in question. However, if a decision is made to conduct surveys for R6 Sensitive fungi, a minimum two year survey protocol is recommended. Surveys in the proposed project area were only conducted during early August through early October 2011. No autumn fruiting fungal species were found. Surveys were not completed for fungal species that emerge only during spring and early summer.

Rationale for Not Completing Fungi Surveys According to Two Year / Multi-season Protocol
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 surveys were not feasible given the timeline of the proposed project and development of the Proposed Action; therefore it is assumed that the following fungi R6 Sensitive/Survey and Manage fungi are present because late-successional forest habitat is present: *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.*

The following information condensed from known site data generally describes the potential affected environment for each of the fungi species listed above. The specific potential effects on these species (if they are present) and on their suitable habitat, as a result of proposed project activities, are discussed in detail under Effects Analysis.

- *Alpova alexsmithii* is in the false truffle group, forms fruiting bodies beneath the soil surface and is associated with conifer trees in the Pinaceae family, particularly western hemlock and mountain hemlock, from 3,900 to 10,500 feet in elevation. There are only four known sites on the Mt. Hood National Forest (NRIS 2010).

- *Choiromyces venosus* is in the true truffle group, forms fruiting bodies beneath the soil surface under Douglas-fir and western hemlock at low elevations. Only two known sites were reported for this species in the Northwest Forest Plan area in 1999 (Castellano et al.). No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

- *Chroogomphus loculatus* is endemic to Oregon and forms fruiting bodies beneath the soil surface. This species is associated with various conifers in the Pinaceae family, particularly mountain hemlock, at mid-elevations. No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

- *Cortinarius barlowensis* is widely distributed, known from 16 sites in the western Cascade Range (Oregon and Washington), Coast Range, and Olympic Mountains. There are two known sites from the Mt. Hood National Forest (Zigzag Ranger District). Habitat is soil in coniferous forest.

- *Cystangium idahoensis* (formerly Martellia idahoensis) forms fruiting bodies beneath the soil surface and is associated with the roots of Pacific silver fir, subalpine fir, noble fir, Engelmann spruce, and mountain hemlock from 3,900 to 5,400 feet in elevation. No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

- *Gastroboletus imbellus* is endemic to Oregon and only one site has been reported for this species (currently only on the Willamette National Forest). No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest. This species forms fruiting bodies beneath the soil surface and is associated with the roots of grand fir, subalpine fir, and mountain hemlock at higher (5,000 feet or more) elevations.

- *Gomphus kauffmanii* is endemic to western North America and found in California, Oregon, and Washington along the Pacific coast or in the Cascade Range. There are six known sites for this mushroom on the Mt. Hood National Forest. Host trees for G.

kauffmanii include true firs and pines. G. kauffmanii forms symbiotic associations with the fine-root systems of plants.

- *Helvella crassitunicata* is endemic to Oregon and Washington and grows scattered to gregarious on soil, especially along trails, in montane regions with Pacific silver fir, noble fir, grand fir, and subalpine fir. There are only two known sites documented on the Mt. Hood National Forest (NRIS 2010).

- *Hygrophorus caeruleus* is endemic to Oregon and Washington and occurs in soil with roots of conifer trees near melting snowbanks. The species epithet caeruleus refers to the blue-tinged color of the mushroom and its blue-green waxy gills. No known sites are documented on the Mt. Hood National Forest (NRIS 2010), but the species is suspected to occur on the Forest.

- *Leucogaster citrinus*, a false truffle, is endemic to the Pacific Northwest with 45 sites known from western Washington, western Oregon, and northern California. There are four known sites on the Mt. Hood National Forest (Zigzag Ranger District). This belowground-fruiting species is associated with the roots of white fir, subalpine fir, lodgepole pine, western white pine, Douglas- fir, and western hemlock from 900 to 6,600 feet in elevation.

- *Macowanites mollis* is endemic to Oregon and Washington. There is only one known site on the Mt. Hood National Forest (Larch Mountain). This mushroom looks like a disfigured specimen of *Russula* or *Lactarius* and is found in association with the roots of grand fir, Douglas-fir, and western hemlock above 1,000 meters elevation.

- *Mycena monticola is* endemic to the Pacific Northwest scattered across the western and eastern Cascade Range, the Klamath Mountains, and the Olympic Mountains. On the Mt. Hood National Forest, the species has been documented in the Bear Springs Campground, Barlow Ranger District. *Mycena monticola* is restricted to conifer forests above 3,300 feet in elevation, particularly those with *Pinus* species and is usually found in gregarious, caespitose clusters in duff.

- *Mythicomyces corneipes* is widespread across western North America and northern Europe and was reported on the Mt. Hood National Forest (Castellano et al. 2003); however, no known sites are documented on the Mt. Hood National Forest in the NRIS database (2010). This species is in the *Cortinariaceae* family, is solitary to gregarious in habit, and grows along margins of bogs among mosses or on wet soil under conifers and alder species.

- *Octaviania macrospora*, a false truffle, is endemic to Oregon and found in association with the roots of western hemlock. One known site for the entire Northwest Forest Plan area is reported for the Mt. Hood National Forest (Twin Bridges Campground) by Castellano et al. (1999); however, no known sites are documented on the Mt. Hood National Forest in NRIS (2010).

- *Phaeocollybia attenuata* is endemic to western North America from British Columbia south to Marin County (northern California) with 131 sites known from western Washington and Oregon to northern California. One known site is reported by Castellano et al. (1999) for the Mt. Hood National Forest (Larch Mountain); however, no known sites are documented in NRIS (2010). P. attenuata grows scattered to closely gregarious in humus and with mosses in moist coniferous forest (Sitka spruce, western hemlock, true firs, and Douglas-fir). It is recorded most frequently from Oregon coastal forests (Norvell & Exeter 2009).

- *Phaeocollybia californica* is endemic to the Pacific Northwest with 34 sites known from western Washington, western Oregon, and northern California. There is one known site on the Mt. Hood National Forest (Larch Mountain) recorded in NRIS (2010). *P. californica* is terrestrial (mycorrhizal), fasciculate (growing in close bundles) to gregarious (growing in arcs) in habit, and occurs in humus soils of moist coniferous (true fir, hemlock, Douglas-fir) forest and mixed (true fir, Pacific marine, oak, Douglas-fir, and hemlock) coastal and coastal montane forests.

- *Phaeocollybia oregonensis* is endemic to the Pacific Northwest with 10 sites known from the Oregon Coast Range and the western Cascade Range. There are five known sites documented on the Mt. Hood National Forest (NRIS 2010). This mushroom species is terrestrial (mycorrhizal), occurring solitary to gregarious, and associated with the roots of true fir, western hemlock, and Douglas-fir.

- *Phaeocollybia piceae* is endemic to the Pacific Northwest, known from 49 sites in western Washington, western Oregon, and northern California. One known site is reported by Castellano et al. (1999) for the Mt. Hood National Forest (Wildcat Mountain); however, no known sites are documented in NRIS (2010). This mushroom species is terrestrial (mycorrhizal), occurring solitary to scattered in small groups, and associated with coniferous (spruce, hemlock, Douglas- fir, true fir) forests.

- *Phaeocollybia pseudofestiva* is endemic to the Pacific Northwest, known from British Columbia south through western Washington and western Oregon to California. There are 38 known sites in Washington, Oregon, and California. Only two sites are documented on the Mt. Hood National Forest (NRIS 2010). The species is terrestrial (mycorrhizal) and occurs solitary to densely gregarious in coniferous (spruce, fir, hemlock, and Douglas-fir) forest.

- *Phaeocollybia scatesiae* is endemic to the Pacific Northwest with 17 sites documented in the Northwest Forest Plan area, three of those on the Mt. Hood National Forest (Zigzag Ranger District). This species is terrestrial (mycorrhizal), grows densely caespitose (clumped) in erumpent mounds in woody humus in coastal and montane (<4,000 feet) coniferous forests.

- *Ramaria amyloidea* is endemic to the Pacific Northwest with 16 sites known from western Washington to northern California. There is one known site on the Mt. Hood National Forest (NRIS 2010). Habitat for the species is soil in coniferous forest.

- *Ramaria gelatiniaurantia* is endemic to the Pacific Northwest with 24 sites known from western Washington to northern California. Three sites are reported by Castellano et al. (1999) for the Mt. Hood National Forest (Eagle Creek, junction of FS roads 4610 and 150, and Fish Creek Road); however, no known sites are documented in NRIS (2010). Habitat for the species is humus or soil in coniferous (true fir, Douglas-fir, and western hemlock) forest.

- *Ramaria spinulosa var. diminutiva* has not been reported for the Mt. Hood National Forest, but it is suspected to occur here. Castellano et al. (1999) reported a site in Mendocino County (northern California) and a site on the Mt. Baker-Snoqualmie National Forest (Glacier Peak Wilderness). Habitat for the species is humus or soil in coniferous (true fir, Douglas-fir, and western hemlock) forest.

- *Rhizopogon exiguus*, a false truffle, is endemic to Oregon with known sites from the Mt. Baker-Snoqualmie, Siuslaw, and Siskiyou National Forests. There are no known sites on the Mt. Hood National Forest although the species is suspected to occur here. This species is associated with the roots of Douglas-fir and western hemlock.

- *Rhizopogon inquinatus*, a false truffle, is found in association with the roots of Douglas-fir and western hemlock from 1,640 to 4,600 feet elevation. There are no known sites on the Mt. Hood National Forest although the species is suspected to occur on the Forest. Castellano et al. (1999) report two sites on the Willamette National Forest.

- *Sowerbyella rhenana* occurs in Europe, Japan, and northwest North America. In the Pacific Northwest, it is known from 63 sites in western Washington, western Oregon, and northern California, including two sites from the Mt. Hood National Forest (Eagle Creek, Rhododendron) according to Castellano et al. (1999); however, only one known site is listed in NRIS (2010) for the Forest. This species grows scattered to gregarious to caespitose (clumped) in duff of moist, relatively undisturbed, older coniferous forests (Castellano et al. 1999).

- *Stagnicola perplexa,* in the Cortinariaceae family, grows in groups on rotten wood, occasionally buried deeply enough to appear rooting in wet (or recently) dried-up depressions in coniferous forest. One known site is reported for the Mt. Hood National Forest (middle fork of the Salmon River) by Castellano et al. (2003); however no known sites are listed in NRIS (2010) for the Forest.

Mycological research indicates that mycelia of mycorrhizal fungi can form an extensive underground web (a wood-wide web) linking them to the fine roots of trees; "host" trees are needed for survival of some fungi species (Beiler et al. 2009, Zhou et al. 2001, Simard & Durall 2004). Fungi species that require host trees for survival are discussed above.

Forest stands bordered by non-forested openings, like those in the project areas (i.e., old clear cut units and young regeneration stands), are susceptible to edge effects (drying conditions due to loss of thermal cover and increased light); edge effects can extend up to 100 feet or more from the edges of clearings into the interior of residual forests which makes forested habitat near the edges of clearings less suitable for late-successional and old growth forest associated species (Chen and Franklin , 1992).

3.9.3 Effects Analysis

No Action – Direct and Indirect Effects

Under the No Action alternative, habitat disturbing activities described under the Proposed Action would not occur: Host trees needed for survival of some fungi species would remain and soil disturbance (including compaction and potential subsequent short-term erosion caused by machinery) would not occur as a result of logging, and the exchange of nutrients between host trees and fungi would not be directly affected by habitat-disturbing activities However, species diversity is likely to remain low if left untreated; Douglas-fir would be expected to dominate the forested stands in the long-term and stand structure would likely remain in a dense single-story condition with increasing crown closure and low diversity of understory species, and insect and disease levels and vulnerability of the stands to infestations would likely remain high (refer to Silviculture Specialist Report). As a result, habitat for fungal species (and other R6 Sensitive and Survey and Manage species) would not develop as it would under optimal conditions intended by silvicultural treatments to promote late seral forest stands.

Proposed Action – Direct and Indirect Effects

There are no known sites of R6 Sensitive species or Survey and Manage species in the proposed project area. There is marginally suitable mid- late-successional forest habitat for fungi species in Unit 44 that may be impacted by proposed project activities if species are present. Because R6 Sensitive fungi and Category B fungi are the same and multi-season surveys were not completed, they are included in the following effects analysis. The determination of effects is made based on the assumption that fungi species might be present because suitable habitat is present. Activities proposed under the Proposed Action would essentially have the same potential direct and indirect effects on mid-elevation mid- late-successional forest habitat regardless of the prescribed treatment per unit.

The Proposed Action would apply prescribed thinning of 1,536 acres with the goal of encouraging forest development from a dense, closed canopy early seral phase to more open late-seral phase. In Unit 44 host trees for some fungal species may be cut which would directly impact the exchange of nutrients between host trees and fungi if they are present. In the short-term, fungal mycelia would be disturbed and fragmented by machinery during project implementation and would also likely be impacted by localized soil compaction and short-term erosion.

Under the Proposed Action, trees that remain standing (especially near the edges of openings), but were previously sheltered among interior forest, would be vulnerable to blowing down in strong winds and breaking under heavy snow. In the short-term, forested habitat would become

susceptible to edge effects (drying conditions due to loss of thermal cover and increased light). Edge effects can extend up to 100-feet or more from the edges of clearings into the interior of surrounding forests, which makes habitat near edges of forested openings less suitable for many late-successional and old growth forest associated species (Chen and Franklin 1992). However, in the long-term, according to proposed silvicultural prescriptions most remaining trees should be large enough in diameter to withstand the effects of winds and snow, and in locations with high risk of blow-down potential (i.e. ridge tops) silvicultural treatments may vary to reflect the need to provide support trees around desired leave trees. In the long-term, the remaining trees are expected to mature and develop into late-successional forested habitats comprised of the essential components associated with most R6 Sensitive and Survey and Manage fungal species.

Cumulative Effects

Discussions of cumulative effects are limited to those past, present and reasonably foreseeable activities. The analysis area is the project area including the affected environment described under Existing Conditions. The discussion of cumulative effects also takes into consideration the amount of existing late-successional and old-growth forest habitat present in similar elevations in surrounding reserve areas (e.g., wilderness, riparian reserves, late-successional reserves).
Past projects that have added to cumulative loss of late-successional and old-growth forest habitat connectivity in and around the analysis area include construction of the BPA power line, clearing of forested lands to construct roads, and past timber harvests (including pre-commercial thinning) on private and federal lands. Any ongoing and future logging activities that are not designed to encourage development of late-successional and old-growth forest, including habitat connectivity corridors, would also contribute to cumulative fragmentation which would in turn affect connectivity needed for dispersal of fungi and other associated species.

Implementation of the proposed Red Hill Restoration Project may have short-term direct and indirect effects on marginally suitable habitat for fungal species in Unit 44, but in the long-term the development of late-successional forest in the analysis area would have beneficial effects on fungal species, and others, in and around the area.

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. The Proposed Action may have direct short-term impacts on fungal species (if they are present) and their marginal mid- late-successional forest habitat in Unit 44, but would not lead to a loss of viability or trend toward Federal listing.

The Proposed Action is expected to have a **Beneficial Impact/Effect** on the following R6 Sensitive Fungi and Survey and Manage Category B Fungi and their habitat as forests mature under the prescribed silvicultural treatment which is intended to encourage development of late-successional forest habitat: *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.*

Rationale for Effects Determination: Survey and Manage is a mitigation measure designed to provide a reasonable assurance of species persistence within the Northwest Forest Plan area. Activities proposed under the Proposed Action, in Unit 44, are not expected to affect the long-term persistence or viability of Survey and Manage fungal species and R6 Sensitive fungi on the Mt. Hood National Forest or throughout their range because the proposed silvicultural treatment of Unit 44 is intended to encourage development of the stand into a late-seral forested condition which would be more favorable for late-successional forest associated species; and, essential habitat is expected to remain in protected in similar mid-upper elevation late-successional/old-growth forest reserve areas around Mt. Hood, the Mt. Hood National Forest, and throughout the range of the Northwest Forest Plan where application of Survey and Manage Standards and Guidelines are intended to provide for persistence of Survey and Manage botanical species.

There are no known sites of R6 Sensitive Bryophytes, Lichens, and Vascular Plants in the proposed project area. The 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 described in Chapter 2 of the DEIS. 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 planning 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 Moderate Risk of introducing or spreading noxious weeds. Noxious weed control measures are identified under the Project Design Criteria/Mitigation Measures (PDC) section of the Environmental Assessment (EA) 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 because 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 EA 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 (Table 1, Attachment A in the Noxious Weed Specialist Report).

There also are invasive plant species not yet included on the ODA list of noxious weeds. but they have been increasingly reported as nuisance invaders in Oregon (Table 2, Attachment B 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 and near units 5, 6, 9, 15, 18, 27, 44 and along the following unit access roads and haul routes: 1340, 1600, 1600-018, 1612, 1620-630, 1800, 1810-011, 1811-620. The species are: Diffuse knapweed (*Centaurea diffusa),* spotted knapweed (*Centaurea stoebe, i.e C. maculosa),* meadow knapweed *(Centaurea debeauxii, i.e C. pratensis)* orange hawkweed*, (Hieracium aurantiacum),* yellow toadflax, *(Linaria vulgaris),* tansy ragwort (*Senecio jacobaea)*. The sites have been approved for treatment under the 2008 Site Specific Invasive Plant Treatment EIS and were treated during 2012 by the Oregon Department of Agriculture (ODA) in partnership with the US Forest Service. Noxious weed control treatments

were also applied to other approved sites along FS Roads 1300, 1600, and 1800 during 2010 and 2011.

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.

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 introduced by other vectors already present in the planning 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 the following table. 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: Noxious Weed Risk Assessment

Project: Red Hill	Factors	Vectors	Risk
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

Past, ongoing, and future activities analyzed for potential cumulative effects in the analysis area include: Timber harvests on Federal and private lands including pre-commercial thinning, riparian thinning, and recent timber sales (Faller, Ax, and Wedge in the Lake Branch planning area); road construction, road decommissioning, and road maintenance; and construction and maintenance of the BPA power line corridor. These project related 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 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/Mitigation Measures for this project.

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 that the benefits of such actions clearly outweigh the potential harm. All feasible and prudent measures to minimize risk of harm would need to be taken in conjunction with the actions.

3.10.4 Summary of Effects by Alternative

Under the No Action alternative, treatment of high priority noxious weed sites in the analysis would still occur annually (as funding allows) and there would be no additional risk of spreading or introducing noxious weeds as a result of proposed project activities. Under the Proposed Action alternative, treatment of high priority noxious weed sites in the analysis would still occur annually (as funding allows) and the High Risk of spreading or introducing noxious weeds as a result of proposed project activities would be reduced by implementation of PDC.

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 related resources would be affected by the management actions proposed by the US Forest Service. The area used in this analyze is the Red Hill Restoration project boundary determined by using Geographic Information System (GIS) data maintained by the Mt. Hood National Forest (Forest). Visual resources were assessed according to the applicable distance zones in relation to the project area. Professional judgment was incorporated in determining the project's potential effects. On-the-ground analysis was obtained by walk-through surveys, including visual assessments from known recreation resources (e.g., trails and campgrounds). Surveys were conducted during the 2011 field season by district recreation personnel. 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 associated Trail Visual Quality Objectives
2. Land Allocation and associated Visual Quality Objectives
3. Developed Recreation Facilities (including Campgrounds)
4. Dispersed Recreation Opportunities (including Special Use Permits)

3.11.2 Existing Condition

FS System Trails and associated Trail Visual Quality Objectives

The Pacific Crest National Scenic Trail #2000 (PCT) is not located within the project boundary; however, at its nearest point it is located at just over a mile (1.1 miles) from an area of proposed plantation thinning (Unit 9). The PCT is a long distance National Scenic Trail traveling from Mexico to Canada and offering a wide variety of recreational experiences. The majority of use on the section of trail located within the Hood River Ranger District is day hiking and horseback day use. The PCT is considered trail sensitivity level I in terms of Trail Visual Quality Objectives (VQO).

Small portions of the Vista Ridge Trail (Forest Service Trail #626) and the Mazama Trail on Cathedral Ridge (Forest Service Trail #625) are located within the project boundary. Both trails provide access into the Mount Hood Wilderness and are used by hikers. Trail VQO defined in the Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) list both trail as trail sensitivity level I. Management prescription of level I sensitivity trail are as follows:

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 c characteristic landscape. Activities may repeat or introduce form, line, color, or texture common to the characteristic landscape but 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 is the visual characteristics are compatible with the natural surroundings.

Land Allocation and associated Visual Quality Objectives

A wide variety of Forest Plan land allocations are located within the project boundary. The VQO associated with these land allocation represent the minimum level of visual quality that should be achieved in terms of long term visual resource management. Management Area VQO are summarized in the following Table:

Table 3-50: Land Allocation Visual Quality Objectives

Land Allocation	Visual Quality Objective per Distance Zone		
	Foreground 0 to ½ mile	Far-Foreground ½ mile to 5 miles	Middleground Beyond 5 miles
A9 - Key Site Riparian	Partial Retention (PR)	Partial Retention (PR)	Partial Retention (PR)
B10 - Deer/Elk Winter Range	Modification (M)	Modification (M)	Modification (M)
B2 - Scenic Viewshed Lost Lake (Rd 13, lake, camp)	Retention (R)	Partial Retention (PR)	Partial Retention (PR)
B5 - Pine Marten	Modification (M)	Modification (M)	Modification (M)
C1 – Timber Emphasis	Modification (M)	Modification (M)	Modification (M)

Developed Recreation Facilities (Including Campgrounds)

The trailheads for both the Vista Ridge and Mazama trails exist within the project boundary. The Vista Ridge Trailhead is located at the terminus of Forest Service Road (FSR) 1650. The

trailhead for the Mazama trail is located on FSR 1811. No developed campgrounds exist with the project boundary. Lost Lake Campground is located over two miles away from the nearest proposed units and is visually screened by topography and vegetation.

Dispersed Recreation Opportunities (Including Special Use Permits)
The project area falls predominantly into the Roaded Modified setting according to the Recreation Opportunity Spectrum (ROS). These setting are characterized by substantially modified natural environments. Although sites may still appear natural, vegetation is often manicured. Renewable resource modification and utilization practices enhance specific activities. Sights and sounds of humans may predominant. Dispersed recreational activities found within the project boundary 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 multiple recreation related events, including the Mount Hood Cycling classic and other similar road biking 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
The project area would continue to be used and enjoyed at its current use levels.
There would be no direct or indirect effects to hiking trails, VQO, trails (including the two trailheads), or dispersed recreational opportunities in the analysis area because none of the proposed activities would occur.

Proposed Action– Direct and Indirect Effects

FS System Trails and associated Trail Visual Quality Objectives
There would be no direct or indirect effect to the PCT itself as no management activities are being proposed on the trail. The nearest proposed management activities (Unit 9) would be visually screened from the PCT by Butcher Knife Ridge and other topographic features. Other forest health related activates may be visually evident within the middleground (from 1320 feet to 5 miles) of the trail as viewed from the Lolo pass area. These effects would be short-term in duration (less than 5 years) and in compliance with the Modification VQO as prescribed by the Forest Plan.

At this closest point, the Vista Ridge Trail would be approximately 1-mile from any management actives related to the Proposed Action. There would be no direct affects to the trails tread surface. Indirectly, noise and smoke from equipment working on the project would be noticeable to recreational users during the short period work was occurring. 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 middleground (from 1320 feet to 5 miles) as seen from the trail.

The proposed helicopter logging systems associated with Unit 15 would occur within the far foreground (660 feet to 1320 feet) of the Mazama trail. No flight paths would occur over the trail or the trailhead. The trail would remain open to recreational use throughout the duration of the

project. Topography and existing vegetation would partially screen the trail from the management active and allow for conformance with the partial retention VQO. Cable yarding proposed within Unit 15 would occur within the middle ground (1320 feet to 5 miles) of the trail. It would be similarly screened by vegetation and topography and be in conformance with the modification VQO prescribed for the middle ground as seen from the trail. There would be no direct affects to the trails tread surface. Indirectly, noise and smoke from equipment working on the project would be noticeable to recreational users during the short period work was occurring.

Land Use Allocations and associated Visual Quality Objectives

A portion of Unit 44 (approximately 390 acres) falls within the A9 Key Site Riparian land use allocation. Areas of A9 land use allocation have been prescribed partial retention VQO for all distance zones as seen from open roads, streams and water bodies. Project Design Criteria/Mitigation Measures (PDC) in place for Aquatic Resources would also be beneficial to visual quality of these areas. Minimum protection buffers for streams and water bodies include a 60-foot buffer for perennial streams, a 30-foot buffer for intermittent streams, and a 60-foot buffer for wetlands and ponds. No ground based mechanized equipment such as tractors or skidder would be allowed within 100 feet of streams, seeps, springs or wetland while conducting logging operations. Given these PDC, these areas would meet their prescribed VQO. See Chapter 2 of the EA for a complete list of the PDC.

The Lost Lake Designated Viewshed (B2 Scenic Viewshed) occurs adjacent to the project area. The key observation points or viewer positions for this viewshed are FSR 13, the lake itself and the existing campground. Given the dense vegetation and varying topography the management action would be screened from the viewer's position and in conformance with retention in the foreground and partial retention in the middle and backgrounds as prescribed by the Forest Plan.

The remainder of the land use allocations within the project area prescribes a VQO of modification in all distance zones. The Proposed Action would be in conformance with this VQO.

Developed Recreation Facilities (including Campgrounds)

The trailheads to both the Vista Ridge and the Mazama trails would remain available for recreational parking through the duration of the project. There would be an increase in traffic on the forest roads used to access these areas due to log haul and project implementation. Helicopter removal of tree with tops and limbs attached would occur throughout the project area with potentially direct flight paths over those authorized to use of the area. Smoke from burning activities would occur throughout the project area.

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. The proposed road closures would minimally reduce opportunities

for dispersed camping from a vehicle within the project area. Hunters utilizing the project area may need to hike further to access roads for game retrieval purposes.

There would be no effects to the Mt. Hood Cycling Classic as no log hauling would be permitted during the event. Effects to other recreation related SUP would be minimized through the coordination of all road closures with Forest Service Recreation personnel.

Cumulative Effects

The spatial area considered for recreation and visual resources is the project boundary. The rationale for this boundary is the interconnected access to recreational resources (trailheads, campgrounds, etc.). The temporal boundary considered for recreation resources is dependent on the existing or future project/activities if there is an overlap in time from an effects perspective then it is included in this analysis. Cumulative effects are outlined in the table below:

Table 3-51: Cumulative Effects for Recreation and Visuals

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
Existing Old Forest Service Timber Harvest Units	FS System Trails & VQO	No	Yes	No	Older timber harvest unit 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. There are no cumulative effects to recreation resources.
	Land Allocation VQO	No	Yes	Yes	
	Developed Recreation Facilities	No	Yes	No	
	Dispersed Recreation and SUP	No	Yes	No	
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	Yes	No	No	
	Dispersed Recreation and SUP	Yes	No	No	

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
Private Land and BPA activities (past timber harvest, power line maintenance activities)	FS System Trails & VQO	Yes	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 VQO 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	Yes	Yes	Yes	
	Developed Recreation Facilities	Yes	No	No	
	Dispersed Recreation and SUP	Yes	No	No	
Dollar Lake Fire	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	
Past Aquatic Restoration Projects (Road Decommissioning, McGee and West Fork Stream Channel Projects)	FS System Trails & VQO	No	Yes	No	Previous road decommissioning efforts are in various stages of re-vegetation. Cumulatively, the effects from road decommissioning would be beneficial to the overall visual resources as prescribed for the various land allocations. There are no cumulative effects to recreation resources.
	Land Allocation VQO	No	No	Yes	
	Developed Recreation Facilities	No	Yes	No	
	Dispersed Recreation and SUP	Yes	Yes	No	
McGee Creek Riparian Thinning	FS System Trails & VQO	Yes	No	No	No cumulative effects would occur.

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
McGee Creek Riparian Thinning Continued . . .	Land Allocation VQO	No	No	No	No cumulative effects would occur.
	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 (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 (#626) and Mazama Trails (#625) in that noise, smoke, and an increase in logging related vehicular traffic would evident. Both alternatives would be in conformance with the prescribed Trail VQO.

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 A9 Key Site Riparian and B2 Scenic Viewshed land use allocations. The Partial Retention VQO assigned to these areas would be met through visual screening and the proposed PDC.

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 related (including logging) vehicular traffic noticeable to forest visitors accessing the Vista Ridge and Mazama trailheads.

Dispersed Recreation Opportunities (including Special Use Permits)
Both alternatives would 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. No log hauling would be permitted during the Mt. Hood Cycling Classic.

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 Red Hill Restoration planning area. The Photo series GTR PNW – 105 was used for predicting natural down woody fuels in the planning area. National Forests in Region 6 have and do use GTR PNW – 105 for assessing natural down wood fuels.

3.12.2 Existing Condition

This planning area encompasses approximately 1536 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 is a combination of maple, chinquapin, rhododendron and some ceanothus in harvested areas

The West Fork Watershed Analysis was completed in 1996. Field reviews of the Red Hill planning area have resulted in the determination that the fire/fuels report for the watershed analysis is inconsistent with the existing condition on-the-ground. The watershed analysis attributes Native American influences on the vegetative condition. However, field reviews indicate little to no direct influence by Native Americans on the area. These Native American influences are found outside the planning area on the lower elevational areas of the watershed. In addition, the 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.

Lightning strikes do occur in this planning 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 Red Hill Restoration planning area had eight 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 planning 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 down bug kill pockets. 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 planning area. It was observed once the fire reached managed stands fire behavior dropped off.

Fuels

The objectives of the fuel treatment in the Red Hill Restoration planning area 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 at 240 to 500 linear feet per acre (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, material in the 3 to 9 inch size class would also need to be left on site. Estimated to be left on site are 26.7 tons per acre, 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 planning area is roughly divided into two Fire Regimes. Fire Regime III is 100 year frequency and mixed severity (less than 75 percent of the dominant overstory vegetation replaced), and Fire Regime V is 200+ year frequency and high (stand replacement) 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 areas 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 planning area are: Fire Regime IV, which is 100 to 200 years, mixed severity; and, Fire Regime IV, which is 100 to 200 years stand replacing. Both of these regimes are not abundant in the planning area. Fire Regimes in the Red Hill Restoration planning area are all capable of sustaining a stand replacing wildfire. See Figure 3-14 for location of fire regimes. Also, the stands in the planning area composed of the three condition classes (see Figure 3-15). The fire regime and condition class are summarized in Table 3-52.

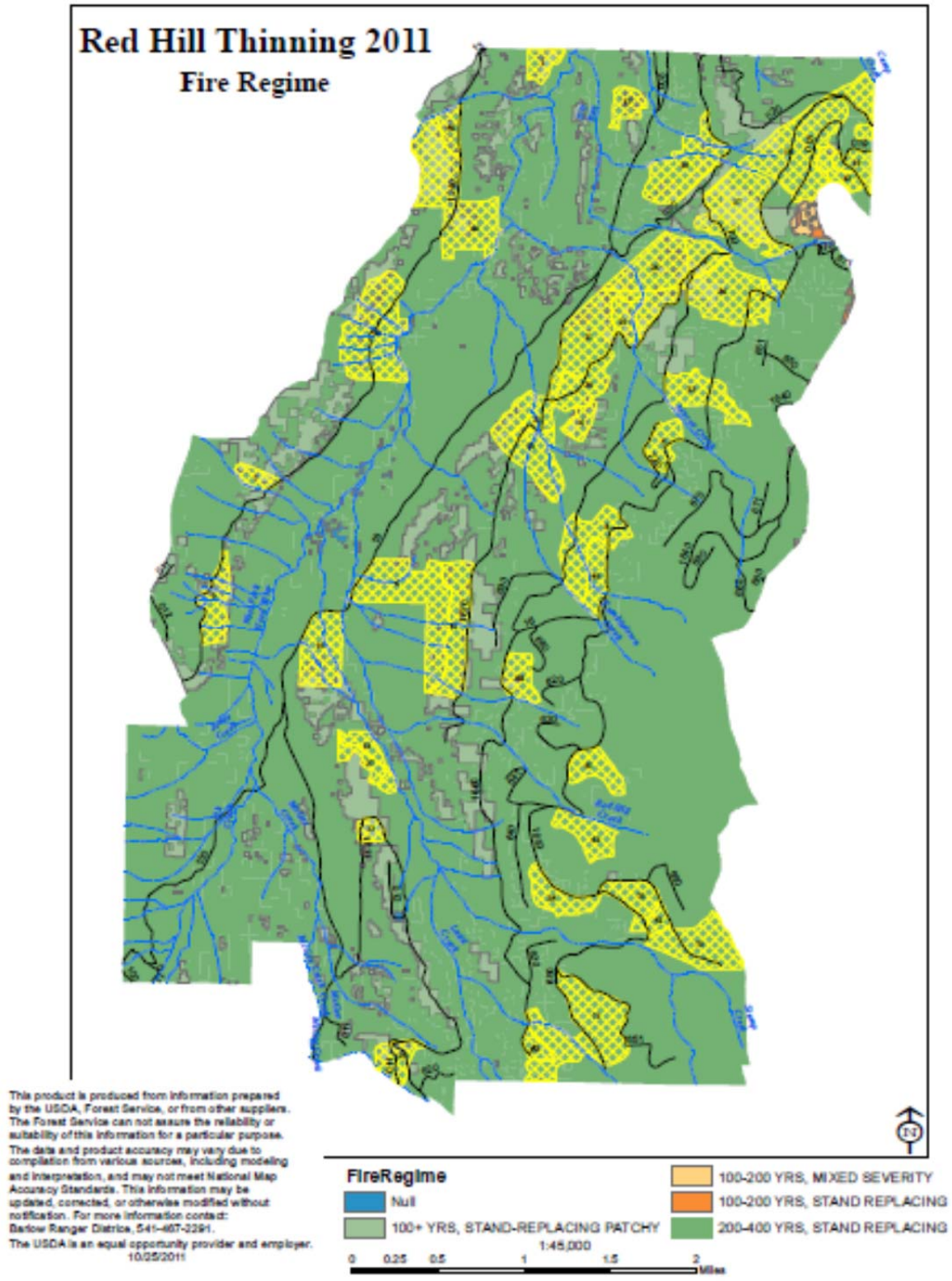

Figure 3-14: Fire Regimes for Red Hill Restoration Planning Area

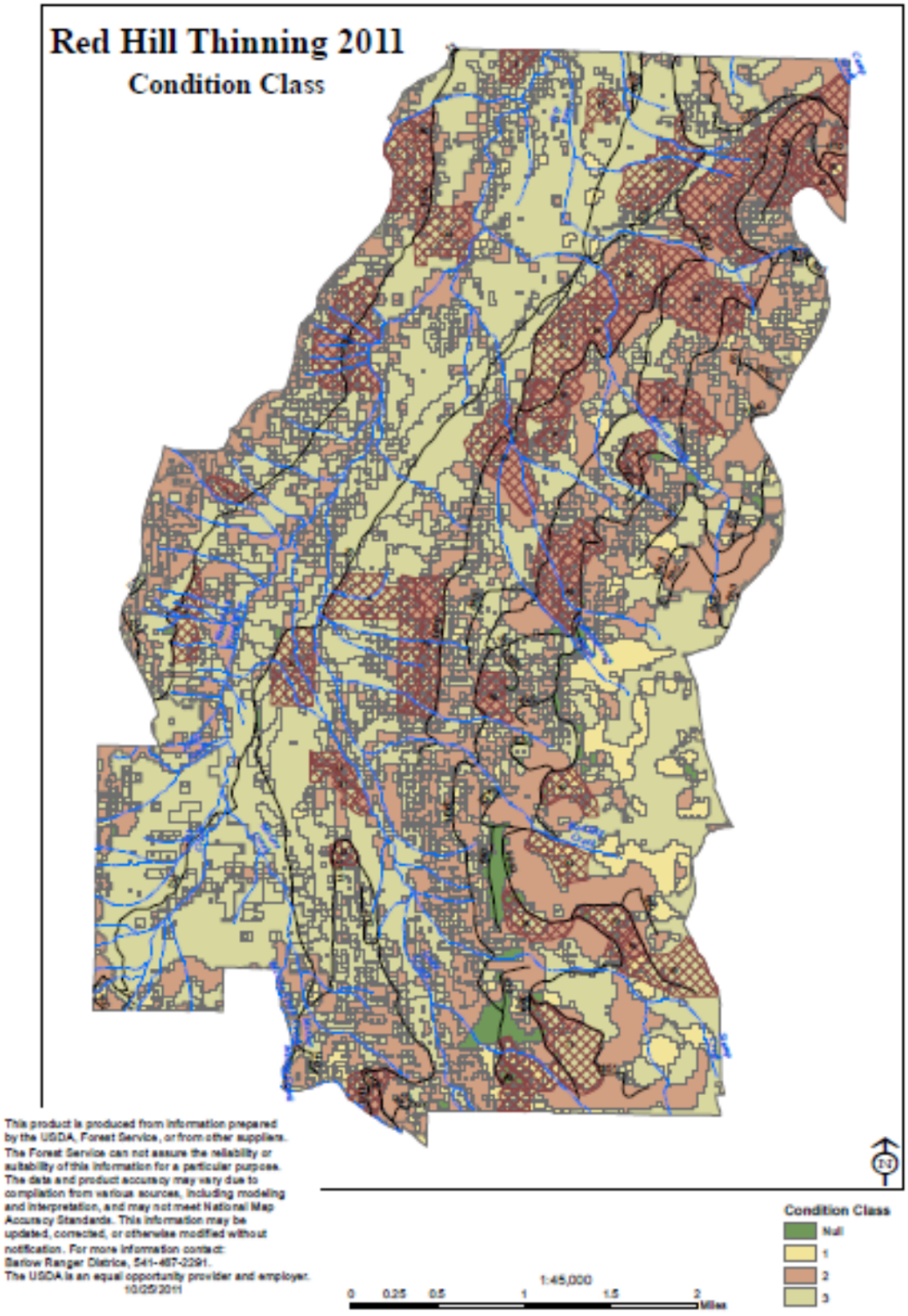

Figure 3-15: Condition Class for Red Hill Restoration Planning Area

Table 3-52: Fire Regime Condition Class within the Planning Area

Fire Regime Condition Class	Description	Potential Risks
Condition Class 1	Within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regime and associated vegetation and fuel characteristics. Composition and structure of vegetation and fuels are similar to the natural (historical) regime.
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.

Air Quality/Smoke Management

Air quality is of particular concern on the Mt. Hood National Forest Airsheds. Airshed is defined as a geographical area that, because of topography, meteorology, and climate, share the same air (Boutcher 94; MHFP, Glossary-1). Portions of the Mt. Hood Wilderness are federally designated as a Class I Airshed (MHFP, FW-046, and FW-047). The Mt. Hood Wilderness is two miles

South of the Red Hill Restoration planning area. The Mark O Hatfield Wilderness, a Class I Airshed is five air miles North West of the Red Hill Restoration planning area. The City of the Dalles is a state receptor site is 26 air miles northeast of the planning area. Management activities shall comply with all applicable air quality laws and regulations, including the Clean Air Act and the Oregon State Implementation Plan (MHFP, FW-040). Also, in compliance with the Clean Air Act, the Forest Service is operating under the Oregon Administrative Rule OAR 629-43-043. The Forest Service is complying and would continue to comply with the requirements of the OSMP (Oregon Smoke Management Plan), which is administered by the Oregon Department of Forestry.

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

The effects of smoke management from activity created 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 problems of Forest burns affecting air quality in local communities. 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

Fuels
By selecting No Action Alternative the landscape of the Red Hill Restoration planning area would be left in its current condition. The potential risk for high severity fires resulting from increasing fuel loads would continue to present hazards to 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 (see the Silviculture Specialist reports for 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 one would continue to move towards a condition class three, 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 three regimes.

Smoke Management
Under the No Action alternative, the Red Hill planning 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
Table 2-2 in the Environmental Assessment identifies treatment prescription for Proposed Action that would be implemented, including fuels treatments (pile burning) that would be implemented after the vegetation treatments were completed.

Fuels
Harvest activities under the Proposed Action would increase fuel loading. 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.

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.

Past actions affecting the project area under this alternative are past timber harvesting and insect infected trees. Additional past, connected reasonable foreseeable future actions that could affect the fuels profile include Yaka timber sale.

Fire Regime

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.

Air Quality/Smoke Management

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 Red Hill Restoration planning 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, for public safety if visibility

on State or Federal Highways is reduced to less than 750 feet, traffic flaggers and pilot cars would be required.

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:
Since the project area is currently in fire regime condition class 2 and 3 and would not change post implementation, there are no notable cumulative impacts as a result of this project. There is no other past, present and 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 fire treatments 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 planning 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 EA is the area of ground disturbance as proposed for the Proposed Action. 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 Red Hill 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 2012/060606/0007 (Dryden 2012) for the Proposed Action.

3.13.2 Existing Condition

Very few archaeological surveys or excavations have been conducted in the area, and little is known about the prehistory of the area. Huckleberries and other plant resources were probably gathered, along with hunting forays for deer, elk and other wildlife. Expansive vistas of Mount

Hood were probably enjoyed for recreational and spiritual pursuits. Some of the current hiking trails likely follow earlier Indian trails.

By 1903, trails were traveling upstream from the confluence of the West Fork of Hood River and Lake Branch to Laurel Creek to Lost Lake. 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. By 1910, a wagon road was completed to Lost Lake, while Lolo Pass existed only as a trail. A structure is shown above Tony Creek on the 1912 Oregon National Forest Map that was probably the Tony Creek Guard Station.

By 1927, a telephone line linked the Tony Creek "Cabin" to Parkdale. The Oregon Lumber Company railway continued up to Stump Creek and McGee Creek. 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. A trail from the Tony Creek "Cabin" connected to Lost Lake. Poorly managed slash burning operations resulted in escaped fires eventually burning 760 acres in upper West Fork watersheds.

By 1931, a trail had been constructed up Cove Branch to Elk Cove. By 1939, a road was constructed by the Civilian Conservation Corps to the Tony Creek Guard Station. Guard stations had been built at Lost Lake and Jones Creek by this time, along with a forest camp at Lost Lake. A trail traveled up Cathedral Ridge to the Eden Park Forest Camp. A telephone line traveled from the Tony Creek Guard Station to Red Hill and continued up to Eden Park.

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.

A fire in 1940 burned about 27,000 acres of previously logged acres within Lake Branch. By 1943, railroad logging had ended within the 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.

The only previously documented Heritage Resources within the project area is the Oregon Lumber Company Railway (666EA0101), now largely replaced by Forest Service Roads (FSR) 1800 and 1810.

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

Portions of the Oregon Lumber Company Railway (666EA0101) extend into the project area. However, the railway was largely replaced by FSR 1800 and 1810; the roads exhibit no remaining historic character for the railway. Continued use of FSR 1800 and 1810 for logging operations would have no effect on the Oregon Lumber Company Railway (661EA0101).

Fragments of previous logging equipment, including logging cable or rope, oil cans, and pieces of equipment were located scattered within portions of the project area. Such isolated finds are generally considered to be ineligible for inclusion on the National Register of Historic Places (NRHP). No protective measures are required or recommended for ineligible sites.

A short spur from the railway (666EA0281) is also shown on archival maps traveling across Ladd Creek and is scheduled for use as a temporary access road. Inspection of the railway spur revealed that it has been used previously for logging and lacks integrity. This portion of the railway was evaluated by East Zone Archaeologist Michael D. Dryden as ineligible for inclusion on the NRHP. No protective measures are required or recommended for ineligible sites.

Historic benchmarks (666EA0282) were located near the summit of Blue Ridge. A 100-foot buffer zone for the exclusion of heavy machinery was flagged around the markers. 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 Blue Ridge Benchmarks (666EA0282).

Several springboard-notched stumps (666EA0283) were noted within the project area. The stumps probably date to logging by the Oregon Lumber Company ca.1920s to 1930s. All significant information about the stumps was recovered; the site no longer offers any archaeological research potential and was evaluated as ineligible for inclusion on the NRHP. No protective measures are required or recommended for ineligible sites.

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/Mitigation Measures (PDC) 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 Chapter 3 of the Environmental Assessment (EA) 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 Proposed Action.

3.13.4 Consistency Determination

The consultation for the Heritage Resource Survey results and recommendations for the project, and for the Determinations of Eligibility (DE) for the Oregon Lumber Company Railway Ladd Creek Spur (666EA0281) and for the Ladd Creek Springboard Stumps (666EA0282) 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.

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 Mt. Hood National Forest Land and Resource Management Plan (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.

The continued use of FSR 1800 and 1810 would have no effect on the Oregon Lumber Company Railway (666EA0101). The Blue Ridge Benchmarks (666EA0282) has been excluded from project activities involving heavy equipment; the project would have no effect on the site. The remaining sites (666EA0281 and 666EA0283) have been evaluated as ineligible for inclusion on the NRHP. No protective measures are required or recommended for ineligible sites.

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 plantations and thinning for forest health improvements in second growth stands. 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 / Environmental Consequences

No Action – Direct, Indirect and Cumulative Effects

As no vegetative manipulation would occur and no 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 underburning, pile burning, and jackpot 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 Red Hill 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 planning area. No activities are proposed that would preclude any granted rights. Fieldwork by the Interdisciplinary Team has revealed that huckleberries exist in only occasional small, isolated patches throughout the area and do not offer any substantial potential for enhancement. 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. Thisproject is not expected to affect these users because the majority of the disturbance is not in areas where permit harvesting is restricted as the watershed is closed to all public access. Therefore, it is anticipated that this proposal would not have any negative effects on special forest product gatherers.

3.16 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.

3.16.1 Floodplains and Wetlands

There would be very limited impacts to floodplains or wetlands from this project. Floodplains are extremely limited in this area due to the steep nature of the landscape. The impacts to wetland are discussed in Section 3.5, Water Quality. Due to the PDC which are aimed at minimizing the impacts to wetlands, there would be minimal direct and indirect effects.

3.16.2 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.

3.16.3 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.

3.16.4 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.

3.16.5 Inventoried Roadless Areas

There will be no impacts to Inventoried Roadless Areas (IRA) as none exist within or near the project area.

3.16.6 Unroaded and Potential Wilderness Areas

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.

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 May 23, 2012 and a presentation of the draft Proposed Action was presented to the Level 1 team on June 12, 2012. The Proposed Action has an effects determination of **may affect, not likely to adversely affect** for Lower Columbia River steelhead (*Oncorhynchus mykiss*), Chinook salmon (*O. tshawytscha*) and their designated critical habitat due to minor sedimentation reduction of potential large wood in proposed Riparian Reserve thinning areas. If this alternative is selected, consultation will be required and must be completed prior to signing the Decision Notice. Consultation on this project is expected to begin in January 2013.

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. FWS personnel attended the June 12 Level 1 team meeting. The Proposed Action has an effects determination of **may affect, not likely to adversely affect** for Columbia River bull trout (*Salvelinus confluentus*) critical habitat for the same reasons as described above. If this alternative is selected, consultation will be required and must be completed prior to signing the Decision Notice. Consultation on this project is expected to begin in January 2013.

The effects to northern spotted owls for this project were consulted on with the U.S. Fish and Wildlife Service through formal consultation on FY 2013 activities within the Willamette province that have the potential to adversely affect spotted owls due to habitat modification and disturbance. The conclusion by the US Fish and Wildlife Service is that these projects are not likely to jeopardize the continued existence of the spotted owl or result in the destruction or adverse modification of spotted owl critical habitat.
This project was included in a programmatic informal consultation submitted to the U.S. Fish and Wildlife Service on April 10, 2012: Biological Assessment of NLAA Projects with the Potential to Modify the Habitat of Northern Spotted Owls Willamette Planning Province – FY 2013. A Letter of Concurrence was signed on June 14, 2012: Letter of Concurrence and Conference Concurrence Regarding the Effects of Habitat Modification Activities within the

Willamette Province, FY 2013, proposed by the Eugene District, Bureau of Land Management; Salem District, Bureau of Land Management; Mt. Hood National Forest; Willamette National Forest; and the Columbia River Gorge National Scenic Area on the Northern Spotted Owl (*Strix occidentalis caurina*) and its' Designated and Proposed Critical Habitat (FWS Reference Number 01EOFW00-2012-I-0105).

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 2012/060601/0007 (Dryden 2012).

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 has concurred that the previous use of these methods would result in no effect to heritage resources. Contracts would contain provisions for the protection of sites found during project activities. Based on the proposed protective measures, the project meets the criteria in the Programmatic Agreement for "Historic Properties Avoided" determination (Stipulation III (B) 2).

4.1.4 Consultation with City of Hood River

A portion of the Proposed Action is located within the City of Hood River Drinking Water Protection Area. Unit 1 (sapling thinning), Unit 7 (plantation thinning with riparian enhancement), and Units 44 and 55 (plantation thinning) are located within the Drinking Water Protection Area. In May 2013, the Hood River Public Works department reviewed a description of the Proposed Action including maps and the Project Design Criteria/Mitigation Measures (PDC). The City of Hood River did not express any concerns with the project as proposed.

4.2 Tribes

The Red Hill Restoration planning 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 planning area. No activities are proposed that would preclude any granted rights. Fieldwork by the Interdisciplinary Team has revealed that huckleberries exist in only occasional small, isolated patches throughout the area and do not offer any substantial potential for enhancement. There are no other known traditional native plant communities within the proposed project area. Therefore, the proposal to implement this project would not have any adverse effect on members of the CTWS.

Confederated Tribes of the Warm Springs Indian Reservation was part of the collaboration group for the development and design of the Red Hill Restoration 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	Jennie O'Connor Card
Silviculturist	Whitney Olsker
Logging Systems	Lisa Ball / Andy Tierney
Roads Engineer	Lucas Jimenez
Geologist	Tom DeRoo
Soil Scientist	John Dodd
Hydrologist	Mark Kreiter
Fish Biologist	Matt Andersen / Gary Asbridge
Wildlife Biologist	Patty Walcott
Fish / Wildlife Surveys	Stephanie Powers
Botanist / Invasive Species	Susan Nugent
Botanical Surveys	Christina Wesseler
Aquatic Conservation Strategy	Mark Kreiter
Fuels Specialist	Leo Segovia
Recreation / Visual Quality	Dan Gilfillan / McKenzie Jensen
Heritage Resource Specialist	Mike Dryden
GIS	Andy Tierney

APPENDIX 1: Final Collaborative Group Recommendations

Hood River Collaborative Stewardship Group
Recommendations for the Red Hill Planning Area
November 2011

Plantation Thinning Recommendation: Variable density thin from below with skips and gaps up to two acres. Base the prescription on function and structure of the stand and leave the best.

- Improvements/Objectives: Scattered openings will foster elk grazing and disease reduction. Thinning will increase species diversity, reduce 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 riparian reserve. 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 or planting 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 Douglas fir monoculture. Funds are generated to support restoration activities.

***Forest Health Treatment**: There was no agreement on a recommendation due to the lack of documented need for forest management in the units.*

Huckleberry Enhancement Recommendation: No agreement on the Forest Service proposed units. Instead, utilize unit 58 for Huckleberry Enhancement and thin to reduce shading of huckleberries. Look for opportunities in other plantation thinning units to implement similar Huckleberry Enhancements. Consider the blowdown potential when identifying other areas for enhancements. Monitor areas recently burned by the Dollar Lake fire to learn more about best practices for huckleberry establishment and management.

- Improvements/Objectives: Greater huckleberry availability for tribal members. Better understanding of where and how huckleberries thrive.

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 and 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.