United States
Department of
Agriculture

Forest
Service

December
2008

North Fork Mill Creek Restoration Opportunities

Environmental Assessment

Hood River Ranger District
Mt. Hood National Forest

Hood River and Wasco Counties, Oregon

North Fork Mill Creek Planning Area

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Mt. Hood/Parkdale, Oregon

Legal Description: T1S, R10E (Hood River County); T1S, R11E (Wasco County) Willamette Meridian

Lead Agency:	USDA Forest Service
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SUMMARY

In February 2004, the City of The Dalles requested the Forest Service take action to improve and protect forest health on federally managed public lands within and adjacent to The Dalles Municipal Watershed. Under the authorities of the Healthy Forest Restoration Act (HFRA), the Hood River and Barlow Ranger Districts convened a collaborative working group to assist with developing recommended actions for the South and North Fork Mill Creek planning areas. Barlow Ranger District currently is implementing the first phase of the recommendations for South Fork Mill Creek with The Dalles Watershed Fuelbreak. That project focuses on reducing fuel loadings and reducing tree density to provide for better protection along the perimeter of, and along roads within, this municipal watershed. The North Fork Mill Creek Restoration Project (Hood River Ranger District) would implement many of the collaborative group recommendations for the North Fork Mill Creek area and would reinforce fuel reduction efforts occurring with The Dalles Watershed Fuel Break.

Stand species composition and tree and brush densities in the North Fork Mill Creek area have been altered through a combination of factors including: fire suppression over the past 100 years, climatic conditions favoring rapid vegetative growth, and the accumulation of dead fuels resulting from insects and disease. Consequently, stands in the area are too dense and crowded. Trees not only have to compete for nutrients, water and sunlight, but are also more susceptible to insects and disease due to their decreased vigor. Dwarf mistletoe-infected trees, trees infected with root rot and other diseases, insect-killed trees, and down fuel are creating a continuous "ladder" of fuel from the ground to the tree crowns thereby increasing the vulnerability of healthy trees to fire. Much of the National Forest System lands in this area have been mapped as Condition Class 3, indicating these lands have missed multiple natural fire events and now contain unnaturally high fuel situations. 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.

The Mill Creek planning area includes the North Fork of Mill Creek watershed and small portions of Mosier and Neal Creek watersheds on National Forest System lands. It is located approximately 5 miles east and southeast of the community of Mt. Hood. The legal land description is T1S-T2S, R10E-R11E, Willamette Meridian. (See attached vicinity map.)

The Hood River Ranger District proposes to treat approximately 2,800 acres. The purpose of the vegetation treatment activities is to reduce hazardous fuels (removal of surface fuels, removal of ladder fuels, and opening of the canopy) and improve forest health conditions (removing root rot pockets, removing diseased trees, thinning overstocked stands). The mechanical fuels reduction treatment methods would consist of tree thinning from below (including the sale of vegetative material), machine piling, hand thinning, pruning by hand, machine mastication, and manual brush removal. Underburning (prescribed fire) would be used in combination with mechanical treatments or with limited non-mechanized (pruning, hand falling) treatments to restore stand health and to create conditions whereby fire could function in a more natural role.

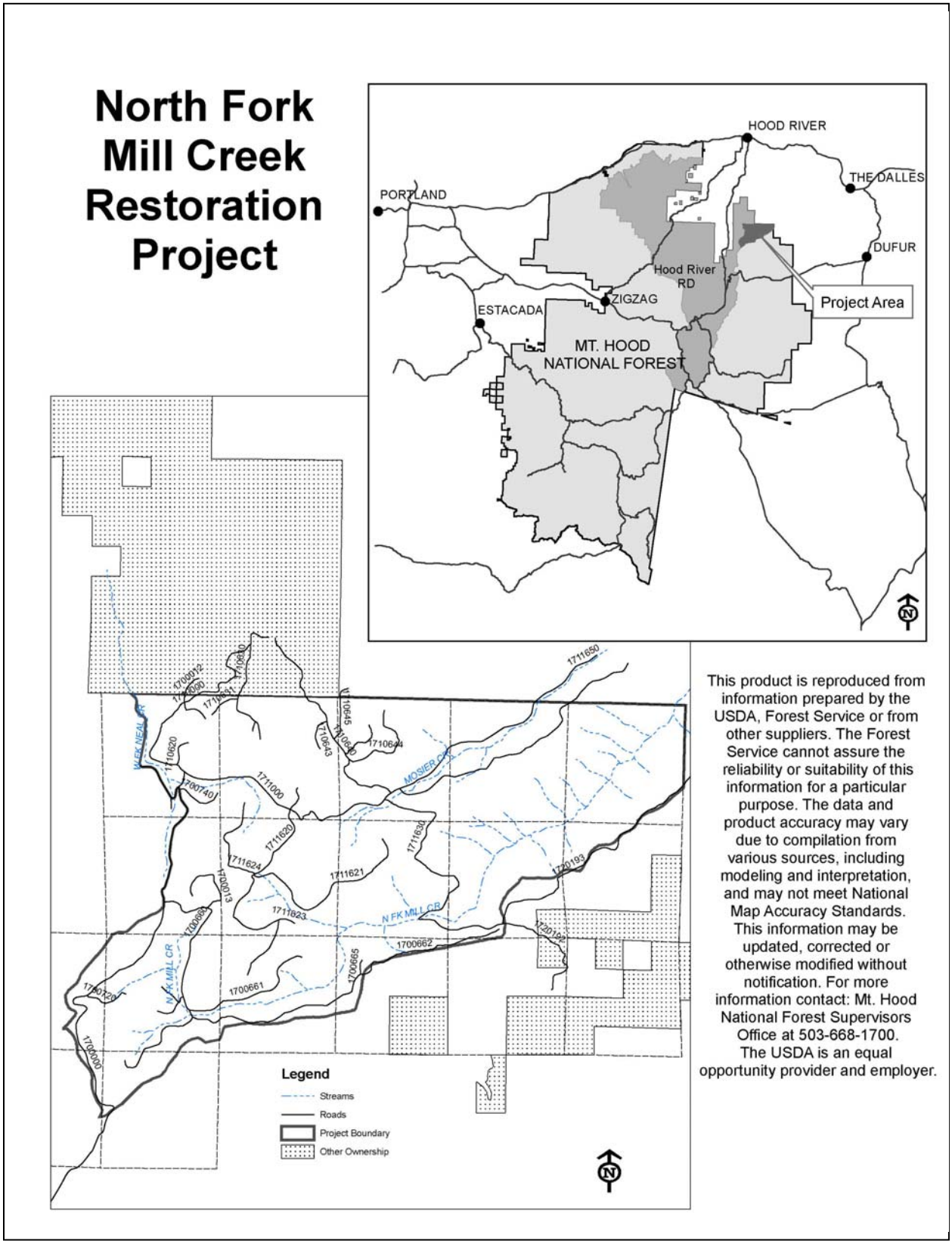

Figure 1-1: Vicinity Map of North Fork Mill Creek Planning Area

CHAPTER 1 – INTRODUCTION

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA), the Healthy Forest Restoration Act (HFRA), and other relevant Federal and State laws and regulations. HFRA projects may be applied to Federal land in wildland-urban interface (WUI) to protect at-risk communities from the risk of wildfire. A WUI is defined as: "an area within or adjacent to an at-risk community that is identified in recommendations to the Secretary in a community wildfire protection plan" [HR 1904, Section 101.16(A)]. This project lies within an identified WUI, as outlined in the Hood River County Community Wildfire Protection Plan (CWPP) and Wasco County CWPP. Additionally, Wasco County CWPP identified the Mill Creek Watershed, which is adjacent to the project area, as an at-risk community.

This Environmental Assessment discloses the direct, indirect, and cumulative environmental effects that would result from the proposed action, action, and no action (baseline) 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 how the Forest Service facilitated a collaboration process among state, local and tribal governments, non-governmental organizations, and interested parties as required by HFRA, 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 Proposed Action, Alternative 2 and No Action Alternatives. This discussion also includes design criteria and mitigation measures that were added as a result of environmental analysis. Finally, this section provides a summary table of the environmental consequences associated with selecting one of the action alternatives versus the No Action Alternative in terms of meeting objectives and addressing the issues.

- *Environmental Consequences:* This section describes the environmental effects of no action as well as the trade-offs and effects of implementing one of the action alternatives. 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 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 Mt. Hood/Parkdale, Oregon.

Background

The North Fork Mill Creek Restoration Opportunities project is located within the North Fork of Mill Creek watershed and small portions of Mosier and Neal Creek watersheds on Mt. Hood National Forest in Hood River and Wasco Counties. Vegetation includes mixed conifer forests, meadows, and open grassy slopes. Dry grand fir, lodgepole pine and white pine are predominant in the west half of the drainage. The eastern half of the drainage on National Forest System (NFS) lands features open, grass covered slopes and forests of hot, dry ponderosa pine, with Oregon white oak dominating the lower elevations and drier sites. Average annual precipitation ranges from 50 inches on the westside to 30 inches on the eastside, occurring mostly during the winter months. Elevation ranges from 2,200 to 4,200 feet. The area supports a wide variety of human uses, including recreation, wood products, and grazing. The area is important for fisheries, wildlife, plant, and other natural values.

In February 2004, the City of The Dalles requested the Forest Service take action to improve and protect forest health on federally managed public lands within and adjacent to The Dalles Municipal Watershed (Mill Creek Municipal Watershed). The Wasco County Community Wildfire Protection Plan (CWPP) identifies the watershed as a community at risk and high priority for treatment.

> *Mill Creek Municipal Watershed is the source of water for the City of The Dalles. It is unpopulated but has high values because of the importance of the water supply for the city. Its risk for fire starts is moderate since there are few homes involved and fire occurrence has been moderate over the past ten years. However, the hazard rating is one of the highest based on the heavy forest fuels throughout the watershed and the strong potential for crown fires. Values protected received the highest rating for all communities because of the importance of the water supply provided (Wasco County, CWPP, page 50)*

Under the authorities of the Healthy Forest Restoration Act (HFRA), the Hood River and Barlow Ranger Districts convened a collaborative working group to assist with developing recommended actions for the South and North Fork Mill Creek planning areas. Barlow Ranger District currently is implementing the first phase of the recommendations for South Fork Mill Creek with The Dalles Watershed Fuelbreak. That project focuses on reducing fuel loadings and reducing tree density to provide for better protection along the perimeter of, and along roads within, this municipal watershed.

The North Fork Mill Creek Restoration Opportunities Project (Hood River Ranger District) would implement many of the collaborative group recommendations for the North Fork Mill Creek area and would reinforce fuel reduction efforts occurring with The Dalles Watershed Fuel Break. The Hood River County CWPP identified this as a project needed to reduce hazardous fuels within the county: “The project will be a collaborative approach to fuels reduction and restoration in the North Fork Mill, Mosier, and West Fork Neal watersheds. It may include fuels reduction (thinning, brush removal, pruning), road closures, stream and wildlife restoration, and/or prescribed burning” (Hood River County, CWPP, page 120). The planning area is within the wildland-urban interface (WUI) as identified in the Hood River County CWPP (see Figure 28, page 87).

Collaborative participants met from November 2004 to March 2006. The community collaborative group was composed of participants from: federal and state agencies (Forest Service, Oregon

Department of Forestry, Oregon Department of Fish and Wildlife, Oregon Department of Environmental Quality Oregon Department of Parks and Recreation, US Fish and Wildlife Service), watershed councils and local agencies (Wasco County Soil and Water Conservation District, City of The Dalles), environmental groups (Bark and Oregon Wild), private citizens, neighboring landowners, timber industry, mountain bike groups and other recreational enthusiasts such as the Backcountry Horsemen of Oregon, Columbia Gorge Power Sledders and Columbia Gorge Off-Road Association. The collaborative group recommended developing hazardous fuel reduction treatments that would restore forest stand health and allow for fire to play a more natural role as well as implementing a variety of restoration activities to improve the overall forest health in the planning area. The specific restoration recommendations focused on wildlife habitat, meadows and aspen stands, fish habitat, road density, recreational trails, and grazing management.

After receiving the recommendations, District personnel began the interdisciplinary process of developing a detailed fuels reduction and restoration proposal that would meet the objectives for the area and respond to many of the recommendations of the collaborative group.

Purpose and Need for Action

The purpose of the project is to conduct restoration activities within the North Fork Mill Creek planning area to effectively reduce fuel loadings, improve the health and vigor of forested stands, restore wildlife habitat, improve conditions for aquatic resources, and to integrate the public's need for access to the area with the needs of aquatic and wildlife resources. Specific management objectives and underlying need of the project are to:

- Reduce risk of loss of healthy large diameter/remnant ponderosa pine, Douglas-fir, and western larch trees, and develop stands more resilient to insects, disease and fire;
- Restore stand health to improve resiliency to insects and disease;
- Maintain the health and vigor of established Douglas-fir understories within stands previously partially harvested;
- Decrease the rate of spread of laminated root rot and dwarf mistletoe;
- Restore wildlife habitat, including the unique aspen stands, within the planning area; and,
- Restore wildlife security and aquatic integrity within the planning area while integrating the public's need for access.

Fire suppression efforts over the past 100 years, favorable climatic conditions, vegetation growth and dead fuels resulting from insects and diseases have altered stand composition and structure, and increased tree and brush densities. The 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. Dwarf mistletoe-infected trees, diseased trees, insect-killed trees, and down fuel are creating continuous fuel ladders from the ground to the tree crowns.

In the planning area, insect and disease are major contributors to increased fuel loadings and poor forest health. The absence of fire and partial cutting in the early 1900s in the project area has contributed to Douglas-fir dominated, dense, and often multi-canopied stand conditions, which are particularly favorable to dwarf mistletoe. Dwarf mistletoe causes decreased height and diameter growth, reduction in seed and cone crops, and direct tree mortality or predisposition to other

pathogens or insects. In addition, most of the stands in the watershed have some level of root disease present, found most often in the Mill Creek drainage as laminated root rot (*Phellinus weirri*). Again, in the absence of fire, root decay has become very active, probably outside its range of natural variability in these stands. Fire does not eliminate root disease, but there is evidence that it slows it down, especially when its host is consumed. When there is an abundance of a susceptible species in a stand, root disease centers continue to grow.

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 invasive plant species, insects or disease (introduced or native), or other past management activities. Within the area, 43 percent of the National Forest System lands have been mapped as Condition Class 3, indicating these lands have missed multiple natural fire events and now contain unnaturally high fuel situations. The planning area also includes lands within Condition Class 2 (9 percent), indicating these lands have departed (either increased or decreased) from historical frequencies by more than one return interval and fuel levels have increased beyond the natural levels. As such, fire regimes have been moderately to significantly altered from their natural range; the risk of losing key ecosystem components is moderate to high; and vegetation attributes have been appreciably altered. Where appropriate, these areas need high levels of restoration treatments to restore the historical fire regime. The proposed vegetation management treatments focus on these lands.

Vegetation would normally consist of well-spaced fire tolerant species such as ponderosa pine, western larch, white oak, and dry-climate Douglas-fir, and frequent fire return intervals of low and moderate intensity would have been expected. The shade-tolerant, thin-barked species such as grand fir, lodgepole pine, and western hemlock would have been thinned out regularly by fire. Historical fire return intervals in the project area are 35 to 200 years. Low intensity, high frequency fires do not occur with higher moisture amounts and greater fuel loadings.

Stand structure changes from lack of fire include a much higher stocking level of fire-intolerant species, an increase of shade-tolerant species in the intermediate layer, an increased shrub and reproduction component, and fewer openings associated with the natural stands. This change results in stands that are more likely to experience a higher intensity fire, with stand-replacing consequences. Currently, the project area includes a variety of unhealthy, mature stands that have a higher risk of damage from catastrophic fire. For example, stands previously dominated by ponderosa pine and western larch are losing the pine component from stress from competing with water using grand fir. Western larch requires full sunlight and a mineral soil seedbed to establish, conditions historically provided by periodic wildfire. Diseased trees, insect killed trees, and down fuel are creating continuous fuel ladders from the ground to the tree crowns (See Figure 1-2).

Management Direction

The North Fork Mill Creek Restoration Opportunities project is proposed at this time to respond to goals and objectives of the National Fire Plan (2000) and the Mt. Hood Land and Resource Management Plan, as amended (USDA Forest Service, 1990a). This Environmental Assessment (EA) process 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. As directed by the Pacific Northwest Regional Forest in memo dated January 31, 2008, this project uses the older sensitive species list since it was initiated prior to January 31, 2008.

The applicable National Fire Plan goal and objective include:

> *Reducing hazardous fuels (dry brush and trees that have accumulated and increase the likelihood of unusually large fires) in the country's forests and rangelands. In response to the risks posed by heavy fuels loads -- the result of decades of fire suppression activities, sustained drought, and increasing insect, disease, and invasive plant infestations -- the National Fire Plan established an intensive, long-term hazardous fuels reduction program. Hazardous fuels reduction treatments are designed to reduce the risks of catastrophic wildland fire to people, communities, and natural resources while restoring forest and rangeland ecosystems to closely match their historical structure, function, diversity, and dynamics. Such treatments accomplish these goals by removing or modifying wildland fuels to reduce the potential for severe wildland fire behavior, lessen the post-fire damage, and limit the spread or proliferation of invasive species and diseases. Treatments are accomplished using prescribed fire, mechanical thinning, herbicides, grazing, or combinations of these and other methods. Treatments are being increasingly focused on the expanding wildland/urban interface areas (http://www.forestsandrangelands.gov/NFP/overview.shtml).*

This EA is tiered to the Mt. Hood National Forest Land and Resource Management Plan Final Environmental Impact Statement (USDA Forest Service, 1990b) and Record of Decision (USDA Forest Service, 1990c), and incorporates by reference the accompanying Forest Plan. The Forest Plan guides all natural resource management activities and establishes management standards and guidelines for the Forest. 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 two 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); and,
- Invasive Plants– *Pacific Northwest Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision* (2005).

Additional guidance for the project area is provided by the Mill Creek Watershed Analysis (USDA Forest Service, 2000), Surveyor's Ridge Late-Successional Reserve Assessment (USDA Forest Service, 1997), and Long Prairie Grazing Allotment Decision Notice and Environmental Assessment (USDA Forest Service, 2005). The watershed analysis and LSR assessment give direction and provide guidance and recommendations to limit destructive crown fire, limit insect and disease mortality, and reduce stand density and fuel loads. The Long Prairie Grazing Allotment overlaps the entire project area. The environmental analysis provides direction on desired vegetative and riparian conditions and how domestic livestock grazing will be managed towards achieving the desired future condition. This document incorporates by reference the analysis and management direction contained in the Long Prairie Grazing Allotment Environmental Assessment.

Desired Future Condition/Land Allocations

The desired future condition of the project is to develop an uneven-aged stand with canopy closure that would allow fire behavior to change from crown fire to surface fire, and to have stand species composition reflecting Condition Class 1 (ponderosa pine, western larch, white oak, and dry-climate Douglas-fir). Achieving this desired future condition would enable meeting the overall goals of the land allocations within the project area (see Figure 1-3).

Several land allocations as designated by the Forest Plan and Northwest Forest Plan are found within the project area (see Figure 1-4). The two major Forest Plan land allocations in the planning area are Deer and Elk Winter Range (B10) and Timber Emphasis (C1), plus a small area of Scenic Viewshed (B2). Additionally, the planning area includes small areas of Special Old Growth (A7) and Research Natural Area (A3), which are Administratively Withdrawn under the Northwest Forest Plan, and Special Emphasis Watershed (B6). No treatments would occur in these land use allocations.

The goal for deer and elk winter range is to provide high quality deer and elk habitat for use during most winters; and to provide for stable populations of mule deer and Rocky Mountain elk on the eastside. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices (Forest Plan, Four-272). The goal for timber emphasis lands is 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, Four-289). Lastly, the goals of scenic viewshed is to provide attractive, visually appealing forest scenery with a wide variety of natural appearing landscape features; and to utilize vegetation management activities to increase and maintain a long-term desired landscape character (Forest Plan, Four-218). Only a small portion of one treatment unit is located with a scenic viewshed for this project and the visual quality objective would be retained.

The major Northwest Forest Plan allocations within the planning area are riparian reserves and matrix. Riparian reserves include areas along rivers, streams, wetlands, ponds, lakes, and unstable or potentially unstable areas where the conservation of aquatic and riparian-dependent terrestrial resources receives primary emphasis. Matrix areas consists of Forest Service lands outside of designated areas (i.e., Congressionally Reserved Areas, LSRs, Adaptive Management Areas, Administratively Withdrawn Areas, and Riparian Reserves). Most timber harvest and other silvicultural activities are conducted in portions of matrix with suitable forest lands. The planning area also includes the Mill Creek Tier 1 Key Watershed. Tier 1 Key Watersheds were designated as sources for high water quality; they contain at-risk anadromous fish. Mill Creek contains Middle Columbia River Evolutionary Significant Unit steelhead trout (*Oncorhynchus mykiss*), listed as a threatened species.

The Surveyors Ridge Late Successional Reserve (LSR), as designated by the Northwest Forest Plan, runs along the western boundary of the project area and does not fall within any treatment units. The Dalles Watershed is located on the southeastern boundary of the project area. Private lands border the project area to the north.

Figure 1-2: Existing Hazardous Fuels Condition in North Fork Mill Creek planning area.

Figure 1-3: Desired future condition in the North Fork Mill Creek planning area. Photo A is the target canopy cover. Photo B is a stand that has been commercially thinned and underburned in the mid-1990s.

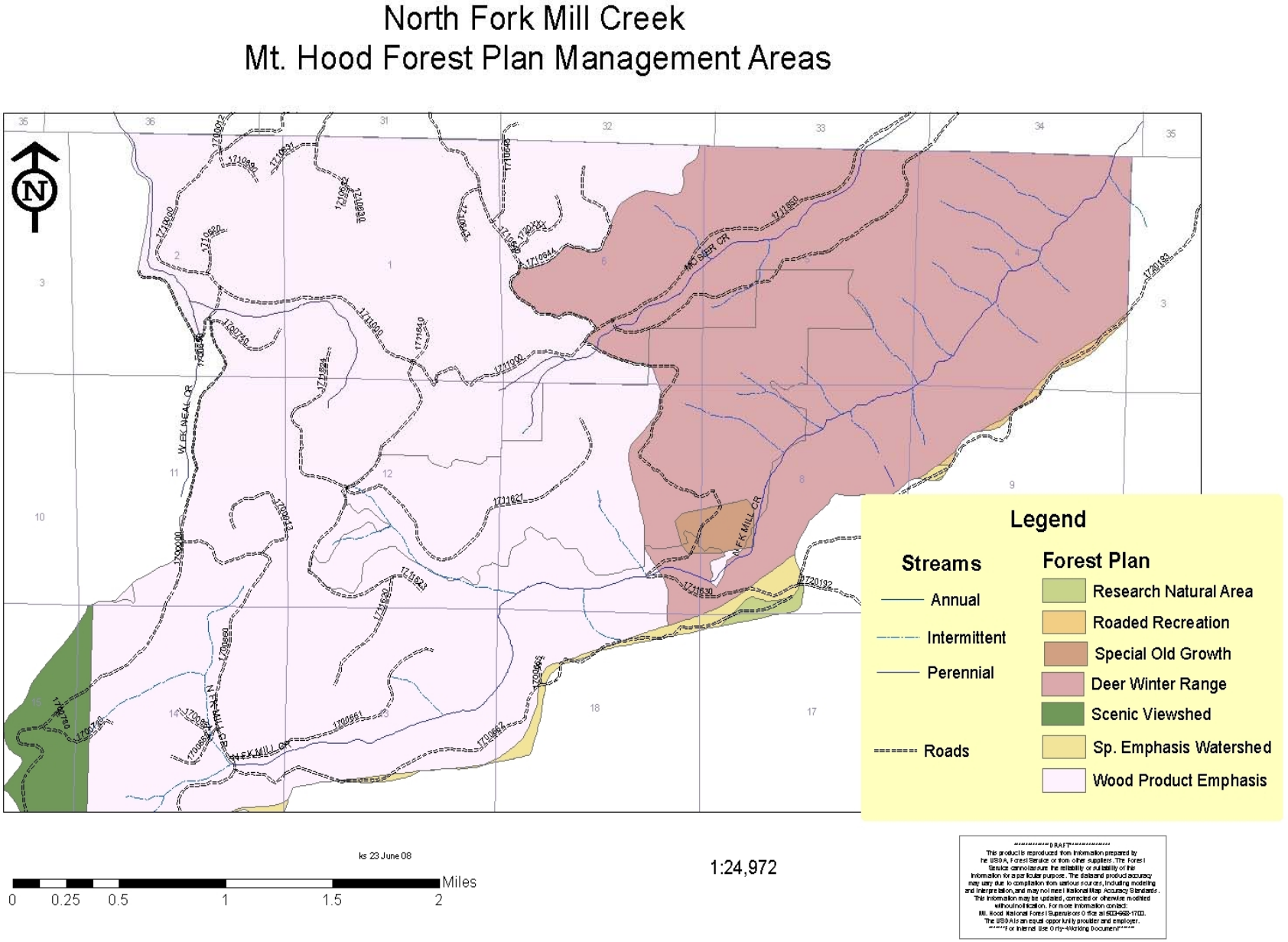

Figure 1-4: Land Use Allocation Map for planning area

Proposed Action

Vegetation Treatments

The Hood River Ranger District proposes to treat approximately 2,800 acres. The purpose of all the activities is to reduce hazardous fuels (removal of surface fuels, removal of ladder fuels, and opening of the canopy) and improve forest health conditions (removing root rot pockets, removing diseased trees, thinning overstocked stands). The mechanical fuels reduction treatment methods would consist of tree thinning from below (including the sale of vegetative material), machine piling, hand thinning, pruning by hand, machine mastication, and manual brush removal. Underburning (prescribed fire) would be used in combination with mechanical treatments or with limited non-mechanized (pruning, hand falling) treatments to restore stand health and to create conditions whereby fire could function in a more natural role. The proposed treatments for the planning area are shown in the table below.

Table 1-1: Proposed vegetation treatments

Treatment	Acres
Restoration Thin	2121
Sapling Thin	26
Aspen Cottonwood Enhancement	45
Underburn	610
Total Acres	2802

All proposed treatment areas are shown on the Proposed Action map (Figure 1-5), and include riparian buffers and buffers around known Northern Spotted Owl nesting sites. Some stands may undergo future prescribed underburning after mechanical thinning. The Proposed Action includes snowplowing to allow for hauling under winter conditions, if necessary and if approved by the District Ranger. Vegetation treatment over most of the area would involve the use of available roads and skid trails existing from past activities (approximately 68 percent of proposed treatment areas were entered in the past 30 to 35 years). Approximately 1-mile of temporary roads would be constructed for removal of vegetation in some stands; these roads would be decommissioned at the end of the project.

Other Restoration Activities

In addition, the Proposed Action for this project area includes restoration and projects that would affect public access (road closures, road decommissioning, culvert replacement/removal, and trail improvement/construction). The road proposal includes implementing seasonal closures on approximately 7.6 miles of road, year-round closures on approximately 7.8 miles of road, and obliterating approximately 8.8 miles of road. The culvert proposal includes removing/replacing 12 culverts on and off-Forest on roads that are under Forest Service jurisdiction. These road treatment proposals would serve to improve wildlife habitat, reduce the risk of spread of noxious weeds, improve water quality, and reduce the costs of road maintenance in the area.

Lastly, the Proposed Action includes designating and improving the non-motorized trail system within the planning area, as shown in the Proposed Action map. Approximately 6.0 miles of horse/hiking trails and approximately 7.5 miles of horse/hiking/biking trails are being proposed for improvement and/or construction.

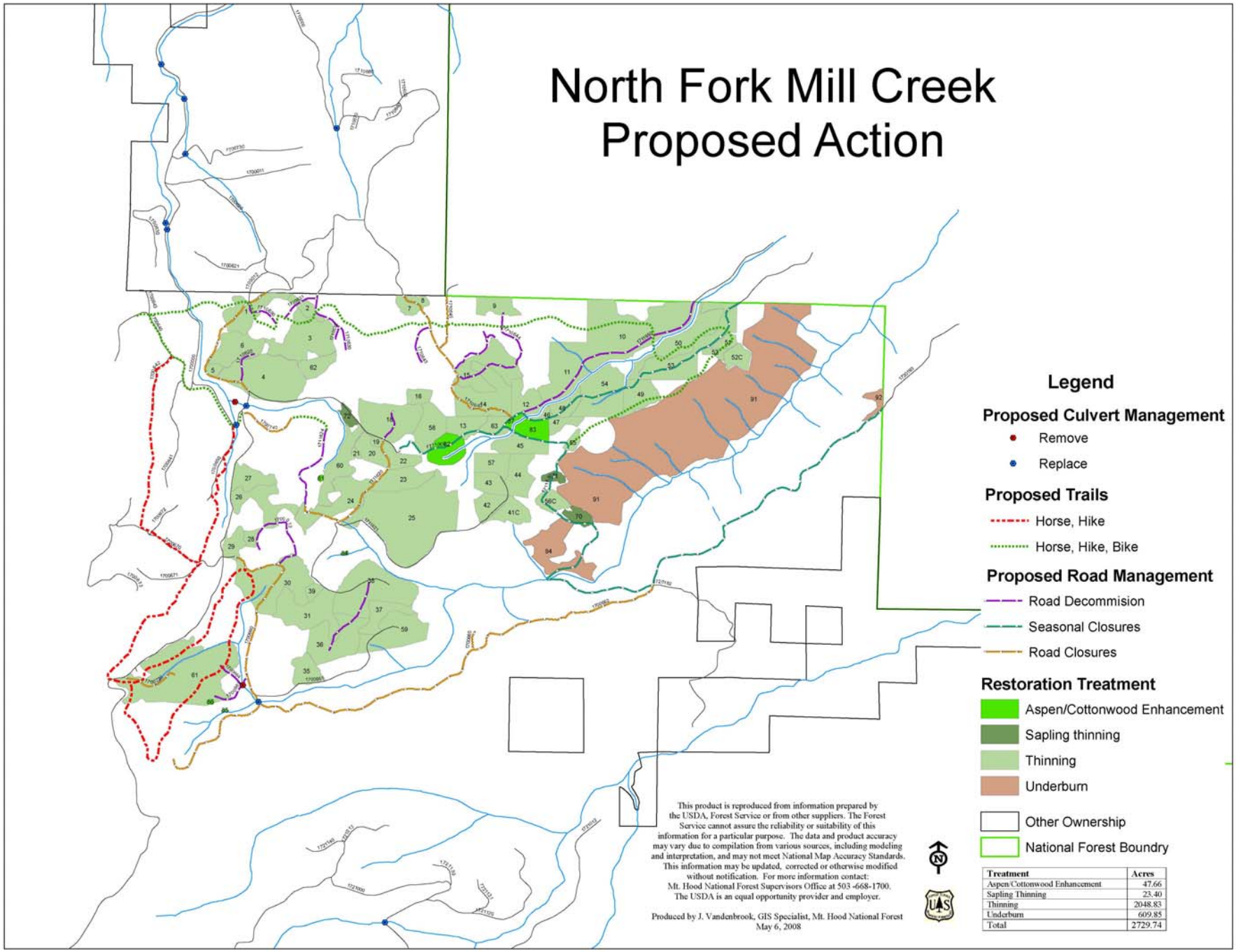

Figure 1-5: Proposed Action Map

Decision Framework

The Forest Supervisor for the Mt. Hood National Forest will make the following decisions based on this interdisciplinary analysis:

- Whether or not to reduce fuels in the North Fork Mill Creek Planning Area by implementing the Proposed Action or Alternative 2;
- Whether or not to decommission or implement seasonal or year-round closures on Forest Service system roads within the planning;
- Whether or not to replace/remove 12 culverts on and off-Forest on roads that are under Forest Service jurisdiction;
- Whether or not to designate and improve the non-motorized trail system within the planning area;
- What design criteria and mitigation measures are needed to implement each of the restoration opportunities within the planning area.

Public Involvement

Collaboration

This project lies within an identified WUI, as outlined in the Hood River County Community Wildfire Protection Plan (CWPP) and Wasco County CWPP. Additionally, Wasco County CWPP identified the Mill Creek Watershed, which is adjacent to the project area, as an at-risk community. Both CWPP were prepared in a collaborative effort by individuals and agencies within each respective county.

In addition, the Hood River and Barlow Ranger Districts initiated an additional collaborative group made up of individuals and agencies to identify specific projects within the North Fork and South Fork Mill Creek planning areas.

The following project specific collaborative efforts were undertaken on this project:

- On October 18, 2004, the District mailed out an invitation for a collaboration meeting asking people to attend who were interested in helping to design fuels reduction and restoration projects in North Fork and South Fork Mill Creek watersheds.
    - Invitations were mailed to Federal, State, and local agencies, the Confederated Tribes of Warm Springs, environmental advocacy groups, adjacent property owners, recreational groups, and the general public.
    - The Forest Service also issued a press release announcing the meeting.
- 15 people attended the first collaboration meeting held at the Discovery Center in The Dalles, Oregon on November 19, 2004 including participants from federal and state agencies (Forest Service, U.S. Fish and Wildlife Service, Oregon Department of Forestry, Oregon Department of Fish & Wildlife, Oregon Department of Environmental Quality), watershed councils and local agencies (Wasco County Soil and Water, The City of The Dalles),

environmental groups (Bark and Oregon Wild), private citizens, neighboring landowners, mountain bike groups and recreational enthusiasts (Backcountry Horsemen of Oregon, Columbia Gorge Power Sledders, Columbia Gorge Off-Road Association).

  - Collaborative participants met from November 2004 to August of 2005 to identify possible solutions to maintaining water quality standards in relation to future fire. The collaborative group recommended developing fuels treatments that would restore forest stand health and allow for fire to play a more natural role as well as implementing a variety of restoration activities to improve the overall forest health in the North Fork Mill Creek planning area. The specific restoration recommendations focused on wildlife habitat, meadows and aspen stands, fish habitat, road density, recreational trails, and grazing management. Appendix 1 contains the final collaborative group recommendations for this project.

- Several other individuals who were unable to attend the collaboration meetings contacted the Forest Service and asked to be included on a mailing list.

- On September 12, 2007, a description and map of the more detailed restoration opportunities in North Fork Mill Creek planning area was presented at a collaborative group meeting at Hood River Library. Six members of the collaborative group attended the meeting. Most present at the meeting were supportive of the more comprehensive approach, represented by Alternative 1. Some expressed concern about entering naturally appearing stands for vegetative treatment, represented by Alternative 2.

  - In follow-up to the meeting, the Hood River District Ranger distributed a survey to the collaborative group via email to determine the support for the various alternatives/options. Approximately nine people responded, including members of the collaborative group not present at the meeting. The views expressed paralleled the collaborative group meeting.

- On February 16, 2008, a stand objectives table detailing the proposed treatments was distributed via email to provide the collaborative group with a final opportunity to provide input into the Proposed Action before the Forest Service conducted public scoping. Six people responded and their comments were incorporated into the stand objectives.

- On September 2, 2008, the District Ranger invited the collaborative group on a field trip to review a representative sample of the marking in the North Fork Mill Creek planning area. Six people attended the field trip and their comments were incorporated into the final Environmental Assessment and Decision Notice.

  On October 23, 2008, the District Ranger went on a follow-up field trip with Oregon Wild to discuss the issues raised during the objection period. Based on this field trip and some follow-up conversations, the Responsible Official incorporated some of the suggestions as noted in the Decision Notice for this project.

Scoping/Public Involvement

The hazardous fuels reduction proposal was listed in the Mt. Hood National Forest quarterly planning newsletter (Schedule of Proposed Actions [SOPA]). No comments were received through that effort. In March 2008, a letter providing information and seeking public comment was mailed to 135 individuals and groups. This included federal and state agencies, the Confederated Tribes of Warm Springs, municipal offices, businesses, interest groups, landowners near the watershed and individuals. Comments were received from representatives of Oregon Wild (formerly ONRC), SDS Lumber, and three individuals.

As required by HFRA, a public meeting was held on March 26, 2008 at the Hood River Ranger Station at Mt. Hood/Parkdale, Oregon. The meeting was announced in *The Oregonian* as part of a legal notice of the public meeting. No individuals attended the meeting. A summary of the public comments received during the scoping period are include in Appendix 2.

Issues

Using the comments from the collaborative effort, the general public and other agencies, the interdisciplinary team identified a list of issues to address. Issues identified during scoping were used to develop alternatives to the proposed action and to refine the proposed action presented in Chapter 2. The issue statements below are taken directly from the public scoping letters received.

- Canopy Fuels Reduction: Removing canopy fuels can reduce crown-to-crown fire spread, but the science clearly shows that removing canopy cover can also increase fire hazard by increasing solar insolation which causes fuels to warm and dry and increases wind speeds. Removing shade trees also frees site resources (light, water, nutrients) that can stimulate the growth of future ladder fuels and increase the cost of maintaining fuel treatments.

  Discussion of this issue can be found in Chapter 3 – Fire/Fuels Management.

- Large Tree Retention: The Mill Creek watershed has a severe shortage of large diameter old-growth trees. The diameter class should be modified to be 21 to 30 inches to reflect the signs of forest and ecosystem complexity that are developing when trees reach the 21 inches diameter.

  This issue was used to refine Alternative 2 which does not treat natural stands. Discussion of this issue can be found in Chapter 3 – Vegetation Resources.

- Forest Health: The current plan appears to prescribe 1-2 acre clear cuts to deal with root rot pockets. This treatment will result in significant negative ecosystem and hydrologic impacts. To mitigate these impacts in the densest pockets of root rot you should still "leave the best of what's left" of the trees in the stand, preferably a minimum of 10 of the best remaining trees per acre in these situations.

  Discussion of this issue can be found in Chapter 3 – Vegetation Resources.

- Snags and Down Logs: There is a shortage of large down wood and snags across the landscape due to extensive logging over the past century. All large snags and down wood should be left in place and/or created to at least meet forest plan standards.

  Discussion of this issue can be found in Chapter 3 – Wildlife Resources.

- Road Density: The current road density in this area is significantly higher than it should be even under the forest plan guidelines. The high road density disturbs wildlife habitat, creates erosion, degrades water quality and allows for increased fire hazard. The current road obliteration plan is a good step in the right direction. We encourage the USFS to include more of this type of management, as there are still significantly more roads that need to be obliterated to restore the aquatic integrity of this watershed.

  Discussion of this issue can be found in Chapter 3 – Transportation Systems and Chapter 3 – Wildlife Resources.

- Temporary Roads: While we feel that temporary road construction is more appropriate than permanent road construction, temporary roads still channelize water, cause erosion, and conduct invasive weeds. New roads should only be considered as a last resort for access to treatment areas.

  As required by the design criteria and mitigation measures, 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.

CHAPTER 2 – ALTERNATIVES

This chapter is intended to describe the alternatives and how they were formulated for the North Fork Mill Creek Restoration Opportunity project. This chapter is the heart of the document and provides readers and the recommending and responsible officials with a description of the project, displaying the alternatives, design criteria and mitigation measures, monitoring requirements and a comparison of effects of the alternatives. This chapter provides a clear basis for choice among options by the line officer.

ALTERNATIVE FORMULATION

This project is being prepared under the Health Forest Restoration Act (HFRA) authorities with an emphasis on reducing hazardous fuels in the Mill Creek Watershed to protect the City of The Dalles Watershed. The project is located within the Wildland Urban Interface (WUI) boundary and is further than 1½ miles from the boundary of an at-risk community. As such, HFRA requires the agency to analyze the Proposed Action as well as one action alternative (Alternative 2) [HR 1904, Section 104(d)(1)]. During scoping, Oregon Wild recommended that the Forest Service consider an alternative addressing concerns over cutting large trees and constructing new roads; these comments formed the basis for Alternative 2. Alternative 2 proposes vegetation management treatments in existing plantations and does not proposed treatments in naturally appearing stands. In addition to the Proposed Action and Alternative 2, the No Action Alternative was considered to form a baseline for the project.

In addition to these comments, the Interdisciplinary Team (IDT) considered all of the issues proposed during scoping (see scoping letters in the project record and content analysis in Appendix 2), and where feasible, adjusted the original proposed action to resolve those issues. In some cases, this was handled by adding design criteria and mitigation measures to the project and in other cases the design of the project was modified.

No other alternatives were considered and eliminated from detailed study for this project.

ALTERNATIVES CONSIDERED IN DETAIL

The Mill Creek planning area includes the North Fork of Mill Creek watershed and small portions of Mosier and Neal Creek watersheds on National Forest System lands. It is located approximately 5 miles east and southeast of the community of Mt. Hood. The legal land description is T1S, R10E (Hood River County) and T1S, R11E (Wasco County), Willamette Meridian. (See Figure 1-1 for Vicinity Map.)

No Action Alternative

Under this alternative, no hazardous fuels reduction treatments would be implemented. No commercial or sapling thinning, cottonwood aspen enhancement, prescribed burning, brush removal, mowing, or pruning would occur. There would be no landings, skid trails or temporary roads built to facilitate removal of fuels. No fire suppression openings would be created; therefore, interagency fire suppression efforts would continue as they operate currently. The fuel

hazard would not be reduced. Dead or dying trees would not be removed and would contribute to the fuel hazard. Natural fuels (downed wood and other dead vegetation) would not be removed and would continue to accumulate. Natural processes of decay are not likely to remove the down and dead woody debris before the next fire cycle. As the available fuel increases, so would the potential for a large stand-replacing wildfire event.

None of the design criteria or mitigation measures would be implemented. There would be no improvements made to the National Forest road system. None of the other restoration projects would be implemented including no road closures, no road decommissioning, no culvert replacements or removals, and no trail construction or reconstruction.

The No Action alternative would not meet the purpose and need for action. Effects of the No Action alternative are analyzed by resource in Chapter 3.

Alternative 1 – Proposed Action

Vegetation Treatments

Alternative 1 – Proposed Action proposes to treat approximately 2,800 acres. The purpose of the treatments is to improve forest health conditions (removing root rot pockets, removing diseased trees) and reduce hazardous fuels (removal of surface fuels, removal of ladder fuels, and opening of the canopy). The mechanical fuels reduction treatment methods would consist of tree thinning from below, machine piling, hand thinning, pruning by hand, machine mastication, and manual brush removal. Underburning (prescribed fire) would be used in combination with mechanical treatments (954 acres) or without any additional treatments (610 acres) to restore stand health and to restore fire to its historical role.

Thinning from below for the purpose of hazardous fuels reduction means that smaller diameter trees growing in lower crown positions would be removed, leaving more space around remaining larger trees. To further reduce fuel loadings, trees would be selected for removal if their spacing facilitates the spread of a crown fire (canopy closure), or a tree form contributes to the initiation of a crown fire (crown base height) such as low growing tree branches over brush, which if ignited, could lead to crown fire initiation. Trees heavily infected with dwarf mistletoe would also be removed, since these trees contribute to ladder fuels (low hanging “brooms”), to low crown base height (distance from surface fuels to bottom of tree crowns), and to torching. These trees may be removed through mechanical means, pruned, or girdled to provide for snags and wildlife trees. Tall brush, which may contribute to the initiation of a crown fire, would also be reduced. Activity fuels (residue from mechanical treatments such as masticated material, thinning, etc.) as well as residual fuels from natural accumulation would be treated by piling and burning, to reach a target fuel loading of between 7 and 15 tons per acre in the zero to three-inch in diameter downed woody material. Stands where the dominant species and fire regime are appropriate, such as ponderosa pine and western larch in a low intensity, frequent fire return interval, would be treated so that future underburning could occur to maintain stand conditions. Variable density thinning would be completed as appropriate.

The stands proposed for fuel reduction would average 40 to 60 trees per acre after treatment. The target canopy closure of remaining overstory would be 30 percent to 60 percent, depending on slope and the condition of potential trees to be retained within a stand. The lower target canopy

closure result for the existing stand conditions where insect and disease has resulted in a large number of dead or dying trees (as indicated in Table 2-3). Achieving this canopy closure would be extremely difficult in many areas. The largest trees were removed from the entire project area many decades ago, and the residual stands are heavily infected with dwarf mistletoe and most have centers of root disease. It is unlikely that these stands would be in their present condition if fire had played its natural (i.e., sanitizing) role in this landscape. Fuel reduction activities through root disease centers is likely to result in some patch openings. Where root disease is identified, disease resistant species would be left. Stand density would vary with the availability of healthy leave trees. Table 2-1 summarizes the proposed vegetation treatments of the planning area.

Table 2-1: Proposed vegetation treatments for Alternative 1

Treatment	Acres
Restoration Thin	2121
Sapling Thin	26
Aspen Cottonwood Enhancement	45
Underburn	610
Total Acres	2802

All proposed treatment areas are shown on the Proposed Action map (Figure 1-5). The vegetation treatments would follow the stand treatment parameters in Table 2-2. The overarching objective of the treatments in the North Fork Mill Creek Planning area is to reduce fuels and restore stands to their historical species composition while also providing for wildlife habitat needs. By doing so, the Forest Service would be moving treated areas toward the appropriate condition class based on the fire regime classification and therefore be addressing fuels reduction needs in the treated areas. Promoting a diversity of tree species would allow the forest to more readily adapt to climate change. Stand treatments would also reduce the vulnerability of the area to uncharacteristic fires that put large amounts of carbon into the atmosphere. Other treatments would occur in the area (i.e. sapling thinning, underburning, pruning, etc.). Cutting of trees identified as hazards along open roads is required to provide for public safety and therefore is one area where the identified size parameters for cutting trees would not apply. Hazard tree removal, to the extent possible, would try to be consistent with the guidelines outlined in Table 2-2. Table 2-3 provides detailed treatments for each unit.

Table 2-2: North Fork Mill Creek Restoration Project Stand Treatment Parameters

Stand condition	Douglas-fir	White fir	Ponderosa pine, larch, western white pine, western red cedar, etc
Stands with root-rot pockets (where target understory or target residual stand is not root rot susceptible species) - openings created through tree removal generally should be around 1-acre in size; however, larger openings may occur if they are naturally appearing in shape (amoeba shaped). The objective is to leave the best of what is left in the largest size class available and to avoid leaving openings that are larger than 2-acres in size. Other treatments such as pre-commercial thinning, pruning, underburning, etc. would still occur. Snag and on-site woody debris would be left on-site, however may be adjusted to meet fuel loading concerns.	30-inch and greater size class Retain unless compelling reason present to girdle. For example, tree presents a fuels risk (i.e., ladder fuel) to adjacent desirable species (ponderosa pine, western white pine, larch, and other healthy fire-resistant species) and measures such as pruning of ladder fuel would not adequately address the risk.	30-inch and greater size class Retain unless within/adjacent to root rot pocket or if a fuels risk to adjacent desirable species, then remove.	Retain all unless stocking density or mistletoe hazard rating (normally when more than one-third of the tree crown is infected with mistletoe) compromises long-term health of residual stand. In that case only remove the smaller trees, but still retain variable density characteristics of the stand. Girdle larger mistletoe infected trees and retain on site unless retention results in excessive fuels loading (refer to dimension parameters identified under Douglas-fir). Plant openings with these resistant species
	24 to 29-inch size class Retain unless compelling reason to girdle (see above). If of such quantity as to result in excessive fuel loading, remove those in the lower end of the diameter class. Generally, the emphasis would be to use the removed trees in this size class for **restoration*** projects. Retain if in clumps that are healthy and not susceptible to infection due to proximity to root rot pockets	24 to 29-inch size class Remove those that are infected and those that are at the edges of infection centers unless there is insufficient number of Douglas-fir on site to meet snag and/or on-site woody debris requirements	
	Less than 24-inch size class Remove those that are clearly infected or at the edge of infection centers. Retain healthy clumps, if available and not overstocked. Thin overstocked clumps with emphasis to leave the best in the largest size class available.	Less than 24-inch size class Remove unless retention of healthy white fir is necessary to meet other resource objectives	

Stand condition	Douglas-fir	White fir	Ponderosa pine, larch, western white pine, western red cedar, etc
Stands where the objective is to restore historical species composition and where target understory is comprised of species such as Douglas-fir, ponderosa pine, western larch, western white pine, western red cedar, etc. Most of these stands had previous entry and resulted in a residual stand that was a seed tree, shelterwood, partial cut (usually selective species removal), or plantation (old clearcuts). These are stands where commercial thinning is prescribed or where there is a need to start over in terms of the understory component (current component has limited ability to achieve long-term growth and health objectives). Other treatments such as sapling thinning, pruning, underburning (where appropriate) would still occur. The emphasis is to leave the best of what is available in the largest size class. Snag and on-site woody debris would be left on-site, however may be adjusted to meet fuel loading concerns.	30-inch and greater size class Retain. If tree is infected with mistletoe and it compromises viability of understory then girdle.	30-inch and greater size class Retain unless presence compromises establishment of target understory, then girdle and leave on-site.	Retain all unless stocking density or mistletoe hazard rating (normally when more than one-third of the tree crown is infected with mistletoe) compromises long-term health of residual stand. In that case, only remove the smaller trees, but still retain variable density characteristics of the stand. Girdle larger mistletoe trees and retain on site unless retention results in excessive fuels loading (refer to dimension parameters identified under Douglas-fir). Plant openings with these resistant species
	24 to 29-inch size class Girdle all that are infected with dwarf mistletoe and if left on-site would compromise health and viability of understory. If of such quantity so as to result in excessive fuel loading, remove those in the lower end of the diameter class. Generally, the emphasis would be to use the removed trees in this size class for **restoration*** projects.	24 to 29-inch size class Remove unless: 1) retention of healthy white fir is needed to meet other resource objectives; or 2) if there is insufficient # of other species on-site to meet snag and/or woody debris requirements.	
	Less than 24-inch size class Remove those that are infected with mistletoe and if left on site would compromise health and viability of understory. Thin where the stand is overstocked with emphasis to leave the best of what's left in the largest size class.	Less than 24-inch size class Remove unless retention of healthy white fir is necessary to meet other resource objectives	

Restoration* generally includes those projects that would result in a benefit to resources on-the-ground such as stream and aquatic restoration, trail restoration, road decommissioning, and site productivity restoration.

Table 2-3: Treatment prescriptions by unit for Alternative 1

Unit	Treatment	Underburn	Existing Canopy Cover	Target Canopy Cover	Silviculture Remarks	Acres
1	Thinning	No	55	15	Heavy dwarf mistletoe in overstory and understory.	35
2	Thinning	No	55	15	Heavy dwarf mistletoe in overstory and understory.	11
3	Thinning	No	50	15	Heavy dwarf mistletoe in overstory and understory.	60
4	Thinning	No	60	20		85
5	Thinning	No	50	30	Thin mid-story. Dwarf mistletoe and root rot.	5
6	Thinning	No	60	40	Dwarf mistletoe.	36
7	Thinning	No	70	50		8
8	Thinning	No	60	40		5
9	Thinning	No	15	15		19
10	Thinning	Yes	60	40	Root rot pockets.	136
11	Thinning	Yes	60	40		47
12	Thinning	Yes	65	45		24
13	Thinning	No	60	40	Young **s**econd growth stand.	20
14	Thinning	Yes	55	40	Second growth stand.	58
15	Thinning	Maybe	60	40	Second growth stand. Leave lodgepole pine.	51
16	Thinning	Yes	50	40	Old selection cut.	10
17	Thinning	Yes	50	25	Old selection cut. Severe dwarf mistletoe.	15
18	Thinning	Yes	50	40	Severe root disease.	57
19	Thinning	No	60	40		3
20	Thinning	No	60	40	Old selection cut.	17
21	Thinning	No	60	40	Old selection cut.	2
22	Thinning	No	50	30	Severe dwarf mistletoe.	18
23	Thinning	No	50	30	Severe dwarf mistletoe.	30
24	Thinning	Yes	60	40	Second growth stand.	46
25	Thinning	Maybe	75	30	Thinned 1975. Severe dwarf mistletoe.	167
26	Thinning	Yes	70	40	Root rot pockets.	35
27	Thinning	Maybe	80	40		22
28	Thinning	Yes	65	40	Root rot pockets.	6
29	Thinning	Yes	60	40	Dwarf mistletoe.	14
30	Thinning	No	60	50		81
31	Thinning	No	70	40	Root rot pockets.	54
35	Thinning	No	70	40	Root rot pockets.	23
36	Thinning	No	65	40	Thinned 1976. Severe dwarf mistletoe.	54

Unit	Treatment	Underburn	Existing Canopy Cover	Target Canopy Cover	Silviculture Remarks	Acres
37	Thinning	No	75	50	Dwarf mistletoe and root rot.	28
38	Thinning	No	70	40	Root rot pocket.	84
39	Thinning	No	70	50	Dwarf mistletoe and root rot.	6
40	Thinning	No	70	50	Dwarf mistletoe.	28
41C	Thinning	No	60	40	Dwarf mistletoe and root rot.	20
42	Thinning	No	75	50	Dwarf mistletoe and root rot.	17
43	Thinning	No	50	30	Heavy dwarf mistletoe and root rot.	18
44	Thinning	No	70	40		28
45	Thinning	Yes	60	30	Root rot pocket.	25
46	Thinning	Yes	60	30	Root rot pocket.	4
47	Thinning	No	50	25	Root rot pocket.	11
48	Thinning	Maybe	55	30	Root rot pocket.	14
49	Thinning	Maybe	60	60		28
50	Thinning	Maybe	50	40		46
51	Thinning	Maybe	50	40		8
52	Thinning	Yes	30	30		5
52C	Thinning	Yes	40	30		15
53	Thinning	Maybe	70	60	Root rot pocket.	67
54	Thinning	Maybe	60	30	Root rot pocket.	56
55	Thinning	Yes	70	40	Root rot pocket.	6
56C	Thinning	Yes	55	40		15
57	Thinning	No	50	30	Dwarf mistletoe and root rot.	21
58	Thinning	No	50	30	Dwarf mistletoe and root rot.	31
59	Thinning	No	70	40	Dwarf mistletoe and root rot.	57
59C	Thinning	No	70	30		11
60	Thinning	No	50	30	Root rot pocket.	36
61	Thinning	No	50	40	Root rot pocket.	151
62	Thinning	No	70	40		16
63	Thinning	No	50	30	Root rot pocket.	13
70	Sapling thinning	Yes	75	45		11
71	Sapling thinning	Yes	40	30		7
72	Sapling thinning	Yes	25	25		7
81	Aspen/Cottonwood Enhancement	Yes	30	20		1
82	Aspen/Cottonwood Enhancement	Yes	50	30		24
83	Aspen/Cottonwood Enhancement	Yes	40	30		17
84	Aspen/Cottonwood Enhancement	Yes	60	40		1

Unit	Treatment	Underburn	Existing Canopy Cover	Target Canopy Cover	Silviculture Remarks	Acres
85	Aspen/Cottonwood Enhancement	Yes	50	40		1
86	Aspen/Cottonwood Enhancement	Yes	30	20		1
87	Aspen/Cottonwood Enhancement	Yes	35	25		3
91	Underburn	Yes	50	40		549
92	Underburn	Yes	5	5		8
94	Underburn	Yes	5	5		53
TOTAL ACREAGE						**2802**

* Acreages are rounded. Acres do not agree with overall acreage due to approximations from GIS.

In addition to traditional vegetation treatments, the Proposed Action includes 45 acres of cottonwood/aspen enhancement treatments. Manipulation techniques that are potentially available to perpetuate aspen forests include: doing nothing, commercial harvest, prescribed fire, mechanical root stimulation, removal of vegetative competition, protection of regeneration from herbivory, or regenerating from seed. Choosing the appropriate technique for a given aspen stand depends upon its age, vigor, stocking, associated vegetation, accessibility, the abundance of other aspen in the landscape, and the importance ascribed to maintaining aspen at a particular location. None of the above techniques could be used in all situations. Fire meets all the requirements of the aspen regeneration triangle. It stimulates suckering by killing overstory stems and by killing near-surface root segments and thereby interrupting the flow of auxin to surviving downstream root segments. Fire removes competing understory vegetation and conifer seedlings and allows sunlight to reach the forest floor. Fire is an important comportment in both establishing new stands of aspen an in assisting aspen in maintaining its position on the landscape. Prescribed fire would keep burn severity to a low and medium burn severity in and around moist areas in aspen stands found in the planning area. No hand lines would be constructed through the interior of any of the aspen stands. Hand lines in conjunction with wetlines would be utilized on the perimeter of the aspen stands as control lines to regulate prescribed fire spread. Historically sensitive aspen trees (Figure 2-1) found in the planning area would be protected by pulling back debris from the base of leave trees, reflective heat wrap also would be used in conjunction with pulling back of debris before ignition would take place.

Treatment within 100-feet of an intermittent stream would be limited to hand treatment or left untreated completely. Similarly, within 150-feet of a perennial stream, activities would be limited to hand treatment or left untreated completely. These riparian treatments apply to all units. Snags would be retained to meet habitat requirements for the Northern spotted owl. Also, snags would be created through the girdling of trees infected with dwarf mistletoe. A minimum of 120 linear feet of down woody material and 4 snags/acre would be retained. Snags to be created by girdling trees infected with dwarf mistletoe are included in this number.

The Proposed Action includes snowplowing to allow for hauling under winter conditions, if necessary and if approved by the District Ranger. Vegetation treatment over most of the area would involve the use of available roads and skid trails existing from past activities (approximately 68

percent of proposed treatment areas were entered in the past 30 to 35 years). Less than one mile of temporary roads would be constructed for removal of vegetation in some stands, but these roads would be decommissioned at the end of the project. Figure 2-2 is a map of the proposed temporary roads.

Figure 2-1: Historic Aspen Stand in North Fork Mill Creek Planning area.

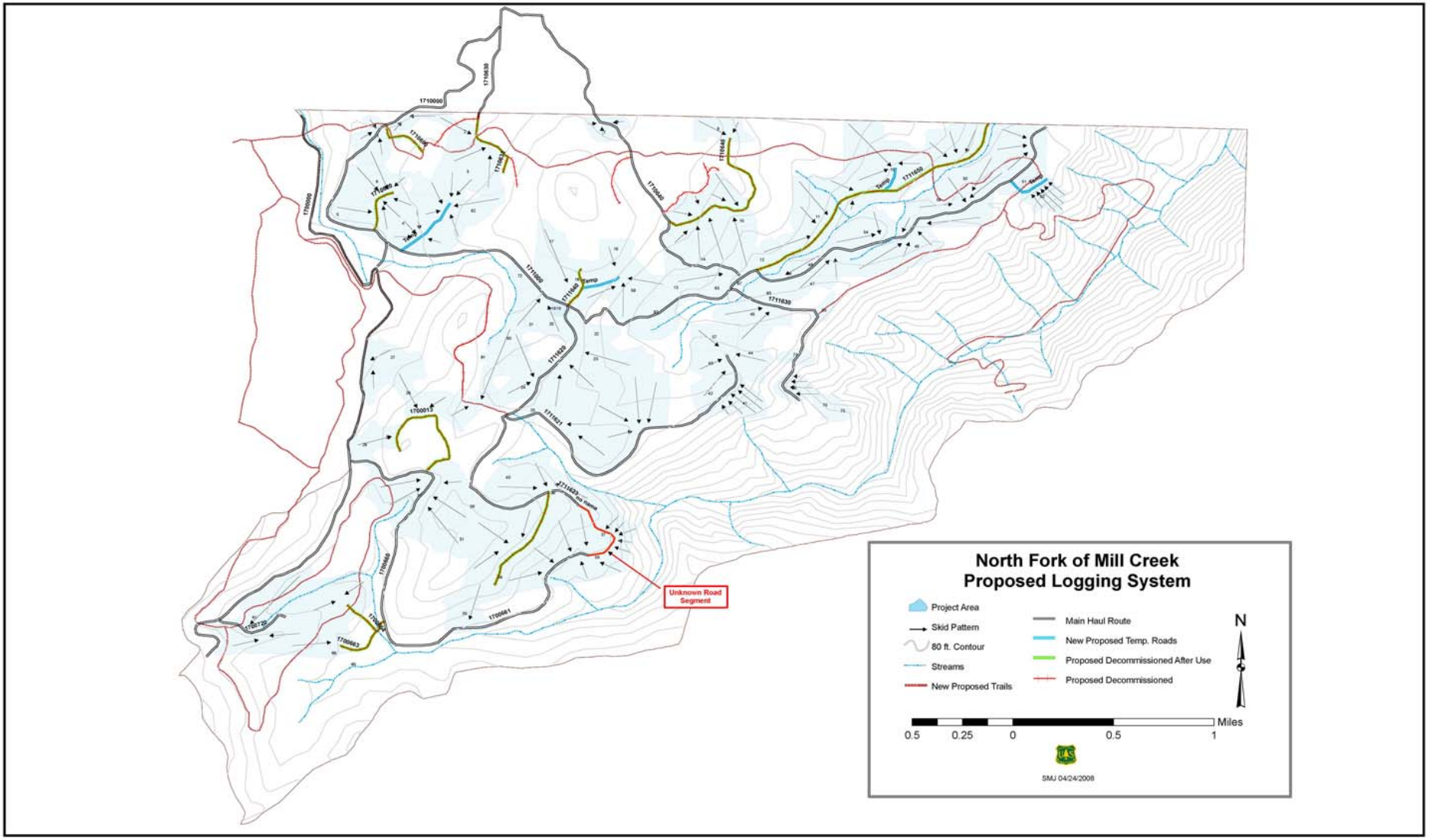

Figure 2-2: Map of Proposed Temporary Roads within the Planning Area.
Note: The exact location of these roads may change during implementation, but no more than 1-mile of temporary roads would be constructed.

Other Fuel Reduction Activities

Natural fuels (litter, brush, and trees) would be treated in the Proposed Action and Alternative 2. Treatment methods would be handpiling, pile burning, underburning, mowing/mastication, fireline construction, and maintenance treatments. The treatments would be used over a large area to reduce the fuel loadings and modify the fuel profiles of the unit.

Hand Piling
Handpiling is the piling of understory brush, small trees, and down dead woody material by hand crews into piles of woody debris that may be later burned or utilized. Chainsaws and hand tools would be used to cut the material to aid in the piling operation. Ladder fuels are reduced as a result of the piling of brush and small trees. The fuel loading is reduced by the piling and subsequent burning of the down dead woody material. The piles are burned in the fall season.

Machine Piling
Machine piling is the use of mechanical devices to pile activity and residual fuels. Bulldozers are generally more efficient in collecting and piling vegetative debris and creating compact piles. Typical mechanical use on the Mt. Hood National Forest is grapple piling to reduce soil disturbance.

Pile Burning
Pile burning is the consumption of landing, hand and/or mechanical piles. The hand piles would contain woody material from brush, small trees, and other dead woody material found on the surface. Mechanical piles would contain woody material from within a treatment unit consisting of residual and activity fuels. The landing piles would contain the woody material (limbs, needles, bark and portions of the trunk) removed from the tree during the harvesting procedure. Landing piles are much larger than hand piles to disposes of the piled fuel concentrations. Pile burning would occur in the fall season. A burn plan would be written which outlines the parameters under which the burning would occur.

When possible, utilization of piles would be encouraged rather then burning. Utilization is dependent on existing market conditions. After thinning operations, there is a small amount of clean up remaining, which consists of burning the residual piles. Burning the pile eliminates the high concentrations (fuel loading) of woody material.

Mowing/Mastication
The treatment consists of mowing the understory of brush, small trees, and other vegetation. A mowing attachment is towed behind a dozer or tractor, or attached to the head of an excavator. The vegetation is chopped into small pieces and left on the surface. Ladder fuels are reduced by mowing thus reducing potential for crown fire initiation.

Underburning
Underburning is the use of prescribed fire underneath existing or residual trees to treat natural and /or created fuels, such as dead woody material, needle litter and dead brush. The majority of the units in the project area would require thinning and/or mowing before underburning could be done safely and effectively. Underburning unit boundaries would be coordinated with individuals from archaeology, silviculture, and fire management. In most of the units needing to be

underburned, the burning would be completed one to four years after the original hand piling or mowing is completed. The underburning is conducted in the spring and fall seasons. A burn plan would be written which outlines the parameters under which the burning would occur.

Underburning would occur in stands classified as existing in Fire Regime 1, as described in the Fire and Fuels section. A post-treatment review would determine the need for implementing the underburns.

Leave Tops Attached Yard
This method is used to harvest trees. Commercial harvest would occur in trees four inches up to 24 to 29 inches diameter breast height (DBH), depending on the species as specified in Table 2-2. Trees would be thinned from below to approximately 50 to 60 percent canopy closure, and to a basal area per acre determined for the stand type and future stand structure. A mechanized feller buncher or similar machinery, restricted to designated skid trails, or cable systems on steeper slopes would be used to remove any vegetative material to meet silvicultural and fuels needs. The tops and limbs are left attached to the last log of each tree as it is yarded to the landing. The tops and limbs are machine piled and burned at the landing or utilized as chips or fuel wood. Vegetation removal may be done over frozen ground or when soil conditions allow.

Fireline Construction
In the units to be underburned, firelines would need to be constructed to serve as control lines during burning operations. The firelines would be constructed either with hand crews with hand tools, with a small plow pulled by an ATV (all-terrain vehicle) or with another form of mechanized equipment (if needed due to fuels or topography). Firelines would be constructed to minimum standards needed to control the burns. Normally a 4 to 6 foot clearing with a 1 to 1.5 foot wide mineral soil line would be sufficient. All downed woody fuels would be cleared, but no duff, grasses or other ground cover would need to be removed. Brush may need to be cut out if line locations cannot avoid them.

Combined Fuel Treatments
In some instances, a combination of treatments would occur in the same unit, such as mowing/mastication, thinning, piling, pile burning, and underburning. Underburning would occur at least one year or possibly several years, after other treatments (hand pile, pile burn, thinning, and/or mastication).

All prescribed burning would occur under the guidance of a site-specific plan that would be developed for each burn area prior to ignition. The burn plan includes the weather and fire behavior prescriptions, resource needs, contingency plans, mitigations, smoke management requirements, lighting techniques, risk assessment, hazard analysis, and site specific resource objectives. Burn plans are written in accordance with the current 5140 directive (FM-5140), and must meet all required elements prior to approval of the plan by the District Ranger or Forest Supervisor.

Maintenance Treatments
It is expected that vegetation would return at varying rates, which would facilitate a staggered maintenance program. Most of the maintenance would include brush removal. Triggers would be established to determine when an area was ready for future treatment (e.g. when grass or trees

get to a certain height). Tall shrubs are reduced significantly after a thinning, but may return to pre-thin levels within 5-7 years (Wilson and Puettmann 2006). Prescribed burning and pile burning would be included as part of the maintenance plan.

Road Reconstruction/Maintenance

No new permanent road construction would be necessary. Road reconstruction and maintenance is necessary on haul routes identified for this project. Weak areas would be reconstructed as needed. These activities are described in Table 2-4. Only the activities needed for log hauling would be completed. Snowplowing may occur on all roads within the project area, if needed for implementation.

Table 2-4 list routes along with the length that could be used for haul. The table includes four categories for maintenance and reconstruction work that are recommended to be accomplished prior to commercial haul. The majority of the work would be accomplished with standard road maintenance specifications, including brushing, drainage maintenance and routine blading.

Table 2-4: Road reconstruction and maintenance needs for identified haul routes in Alternative 1

Road[1]	Miles	Brushing	Drainage[2]	Surface[3]	Blading[3]
1700000 From MP 0.00 to 4.00	4.00	X	X	X	X
1700000 From MP 4.00 to 4.80	0.80	X	X	X	X
1700000 From MP 4.80 to 8.66	3.86	X	X	X	X
1700000 From MP 8.66 to 11.03	2.37	X	X	X	X
1700013 From MP 0.00 to 0.70	0.72	X	X	X	X
1700660 From MP 0.00 to 2.34	2.34	X	X	X	X
1700661 From MP 0.00 to 1.21	1.21	X	X	X	X
1700663 From MP 0.00 to 0.35	0.35	X	X	X	X
1700664 From MP 0.00 to 0.22	0.22	X	X	X	X
1700720 From MP 0.00 to 0.40	0.40	X	X	X	X
1710000 From MP 0.00 to 0.93	0.93	X	X	X	X
1710000 From MP 0.93 to 2.30	1.37	X	X	X	X
1710620 From MP 0.00 to 0.13	0.13	X	X	X	X
1710630 From MP 0.00 to 0.94	0.94	X	X	X	X
1710631 From MP 0.00 to 0.40	0.40	X	X	X	X
1710640 From MP 0.00 to 1.28	1.28	X	X	X	X

Road[1]	Miles	Brushing	Drainage[2]	Surface[3]	Blading[3]
1710640 From MP 1.28 to 1.90	0.62	X	X	X	X
1710644 From MP 0.00 to 0.61	0.61	X	X	X	X
1710690 From MP 0.00 to 0.40	0.40	X	X	X	X
1711000 From MP 0.00 to 1.01	1.01	X	X	X	X
1711000 From MP 1.01 to 4.05	3.04	X	X	X	X
1711620 From MP 0.00 to 1.12	1.12	X	X	X	X
1711620 From MP 1.12 to 2.19	1.07	X	X	X	X
1711621 From MP 0.00 to 1.68	1.68	X	X	X	X
1711623 From MP 0.00 to 0.19	0.19	X	X	X	X
1711624 From MP 0.00 to 0.92	0.92	X	X	X	X
1711630 From MP 0.00 to 2.67	2.67	X	X	X	X
1711640 From MP 0.00 to 0.40	0.40	X	X	X	X
1711650 From MP 0.00 to 1.51	1.51	X	X	X	X
1720193 From MP 0.00 to 0.11	0.11	X	X	X	X
TOTAL MILES	**36.67**				

1 Roads are asphalt, gravel, and native surface.
2 Road drainage consists of ditch to culverts or insloped or outsloped surface to drain dips or berms.
3 Deep patching, patching and reconditioning of aggregate surface roads would use standard construction specifications. All work would be within the existing road structure.

Other Restoration Activities

In addition to the vegetation treatments and associated activities, this project includes restoration projects (road closures, road decommissioning, culvert replacement/removal, and trail construction/improvement). The road proposal includes implementing seasonal closures on approximately 7.6 miles of road, year-round closures on approximately 7.8 miles of road, and obliterating approximately 8.8 miles of road (see Table 2-5). All the roads proposed for decommissioning would be obliterated (remove road bed) at a minimum within sight distance from the main road. The remaining portion of the road would have the culverts and waterbars removed and the soil would be ripped. The culvert proposal includes removing/replacing 12 culverts on and off-Forest on roads that are under Forest Service jurisdiction (see Table 2-6). These road treatment proposals would serve to improve wildlife habitat, reduce the risk of spread of noxious weeds, improve water quality, and reduce the costs of road maintenance in the area.

Lastly, the Proposed Action includes designating and improving the non-motorized trail system within the planning area, as shown in the Proposed Action map (Figure 1-5). Approximately 7.6

miles of horse/hiking trails and approximately 8.8 miles of horse/hiking/biking trails are being proposed for improvement and/or construction. The trails would have a 24-inch wide tread with six to eight-foot clearing height depending on the site distance. All horse trails would have a 10-foot clearing height. Perennial and fish-bearing stream would have bridge as a stream crossing, and all stream crossing would meet the Aquatic Conservation Strategy.

Table 2-5: Proposed Road Closures and Decommissioning

Road #	Miles Closed
Seasonal Closures	
1711	2.83
1711630	2.67
1720193	2.14
Sub-total	**7.64**

Road #	Miles Closed
Year-Round Closures	
1710640	1.29
1700660	2.26
1700662	2.97
1700665	0.13
1700740	0.40
1711620	0.73
Sub-total	**7.78**

Road #	Miles Closed
Decommission	
1711650	1.46
Unnamed spur rod to 1710	0.49
1710643	0.3
1710644	0.87
1710630	0.48
1710631	0.27
1710632	0.09
1710690	0.27
1710620	0.25
1711640	0.22
1711620 from the 1711623 junction	0.57
N10911	1.7
1711624	0.61
1700013	0.7
1700663	0.3
1700664	0.2
Sub-total	**8.78**

Table 2-6: Proposed Culvert Replacements and Removals

Creek	Culvert	Location	Action
North Fork Mill Creek	1700-660	on-Forest	Replacement
	1700-663	on-Forest	Removal
Alder Creek	1721	on-Forest, in The Dalles Municipal Watershed	Replacement
West Fork Neal Creek	1700	on-Forest	Replacement
	1710	on-Forest	Replacement
	1700-710	on-Forest	Removal
	1700	~0.5 mile downstream of Forest boundary	Replacement
	1700-630	~0.5 mile downstream of Forest boundary	Replacement
	1700	~1.5 mile downstream of Forest boundary	Replacement
Tributary to West Fork Neal Creek	1700	~1.25 mile downstream of Forest boundary	Replacement
	1700-730	~1.0 mile downstream of Forest boundary	Replacement
Neal Creek	1710	~1.25 mile downstream of Forest boundary	Replacement

Alternative 2

Alternative 2 proposes to treat vegetation to discourage wildfire from spreading through National Forest land and into adjacent private land. Treatments would vary depending on the existing vegetative conditions. In total, approximately 1275 acres are proposed for some type of treatment. These treatments include restoration thinning, sapling thinning, cottonwood/aspen enhancement and underburning. Restoration thinning would only occur in previously harvested timber stands.

Table 2-7 summarizes the proposed vegetation treatments and Table 2-8 provides detailed treatments for the proposed units. Figure 2-3 shows the treatment units proposed under this alternative.

Table 2-7: Proposed vegetation treatments for Alternative 2

Treatment	Acres
Restoration Thin	594
Sapling Thin	25
Aspen Cottonwood Enhancement	47
Underburn	610
Total Acre	1276

Table 2-8: Treatment prescriptions by unit for Alternative 2

Unit	Treatment	Underburn	Existing Canopy Cover	Target Canopy Cover	Silviculture Remarks	Acres
7	Thinning	No	70	50		8
8	Thinning	No	60	40		5
10	Thinning	Yes	60	40	Root rot pocket.	136
11	Thinning	Yes	60	40		47
12	Thinning	Yes	65	45		24
13	Thinning	No	60	40	Second growth stand.	20
14	Thinning	Yes	55	40	Second growth stand.	58
15	Thinning	Maybe	60	40	Second growth stand. Leave lodgepole pine.	51
16	Thinning	Yes	50	40	Old selection cut.	10
24	Thinning	Yes	60	40	Second growth stand.	46
26	Thinning	Yes	70	40		35
28	Thinning	Yes	65	40		6
45	Thinning	Yes	60	30	Root rot pocket.	25
46	Thinning	Yes	60	30	Root rot pocket.	4
47	Thinning	No	50	25	Root rot pocket.	11
48	Thinning	Maybe	55	30	Root rot pocket.	14
50	Thinning	Maybe	50	40		46
52	Thinning	Yes	30	30		5
52C	Thinning	Yes	40	30		15

Unit	Treatment	Underburn	Existing Canopy Cover	Target Canopy Cover	Silviculture Remarks	Acres
56C	Thinning	Yes	55	40		15
63	Thinning	No	50	30	Root rot pocket.	13
70	Sapling thinning	Yes	75	45		11
71	Sapling thinning	Yes	40	30		6
72	Sapling thinning	Yes	25	25		7
81	Aspen/Cottonwood Enhancement	Yes	30	20		1
82	Aspen/Cottonwood Enhancement	Yes	50	30		24
83	Aspen/Cottonwood Enhancement	Yes	40	30		17
84	Aspen/Cottonwood Enhancement	Yes	60	40		1
85	Aspen/Cottonwood Enhancement	Yes	50	40		0
86	Aspen/Cottonwood Enhancement	Yes	30	20		1
87	Aspen/Cottonwood Enhancement	Yes	35	25		3
91	Underburn	Yes	50	40		549
92	Underburn	Yes	5	5		8
94	Underburn	Yes	5	5		53
TOTAL ACRES						**1275**

The thinning methods, stand objectives, aspen cottonwood/enhancement treatments, stream prescriptions, and other fuel reduction activities described in Alternative 1- Proposed Action would apply to the units proposed for treatment in this alternative. All the temporary roads needed to remove the timber from the commercially thinning units would be built, as indicated in Figure 2-2. The road reconstruction and maintenance needs would be reduced as detailed in Table 2-9. The other proposed restoration activities, including road closures/decommissioning, culvert removal/replacement, and trail construction/improvement would remain unchanged in this alternative.

Table 2-9: Haul Route Analysis for Alternative 2

Road[1]	Miles	Brushing	Drainage[2]	Surface[3]	Blading[3]
1700000 0.00 to 4.00	4.00	X	X	X	X
1700000 4.00 to 4.80	0.80	X	X	X	X
1700000 4.80 to 8.66	3.86	X	X	X	X
1700000 8.66 to 11.03	2.37	X	X	X	X
1700013 0.00 to 0.72	0.72	X	X	X	X

Road[1]	Miles	Brushing	Drainage[2]	Surface[3]	Blading[3]
1700660 0.00 to 2.34	First 0.4	X	X	X	X
1710000 0.00 to 0.93	0.93	X	X	X	X
1710000 0.93 to 2.30	1.37	X	X	X	X
1710640 0.00 to 1.28	1.28	X	X	X	X
1710640 1.28 to 1.90	0.62	X	X	X	X
1710644 0.00 to 0.61	First 0.35	X	X	X	X
1711000 0.00 to 1.01	1.01	X	X	X	X
1711000 1.01 to 4.05	First 2.50	X	X	X	X
1711620 0.00 to 1.12	1.12	X	X	X	X
1711620 1.12 to 2.19	1.07	X	X	X	X
1711624 0.00 to 0.92	0.92	X	X	X	X
1711630 0.00 to 2.67	2.67	X	X	X	X
1711650 0.00 to 1.51	1.51	X	X	X	X
1720193 0.00 to 0.11	0.11	X	X	X	X
TOTAL MILES	**27.61**				

1 Roads are asphalt, gravel, and native surface.
2 Road drainage consists of ditch to culverts or insloped or outsloped surface to drain dips or berms.
3 Deep patching, patching and reconditioning of aggregate surface roads would use standard construction specifications. All work would be within the existing road structure.

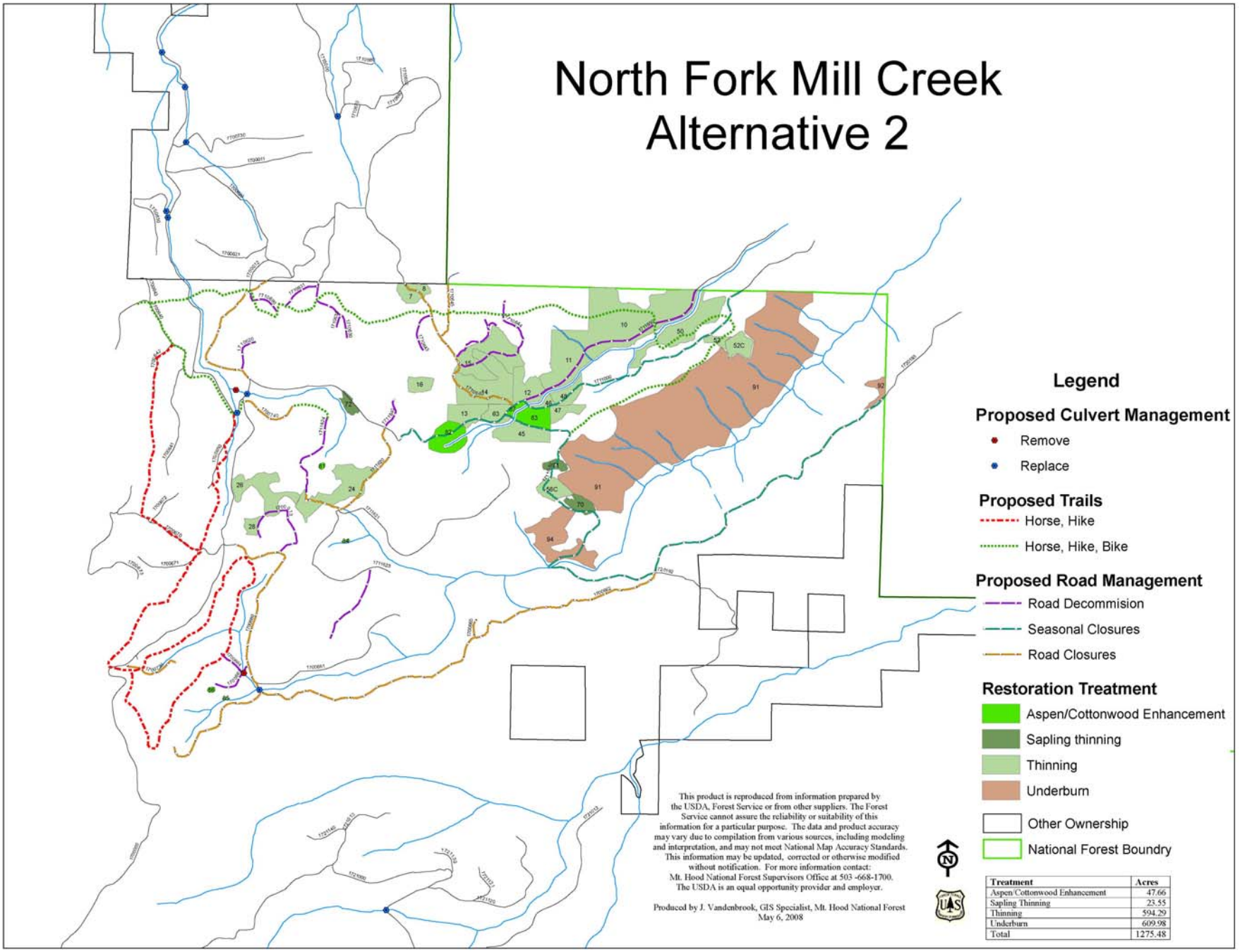

Figure 2-3: Alternative 2 Map

Design Criteria/Mitigation Measures for All Alternatives

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 or Alternative 2. In most cases, the effects analysis in Chapter 3 is based on these design criteria and mitigation measures being implemented.

Design Criteria/Mitigation Measures for Vegetation Treatments and Trail Proposals

Fuels:

1. Any mechanical slash piling within units would be done with equipment capable of picking up (grasping) slash material and piling (as opposed to pushing/dozing) thereby meeting the objectives of minimizing detrimental soil impacts. Piles would be covered with water resistant material meeting clean air standards to facilitate consumption of piled fuels. Piles need to be 4-feet wide, 4-feet long, and 6-feet high as a minimum*.
2. Hand piles would be constructed with enough fine fuels to allow for ignition during fall and winter months, and covered with water resistant material meeting clean air standards to facilitate consumption of piled fuels. Piles need to be 4-feet wide, 4-feet long, and 6-feet high as a minimum[1].
3. Piles should be as compact and free of dirt as possible.

Vegetation:

1. Patch opening size needs to be sufficient to provide for conditions suitable for early seral species establishment and growth (normally at least 1-acre in size). Generally, patch size should not exceed two acres. However, there may be instances where this would be allowed to address root disease issues. In these instances, the patches would be of irregular share (with scattered retention pockets) and of limited distribution/number within the unit.
2. Where the understory would be adversely affected, retained trees with a dwarf mistletoe rating of 2 or more would be girdled within unit boundaries.

Roads:

1. As appropriate, where haul route crosses streams on gravel or native-surface roads, roads should be improved to minimize the risk of delivering sediment to streams to the extent practicable. Haul would be restricted to the normal operating season (May 15-October 31), unless weather conditions permit operating outside of this window.
2. As appropriate, the roads should be treated for dust abatement during extreme dry weather.
3. If a proposal to implement winter logging is presented, the following would be considered by the District Ranger and Responsible Official if the ground is not frozen hard enough and/or insufficient snow depth to support the weight and movement of machinery in moist to wet soil conditions (these are based upon observations and monitoring of winter logging in Sportsman's Park):
    a. The proposal would be considered on a unit-by-unit basis using soil types in the area

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

since some soils may be more prone to detrimental damage than others.

b. Since the margin of difference between not detrimental and detrimental soil damage could 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 administrator and soil scientist.
c. Equipment normally expected to traverse the forest, such as feller bunchers, track mounted shears, etc., would 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. When soils become fully saturated (approach their liquid limit), equipment with a pounds per square inch of 9 or higher would not be used. Typically rubber-tired equipment (e.g., skidders) would not be permitted under these conditions.

4. Locate new temporary roads and landings outside of Riparian Reserves. Use of existing facilities within riparian reserves may be allowed if erosion potential and sedimentation concerns could be sufficiently mitigated. All temporary roads and landings would be decommissioned immediately after harvest operations are completed.
5. Snowplowing would be restricted when a freeze/thaw condition is expected or when a saturated base and subgrade would result.
6. The contractor or permittee would be responsible for snow removal in a manner which would protect roads and adjacent resources.
7. Rocking or other special surfacing and drainage measures may be necessary before the operator would be allowed to use the roads after snowplowing.
8. After snowplowing, snow berms should be removed or breached to avoid accumulation or channelization of melt water on the road and prevent water concentration on erosive slopes or soils. If the road surface is damaged, the contractor or permittee shall replace lost surface material with similar quality material and repair structures damaged in the operations, unless otherwise agreed to in writing.

Soil Resource:

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. In commercial units, ground-based harvest systems should not be used on slopes greater than 30 percent to avoid detrimental soil and/or watershed impacts.

Riparian Areas*:*

1. No vegetation removal or manipulation, or hand piling slash would occur within 60-feet[2] of any perennial and 30-feet[2] of any intermittent streams, seeps, springs or wetlands. This would ensure current stream shading would remain unchanged and protect stream temperatures as well as reduce the likelihood of eroded material entering streams.
2. No wheeled or tracked motorized equipment would be allowed within 100-feet[2] of streams,

[2] The Forest Service would meet an *average* distance of 30-feet, 60-feet, or 100-feet from streams, seeps, springs or wetlands. From past experience with implementation, it is virtually impossible to maintain an exact distance from a wet area due to stream sinuosity and dense riparian vegetation so allowance for a small deviation would be made as long as this deviation doesn't jeopardize meeting the above stated goals.

seeps, springs or wetlands. This would reduce the chance of sediment delivery to surface water.

3. Fueling of gas-powered machinery would not occur within 150-feet of any live waters to maintain water quality. Each fueling area shall have a hazardous material recovery kit, including absorbent pads on site.
4. Use erosion control measures where de-vegetation may result in delivery of sediment to adjacent surface water. Soil scientists or hydrologists would assist in evaluation of sites to determine if treatment is necessary and the type of treatment needed to stabilize soils.
5. Any felled trees which fall into the 60-foot unmanaged area of perennial streams or the 30-foot unmanaged area of intermittent streams, seeps, springs or wetlands would be bucked at the unmanaged edge and only the portion of tree outside these areas could be removed.
6. Low severity burns[3] should constitute the dominant type of controlled burn within the Riparian Reserve, resulting in a mosaic pattern of burned and unburned landscape.
7. Moderate-severity burns[4] are permitted in no more than 20% of the Riparian Reserves to invigorate desirable deciduous species.
8. Ignition could occur anywhere in the Riparian Reserve as long as all other design criteria are met.
9. Burning activities excluded in the Riparian Reserves are as follows: No mechanical piles, mechanical fire line construction (e.g. dozer, small tractor etc.), or chemical fire retardants. Fireline construction is defined to mean activities that result in exposure of bare mineral soil. Hand fireline construction should be minimized within the Riparian Reserve and wet line or black line is preferred. An exception to this would be situation where fireline is needed to control burn intensity and spread due to unforeseen circumstances. In these situations, there would be an emphasis to mitigate any potential for sedimentation to streams.
10. All trails crossing perennial or fish-bearing streams would have a bridge as a stream crossing, including but not limited to West Fork Neal Creek and tributary to North Fork Mill Creek. All stream crossing would meet the Aquatic Conservation Strategy objectives.

Wildlife:

1. Known Northern spotted owl activity centers would be protected through the implementation of seasonal operating restrictions (March 1- July 15) for Units 41, 42, 47, 54, and 55. In the event that new activity center(s) is/are located during the period of the contract(s) seasonal operating restrictions would be implemented in the area affected.
2. No underburning may take place less than ¼-mile from spotted owl activity centers (between March 1 and July 15).
3. A seasonal operating restriction (restricting harvest and fuels treatment activities) for winter range would be implemented with this project from December 1 through April 1 for Units 10, 11, 12, 14, 15, 46 through 56, 70, and 71.
4. A seasonal closure of December 1 thru April 1 would apply to portions of trails that are

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

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

within deer and elk winter range (B10 land allocation).
5. Rare and uncommon species needing protection would be designated on-the-ground prior to ground disturbing activities occurring.

Botany:
1. Buffer seep/spring habitat in Unit 95 by at least two site potential tree heights for *Botrychium minganense* (moonwort). A botanist would visit site to post buffer.
2. Buffer seep/spring habitat in sapling thinning treatment (Unit 25) for *Botrychium minganense* (moonwort). A botanist would visit site to post buffer.
3. Buffer grassland habitat by approximately 50-meters (164 feet) for Sickle-pod rockcress in grassland underburn (Unit 92) on the summit of Mill Creek Ridge. A botanist would visit site to post buffer.
4. Collect seed from Sickle-pod rockcress and native grasses during July to September 2008 and 2009 to sow into Unit 92 after proposed treatments completed.

Invasive Species:
1. It is recommended that "pre-treatment" occur before any harvest activities are implemented along roads 1700 (treatment sites #66-044 and #66-074), 1700-013 (treatment site #66-055), 1700-662 (treatment sites #66-081 and #66-033). If possible schedule implementation of work from infestation-free areas into infested areas rather than vice-versa.
2. 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. Reforestation and restoration efforts should limit use of container stock or other practices where soils or other growing mediums are brought into the planning area.
7. Create a 3-5 year implementation plan for prescribed fire in areas that are dominated by invasive non-native grasses and noxious weeds. Include collection of fire tolerant perennial native bunch grasses for seed increase contract.
8. Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that is judged to be weed free by District or Forest weed specialists.

Recreation (Trails and Campgrounds):

1. Trees harvested within the 50-feet of Gibson Prairie Horse Camp would be felled directionally away from the camp
2. All landings and skid trails would be located at least 100-feet from Gibson Prairie Horse Camp unless blocked by topography from view.
3. All brush piles within 100-feet of Gibson Prairie Horse Camp would be disposed of within 1-year. Exceptions may occur under agreement with volunteers hosting at the horse camp.
4. All stumps within 100-feet of Gibson Prairie Horse Camp would be cut to 6-inches in height or less.
5. Prescriptions would meet the Partial Retention Visual Quality Objectives (VQO) in the area viewed from the Gibson Prairie Horse Camp.
6. The methods used to rehabilitate landings, skid trails and temporary roads would be designed to meet VQO within foreground of Gibson Prairie Horse Camp.
7. Ground disturbance and activity debris resulting from project activities within 1-year would become visually subordinate in the immediate foreground Gibson Prairie Horse Camp.
8. New trail construction would be coordinated with an archeologist.
9. All new trail construction would be made compatible with existing range pasture fences within the Long Prairie Grazing Allotment. The trails may be made compatible through measures, such as installing gates or walk-thoughs.

Heritage Resource Sites:

1. All designated cultural resource sites (excepting these described in heritage resource design criteria #3 below) requiring protection would have a 100-foot buffer zone where heavy machinery would be excluded. Treatment of vegetation by hand could still occur as necessary.
2. Prescribed burning may occur, but piling may not occur within the flagged buffer zones.
3. All culturally-modified trees or trees with insulator mountings would be avoided during harvest activities, unless otherwise specified by the archaeologist.

Design Criteria/Mitigation Measures for Road Decommissioning and Culvert Projects

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.
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 is 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 stormproofing 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.

Culvert Replacement Only:

1. Follow stream simulation design requirements for all new stream crossings (i.e. match, to the degree possible, stream width, slope, and substrate conditions with up and downstream conditions).
2. Rip Rap – The use of riprap is permissible above bankfull height to protect the inlet or outlet of new culverts or open-bottomed arches. If the use of riprap is required for culvert stability, then additional analysis may be required to ensure that the structure is not undersized. Riprap may only be placed below bankfull height when necessary for protection of abutments and pilings for bridges. However, the amount and placement of riprap around the abutments and/or pilings should not constrict the bankfull flow.
3. Grade Control Structures – Grade control structures are permitted to prevent headcutting above or below the culvert or bridge where natural channel regarding is not desired. Grade control typically consists of boulder structures that are keyed into the banks, span the channel, and are buried in the substrate.
4. Road Dips – Where applicable, incorporate road dips into stream crossing design, to ensure catastrophic flood events would transport overflow back into the stream channel instead of onto the road bed.
5. Structures containing concrete must be cured or dried before they come into contact with stream flow.
6. When removing woody debris from the road-crossing inlet, place the debris downstream of the road crossing.
7. In streams where fish are present above and/or below the culvert a fish collection and removal procedure shall be implemented prior to dewatering (see below) and construction. The project area shall remain isolated using block nets or some other means during the construction period.
8. **Dewater Construction Site**: The preferred method for replacing a culvert involves dewatering the construction site to minimize impacts to water quality and fish populations. Upstream of the isolated construction area, divert flow around the construction site with a coffer dam (built with non-erosive materials) and an associated pump or a by-pass culvert. Pumps must have fish screens and be operated in accordance with NMFS fish screen criteria (NMFS 1995). Dissipate flow energy at the bypass outflow to prevent damage to riparian vegetation or stream channel. If diversion allows for downstream fish passage (i.e., is not screened), place diversion outlet in a location to promote safe reentry of fish into the stream channel, preferably into pool habitat with cover. When necessary, pump seepage water from the de-watered work area to a temporary storage and treatment site or into upland areas and allow water to filter through vegetation prior to reentering the stream channel.
    - **Stream Re-watering**: Upon project completion, slowly re-water the construction site to prevent loss of surface water downstream as the construction site streambed

absorbs water and to prevent a sudden increase in stream turbidity. Monitor downstream during re-watering to prevent stranding of aquatic organisms below the construction site.

Mt. Hood Land and Resource Management Plan Consistency

Standards and guidelines in the Mt. Hood Forest Plan were not written to address hazardous fuels reduction. When the Mt. Hood Forest Plan was written, it emphasized traditional timber sales, rather than fuels reduction projects. The following standards would not be met with either Alternative 1-Proposed Action or Alternative 2.

- Organic Matter (FW-033): At least 15 tons per acre of dead and down woody material in eastside vegetation communities…should be maintained and evenly distributed across managed sites.

  It is likely organic matter tonnage would be reduced to levels below Forest Plan Standard FW-033, especially in the higher fire frequency areas and on the south and west slopes. Since the overarching goal of the hazardous fuel reduction project is to reduce organic matter available to burn, it is a trade-off to meet the purpose and need. Fine organic matter levels should trend upward as the forest floor in higher fire frequency areas increase in shrubs, forbs, and grasses. Also, it is likely localized acreage would be lower than Forest Plan standards for organic matter, which is an intention of the proposed action for a hazardous fuel reduction project. When this occurs, it is not expected to be a substantial impact to nutrient cycling because these are not clearcuts followed by intense burning and extreme loss of current and future organic matter. Many of the soils impacted would retain substantial organic matter reserves in the mineral topsoil due the way in which they have developed. See Chapter 3, Soil Productivity for more details.

- Silvicultural Systems (FW-333): Uneven-age management should not be applied on slopes where cable logging systems would be necessary (30+% slopes).

- Silvicultural Systems (FW-337). Uneven-aged management should not be applied where stands are moderately to heavily infected with dwarf mistletoe.

  Silvicultural systems refer to whether even-aged or uneven-aged management should be applied. Even-aged systems are regeneration harvests, including clearcutting, seed tree, and shelterwood cuts. The Forest Plan recommends an even-aged system on slopes over 30 percent because the residual trees in an uneven aged harvest system are often damaged with cable logging systems. Even-aged management is also the preferred approach when treating stands with dwarf mistletoe because of the spread of the parasitic plants to healthy trees under the canopy of infected trees. These Standards (FW-333 and FW-337) are not being met because the silvicultural prescriptions specify appropriate mitigation measures in management areas where uneven-aged management is being considered to fulfill resource objectives other than timber production (Forest Plan, Four-88). The objective of this project is fuels reduction while maintaining structure for aesthetics, wildlife, nutrient cycling, future stand composition and health. Mitigation measures

create patch openings, girdle mistletoe-infected trees, underburn, and use directional falling techniques to limit residual tree damage on cable logged slopes which are part of the design of the proposed action. The expected condition after harvest is reduced mistletoe infestation creating a more open forest with a greater grass, forb, and shrub undergrowth. See Chapter 3, Vegetation Resources section for more details.

Exceptions to these standards are required to meet the purpose and need of effective fuel reduction. These exceptions were identified during the interdisciplinary planning analysis and the IDT process concluded that these exceptions were within the purpose and need for action. Exceptions are allowed under the Forest Plan, if they are identified during the interdisciplinary process. All other standards and guidelines are expected to be met with this proposal.

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.

Suitability for Timber Production
The primary objective of the proposal is fuel reduction rather than timber production. As a pre-cursor to the silvicultural diagnosis process, however, 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.).

Suitability for uneven-aged management
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. The Forest Plan states: "However, silvicultural prescriptions may specify appropriate mitigation measures in Management Areas where uneven-aged management is being considered to fulfill resource objectives other than timber production" (Mt. Hood FP Four-88). The resource objective here is hazardous fuels reduction while maintaining structure for aesthetics, wildlife, nutrient cycling, and future stand composition and health. Project design features/mitigation measures such as patch openings and girdling mistletoe-infected residual overstory trees are written into the design of the proposed action to meet Forest Plan direction.

REGULATORY FRAMEWORK

Best Management Practices included in Alternatives 1 and 2
According to the Northwest Forest Plan, Best Management Practices (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) and the Draft Environmental Protection Agency Region 10 Source Water Protection Best Management Practices for USFS, BLM (April 2005).

Consistency with the Healthy Forest Restoration Act and the Northwest Forest Plan for Alternatives 1 and 2
Old growth stands: The Healthy Forest Restoration Act (HFRA) (H. R. 1904-8) requires that projects designed under its authority fully maintain, or contribute toward the restoration of, the structure and composition of old growth stands according to the pre-fire suppression old growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health, and retaining the large trees contributing to old growth structure. Section 102(e)2 states HFRA projects should "fully maintain, or contribute toward the restoration of, the structure and composition of old growth stands according to the pre-fire suppression old growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health, and retaining the large trees contributing to old growth structure."

This project would retain the structure and composition of pre-fire suppression old growth by promoting fire-adapted species where their health condition does not threaten the overall health of the stand. Also, the treatments would not impact the Special Old Growth Area (A7) in the planning area.

HFRA provides that old growth direction in the Northwest Forest Plan Record of Decision is sufficient to meet the requirements of the Act. The Northwest Forest Plan Record of Decision recognizes that large-scale disturbances, such as fire, could eliminate spotted owl habitat on hundreds or thousands of acres. Elevated risk levels are attributed to changes in the characteristics and distribution of the mixed conifer forests resulting from past fire protection. Management activities designed to reduce risk levels are encouraged in Late Successional Reserves even if a portion of the activities must take place in currently late successional habitat (S &G C-13, ROD).

Large tree retention: HFRA Section 102(f) states that projects should be carried out in a manner that "(A) focuses largely on small diameter trees, thinning, strategic fuel breaks, and prescribed fire to modify fire behavior, as measured by the projected reduction of uncharacteristically severe wildfire effects for the forest type (such as adverse soil impacts, tree mortality or other impacts); and (B) maximizes the retention of large trees, as appropriate for the forest type, to the extent that the trees promote fire-resilient stands."

The proposed treatments meet this requirement by retaining large trees suitable to the site in mature stands, and reducing stand density that has increased since the exclusion of fire. Large trees would be retained where they do not threaten the overall health of the stand. Trees with dwarf mistletoe threaten the overall health of the stand and would either not be retained or would

be girdled. The HFRA states that the large tree retention requirement must not prevent agencies from reducing wildland fire risk to communities, municipal water supplies, and at-risk Federal land.

COMPARISON OF ALTERNATIVES

This section provides a summary of the effects and trade-offs of No Action Alternative, verses implementing either the Proposed Action or Alternative 2. It compares the three alternatives in terms of how they meet project objectives (purpose and need as stated in Chapter 1) and how they address concerns/issues identified during public scoping. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2-10: Comparison of Alternatives in Relation to Management Objectives and/or Issues Identified by the Public

Objective or Issue	No Action	Alternative 1 Proposed Action	Alternative 2
Overall Purpose To conduct restoration activities within the North Fork Mill Creek planning area to effectively reduce fuel loadings	No hazardous fuels reduction treatment would be implemented. High fuel loadings would remain throughout the planning area. All fuel loadings are capable of sustaining a stand-replacing fire in the area.	Hazardous fuel reduction treatments would be implemented on **2802 acres** (42% of planning area). Surface fuels would be reduced to 15 tons per acre. Flame length and rate of spread in the event of a fire start would be decreased, allowing suppression forces to safely and effectively contain and control a fire in the area.	Hazardous fuel reduction treatments would be implemented on **1276 acres** (19% of planning area). Surface fuels would be reduced to 15 tons per acre. Flame length and rate of spread in the event of a fire start would be decreased, allowing suppression forces to safely and effectively contain and control a fire in the area.
Objective Reduce risk of loss of healthy large diameter/remnant ponderosa pine, Douglas-fir, and western larch trees	No treatments would occur in Douglas-fir dominated forests of concern, located on the warm, dry/moist grand fir Douglas-fir habitat associations. No additional protection would be offered to large diameter/remnant trees.	Most of the fuels reduction treatment proposed occurs within the Douglas-fir dominated forests of concern, located on the warm, dry/moist grand fir Douglas-fir habitat associations. About **1432 acres** of this type would change from what is currently dense, mostly closed canopy forest to a semi-open condition, which offers more protection to large diameter/remnant trees.	A small representation of the fuels reduction treatment proposed occurs within the mixed conifer stands located on the warm, dry/moist grand fir Douglas-fir habitat associations. About **166 acres** of this type would change from what is currently dense, mostly closed canopy forest to a semi-open condition, which offers more protection to large diameter/remnant trees.
Objective Restore stand health to improve resiliency to insects and disease	The dense, multi-canopied Douglas-fir and grand fir dominated forests in the area are perfect conditions for the proliferation of root disease and particularly favorable to dwarf mistletoe on Douglas-fir. Most of the stands in the	Dwarf mistletoe populations would reduce with the proposed treatments. Thinning and small patch openings would reduce root-to-root contact and promote the growth of species in the stands that are resistant or have an	Dwarf mistletoe populations would reduce with the proposed treatments. Thinning would reduce root-to-root contact and promote the growth of species in the stands that are resistant or have an increased tolerance to root

Objective or Issue	No Action	Alternative 1 Proposed Action	Alternative 2
	watershed have some level of root disease present. Highly susceptible species for root rot include Douglas-fir, grand fir, mountain hemlock, and white fir.	increased tolerance to root disease. Trees with improved vigor would be more resistant to root disease as well as the commonly associated insects.	disease in a limited capacity with fewer patch openings associated with Alternative 1.
Objective Maintain the health and vigor of established Douglas-fir understories within stands previously partially harvested	The degree of mistletoe infection in the younger Douglas-fir trees (<120 years) varies from very low levels in some stands to very high levels in others. Generally, where heavily infected Douglas-fir overstory exists, the infection level in the adjacent and understory trees is also high and would be expected to continue to increase as long as the source of infection exists.	Vigor of established Douglas-fir understories would improve in the treated stands in proportion to the treated overstory stands. This alternative treats approximately **1,432 acres** of currently dense, mostly closed canopy warm, dry/moist grand fir Douglas-fir forest.	This alternative treats approximately **166 acres** of currently dense, mostly closed canopy warm, dry/moist grand fir Douglas-fir forest.
Objective Decrease the rate of spread of laminated root rot and dwarf mistletoe	In the absence of fire, root decay has become very active, probably outside its range of natural variability in these stands. Fire does not eliminate root disease, but there is evidence that it slows it down, especially when its host is consumed. Dwarf mistletoe spread rate is fastest in the multi-storied stands where mistletoe seeds from infected overstory trees “rain down” on susceptible understory trees.	Alternative 1 would work toward restoring healthy forest conditions on **1234 acres** of mixed conifer stands with a high incidence of root disease and/or dwarf mistletoe. Alternative 1 would treat **584 acres** of hot, dry pine/oak and Douglas-fir stand group containing root disease and/or dwarf mistletoe.	Alternative 2 treats **97 acres** of mixed conifer stands with a high incidence of root disease and/or dwarf mistletoe. Alternative 2 would treat **350 acres** of hot, dry pine/oak and Douglas-fir stand group containing root disease and/or dwarf mistletoe.

Objective or Issue	No Action	Alternative 1 Proposed Action	Alternative 2
Objective Restore wildlife habitat, including the unique aspen stands, within the planning area	Aspen are present in four areas in the North Fork Mill Creek Planning area primarily found in moist areas along stream corridors. Decline of aspen stands is attributed to natural succession (e.g., invasion of conifers), fire suppression, and over browsing by domestic livestock and native ungulates.	Both Alternatives 1 and 2 enhance approximately **45 acres** of aspen/cottonwood stands to restore wildlife habitat. Reducing hazardous fuels and improving forest health, wildlife habitat is restored and/or improved throughout the planning area.	Both Alternatives 1 and 2 enhance approximately **45 acres** of aspen/cottonwood stands to restore wildlife habitat. Reducing hazardous fuels and improving forest health, wildlife habitat is restored and/or improved throughout the planning area. This alternative would improve less wildlife habitat because fewer acres are treated.
Objective Restore wildlife security and aquatic integrity within the planning area while integrating the public's need for access	No restoration projects would be completed within the planning area. Road densities and public access would remain unchanged.	The road proposal includes implementing seasonal closures on approximately 7.6 miles of road, year-round closures on approximately 7.8 miles of road, and obliterating approximately 8.8 miles of road. The culvert proposal includes removing/replacing 12 culverts on and off-Forest on roads that are under Forest Service jurisdiction. Approximately 6.0 miles of horse/hiking trails and approximately 7.5 miles of horse/hiking/biking trails are being proposed for improvement and/or construction. All restoration projects are included in both Alternative 1 and 2.	
Issue <u>Canopy Fuels Reduction</u>: Removing canopy fuels can reduce crown-to-crown fire spread, but the science clearly shows that removing canopy cover can also increase fire hazard by increasing solar insolation which causes fuels to warm and dry and increases wind speeds.	No canopy fuels would be removed. There would be no increase to fire hazard or reduction in the fire rate of spread.	Opening crown spacing reduces the probability of a wildland fire transition from a surface fire to a crown fire. Although opening the crown spacing could increase surface rates of spread, it also makes the fire easier to control. Approximately **2131 acres** would be commercially thinned (canopy fuel reduction) under this alternative.	Approximately **594 acres** would be commercially thinned (canopy fuel reduction) under this alternative.

Objective or Issue	No Action	Alternative 1 Proposed Action	Alternative 2
Issue Large Tree Retention: The Mill Creek watershed has a severe shortage of large diameter old-growth trees.	No large diameter old-growth trees would be removed. No change in existing conditions, as described in the Vegetation Resource section of Chapter 3.	Field visits and GIS data layers do not indicate a shortage of large diameter old-growth trees within the watershed. Within the planning area, large trees would be retained where appropriate as indicated in the stand objective table. Leaving all large trees would not meet the purpose and need for this project due to the infestations of dwarf mistletoe.	Additional large trees would be retained under this alternative because fewer acres are treated. Within the treated acres, large trees would be retained where appropriate as indicated in the stand objective table.
Issue Forest Health: The current plan appears to prescribe 1-2 acre clear cuts to deal with root rot pockets. This treatment will result in significant negative ecosystem and hydrologic impacts.	No root rot pockets would be treated. No change in existing conditions, as described in the Vegetation Resource section of Chapter 3.	The impacts of create 1-2 acre patch openings to treat root rot pockets is addressed by each resource area in Chapter 3. No significant effects to ecosystem or hydrologic function were identified.	Fewer root rot pockets are treated under Alternative 2.
Issue Snags and Down Logs: There is a shortage of large down wood and snags across the landscape due to extensive logging over the past century.	The Forest Plan recommends a 40% biological potential (0.9 snags/acre) for cavity nesting species across the landscape and a 60% biological potential (1.35 snags /acre) in new timber harvest units. The planning area meets the 40% level. The majority of the mature stands within the planning area exceed the 100% biological potential (2.25 snags/acre).	The proposed project area is between 30 and 80 percent snag and down wood levels as outlined in the DecAID Advisor. The 30 percent levels are generally associated with previously harvested areas and the pine/oak habitat. The 80 percent levels are generally located in unharvested portions of the project area and the Surveyor's Ridge LSR. The proposed project would retain snags and down wood at the	Additional snags and down logs would be retained through the planning area because fewer acres are treated. For treatment units, the impacts would be similar to those described in Alternative 1.

Objective or Issue	No Action	Alternative 1 Proposed Action	Alternative 2
		30 to 50 percent level in the planning area. This project would maintain a minimum of 120 linear feet of down woody material and 4 snags/acre would be retained	
Issue Road Density: The current road density in this area is significantly higher than it should be even under the forest plan guidelines.	Current road densities for the planning area are 3.36 mile per square mile total road density and 2.24 miles per square mile for open roads. This is less than the 2.5 miles of open road density of the Forest Plan Standards and Guideline. Open road density in inventoried winter range is 1.91 miles open road density per square mile. This is within the 2.0 miles of open road density of the Forest Plan Standards and Guideline. For Deer/Elk Winter Range, the open road density is .11 miles per square mile. This is within the 1.5 miles of open road density of the Forest Plan Standards and Guideline.	Under Alternatives 1 and 2, road densities for the planning area would be reduced to 2.88 mile per square mile total road density and 1.72 miles per square mile for open roads. Open road density in inventoried winter range is 0.87 miles open road density per square mile. All of these road densities are below the standards and guidelines established in the Forest Plan. For Deer/Elk Winter Range, neither alternative would result in any open roads during the seasonal closure that would exceed the 1.5 miles of open road density of the Forest Plan Standards and Guideline for this allocation.	
Issue Temporary Roads: While we feel that temporary road construction is more appropriate than permanent road construction, temporary roads still channelize water,	No temporary roads would be constructed.	Under Alternatives 1 and 2, temporary roads would be rehabilitated after project implementation. New temporary roads would not exceed a total of 1-mile in the North Fork Mill Creek planning area. Figure 2-2 shows the proposed temporary roads.	

Objective or Issue	No Action	Alternative 1 Proposed Action	Alternative 2
cause erosion, and conduct invasive weeds.			

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. These effects are the scientific and analytic basis for the comparison of 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 further actions, regardless of what agency or person undertakes such other actions

The Environmental Assessment (EA) 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 EA. Specialist reports were completed for fire/fuels, vegetation resources, soils, hydrology, fisheries, wildlife, botany, invasive plants, recreation, and heritage resources. Separate biological evaluations and/or biological assessments were completed for botanical species, aquatic species, and terrestrial wildlife species as part of the consultation process with the National Marine Fisheries Service (NMFS) and the U.S. Fish & Wildlife Service (FWS). Full versions of these reports are available in the project record, located at the Hood River Ranger District office in Mt. 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. Each report details the specific projects that were analyzed for cumulative effects.

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

Past Activities
Past timber harvests
Past road building in planning area
Private land harvesting activities on Sections 31 and 36
Harvesting within The Dalles Watershed area
Firewood cutting activities
Pre-commercial thinning
Culvert replacements on Mill Creek road (1711-630 Road) and on North Fork Mill Creek (located approximately 0.5 miles downstream of Forest boundary)
Hazard tree removal along roads
Illegal trail construction in Gibson Prairie area
Present Activities
Additional non-motorized trail construction proposal from Mill Creek Collaborative Group
Hood River County trails project proposal (non-motorized and motorized) to north of project area

Present Activities Continued . . .
Long Prairie Grazing Allotment
The Dalles Watershed Fuelbreak
Pre-commercial thinning
Bonneville Power Administration maintenance, including herbicide treatments
Special Forest Products (e.g., firewood cutting, mushroom picking)
Ongoing incidental road maintenance
Ongoing trail maintenance
Future Activities
Off-highway vehicle (OHV) Travel Management Environmental Impact Statement – Gibson Prairie OHV Area proposal
Site-specific invasive plant treatments
Warming huts on Surveyor's Ridge
Surveyor's Ridge Trail grant proposal for trail reconstruction
Hazard tree removal along roads
Future aquatic restoration projects

Setting the Stage

Since the North Fork Mill Creek Restoration Opportunities project is being prepared under the Healthy Forests Restoration Act, and is within the Wildland Urban Interface, the No Action Alternative is not required to be developed. Understanding what would occur should no action be taken, however, is as important to gaining an understanding of the effects of the Proposed Action and Alternative 2, as well as to helping the readers and the decision maker understand why this project fits the purpose of the Health Forests Restoration Act to:

> *…reduce the risk to communities,…and other at-risk Federal land through…implementing hazardous fuels reduction projects…and…protect, restore, and enhance forest ecosystem components…*

Both the Fire/Fuels (7/15/2008) and Silviculture (7/11/2008) Specialists Reports, by District Fuels Specialist, Leo Segovia and District Silviculturist, Kim Smolt respectively, give details on what is expected to occur over time without treatment. Both reports are summarized in this chapter.

Fire / Fuels Management

A more detailed fuels report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below. Reference material is contained in the full specialists report.

Introduction

The North Fork Mill Creek Planning area lies within the Mill Creek watershed. This planning area encompasses approximately 6607 acres and is located in the northern portion of the Hood River Ranger District. Elevations range from 2200 to 4000 feet. The area is predominately Douglas fir, white fir, ponderosa pine, lodgepole pine, and western hemlock. Riparian areas are predominately Douglas-fir, western hemlock, and western red cedar. With an understory combination of maple, chinquapin, and rhododendron in the lower elevation in North Fork Mill Creek.

The Mill Creek Watershed Analysis was completed in 1994. Field reviews of the North Fork Mill Planning area have resulted in the determination that the fire/fuels report for the watershed analysis is inconsistent with the existing conditions 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 elevation areas of the watershed. In addition, the watershed analysis was completed 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 eastside attempt to map historical fire regimes.

Figure 3-1: 1937 Picture Mill Creek Look Out

Figure 3-2: 1992 picture Mill Creek Look Out

Existing Conditions

Historically, fires would have burned in this area every 35 to 200 years. Fire suppression activities in the past 100 years have not altered the historical development of the vegetation. However, the different land management practices such as timber harvest and the associated road development after 1855 have increased the risk in human caused fire. Both natural and human caused fires have changed the landscape and increased the risk of ignitions occurring.

Lighting strikes do occur in this planning area but are often accompanied by rain that puts many fire starts out. Fire suppression efforts have been used to put out small fires that were held over from lighting storms. In areas where high fuel loadings and ladder fuels are present extreme fire behavior would 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 North Fork Mill Creek Planning area had seven wildfires in the past ten years. The causes of ignition included: lighting, smoking, equipment, abandoned campfires and arson.

Fire history for the non-Forest Service ownership (Oregon Department of Forestry, Oregon Department of Fish and Wildlife, and private) near The Dalles Watershed Fuel Break planning area was not collected. Although several large fires have occurred in or near the watershed in the past 40 years, including Sheldon Ridge Fire in 2002 (12,500 acres), School Marm Fire (includes the Brown Creek fire) in 1967 (9,618 acres), and Dog River Fire in 1908 (unknown acres). These fires were generally wind driven from the west and were mixed to high severity events. Sheldon Ridge burned to the north of the watershed, School Marm burned from inside the watershed in an easterly direction, and the Dog River occurred in the Dog River drainage of the watershed (SW of the project area). The 2004 Dalles Watershed Analysis, Wasco County, references three other fires (> 10 acres) within the watershed near the Mill Creek Butte area, but no other data is given.

The planning area is roughly divided into four Fire Regimes: Fire Regime I 50 – 100 year mixed severity, Fire Regime IIIA 100 – 200 years mixed severity, Fire Regime III B 100 – 200 years

stand replacing, and Fire Regime IIIC (see Table 3-2). Fire regime refers to the nature of fire occurring over long periods and the prominent immediate effects of fire that generally characterize an ecosystem. All four 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. Fire Regimes in the North Fork Mill Creek Planning area are all capable of sustaining a stand replacing wildfire. See Figure 3-3 for location of fire regimes.

Table 3-2: Fire Regime in the North Fork Mill Creek Planning Area

Fire Regime	Percent of Planning Area
Fire Regime I	47%
Fire Regime III A	14%
Fire Regime III B	39%
Fire Regime III C	14 acres not notable

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 invasive plant species, insects or disease (introduced or native), or other past management activities. The stands in the planning area composed of the three condition classes shown in Table 3-3, Table 3-4, and Figure 3-4.

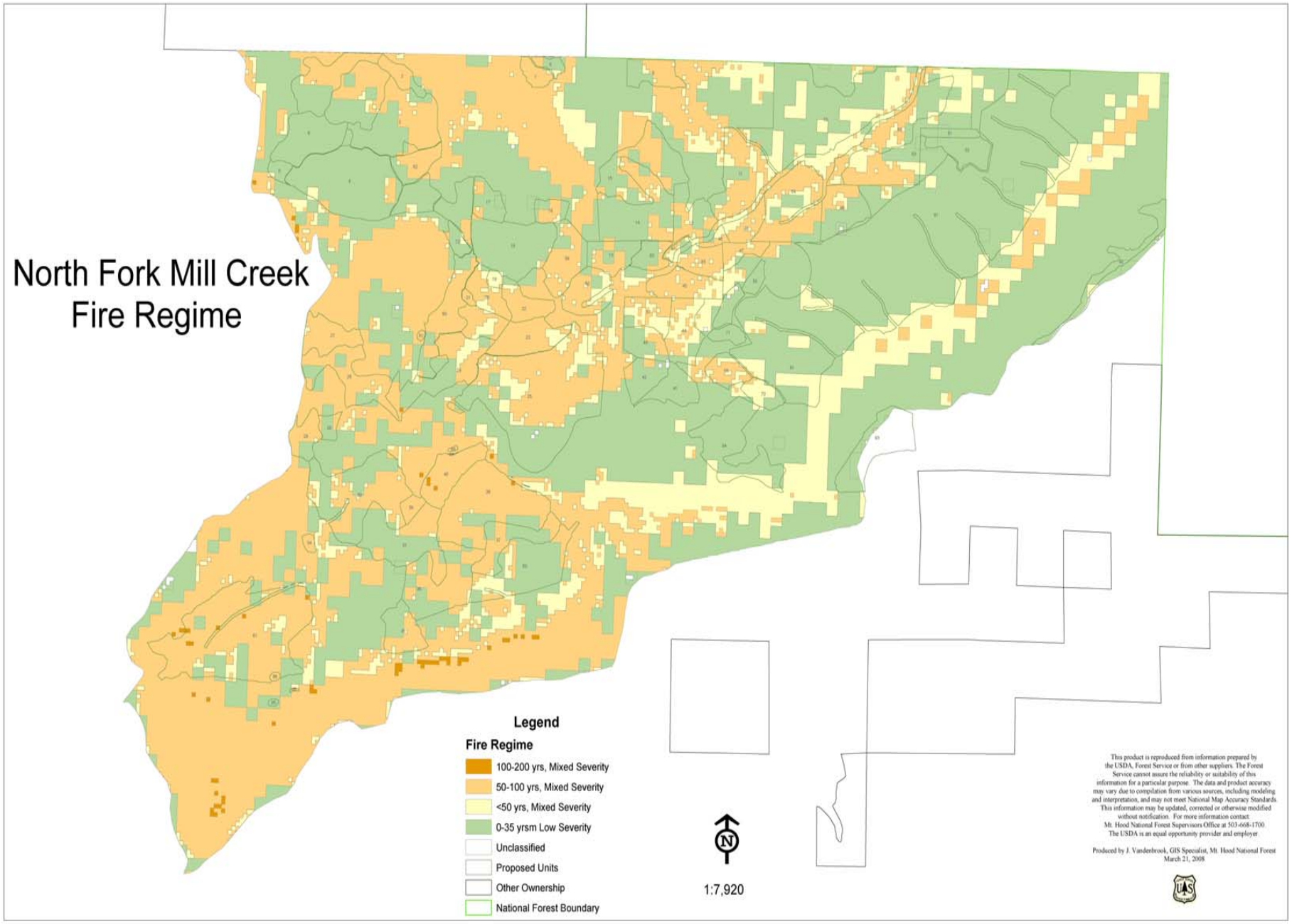

Figure 3-3: Fire Regime Map for Planning Area

Table 3-3: Fire Condition Classes in North Fork Mill Creek Planning Area

Condition Class	Attributes	Example Management Options
Condition Class 1	• Fire regimes are within or near an historical range. • The risk of losing key ecosystem components is low • Fire frequencies have departed from historical frequencies (either increased or decreased) by no more than one return interval. • Vegetation attributes (species composition and structure) are intact and functioning within an historical range.	Where appropriate, these areas can be maintained within the historical fire regime by treatments such as fire use.
Condition Class 2	• Fire regimes have been moderately altered from their historical range. • The risk of losing key ecosystem components has increased to moderate. • Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval. This change results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. • Vegetation attributes have been moderately altered from their historic ranges.	Where appropriate, these areas may need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime.
Condition Class 3	• Fire regimes have been significantly altered from their historical range. • The risk of losing key ecosystem components is high. • Fire frequencies have departed (either increased or decreased) by multiple return intervals. This change results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. • Vegetation attributes have been significantly altered from their historic ranges.	Where appropriate, these areas need high levels of restoration treatments, such as hand or mechanical treatments. These treatments may be necessary before fire is used to restore the historical fire regime.

Table 3-4: Condition Class by percentage in the North Fork Mill Creek Planning Area

Condition Class	Percentage in Planning Area
Condition Class 1	48%
Condition Class 2	9%
Condition Class 3	43%

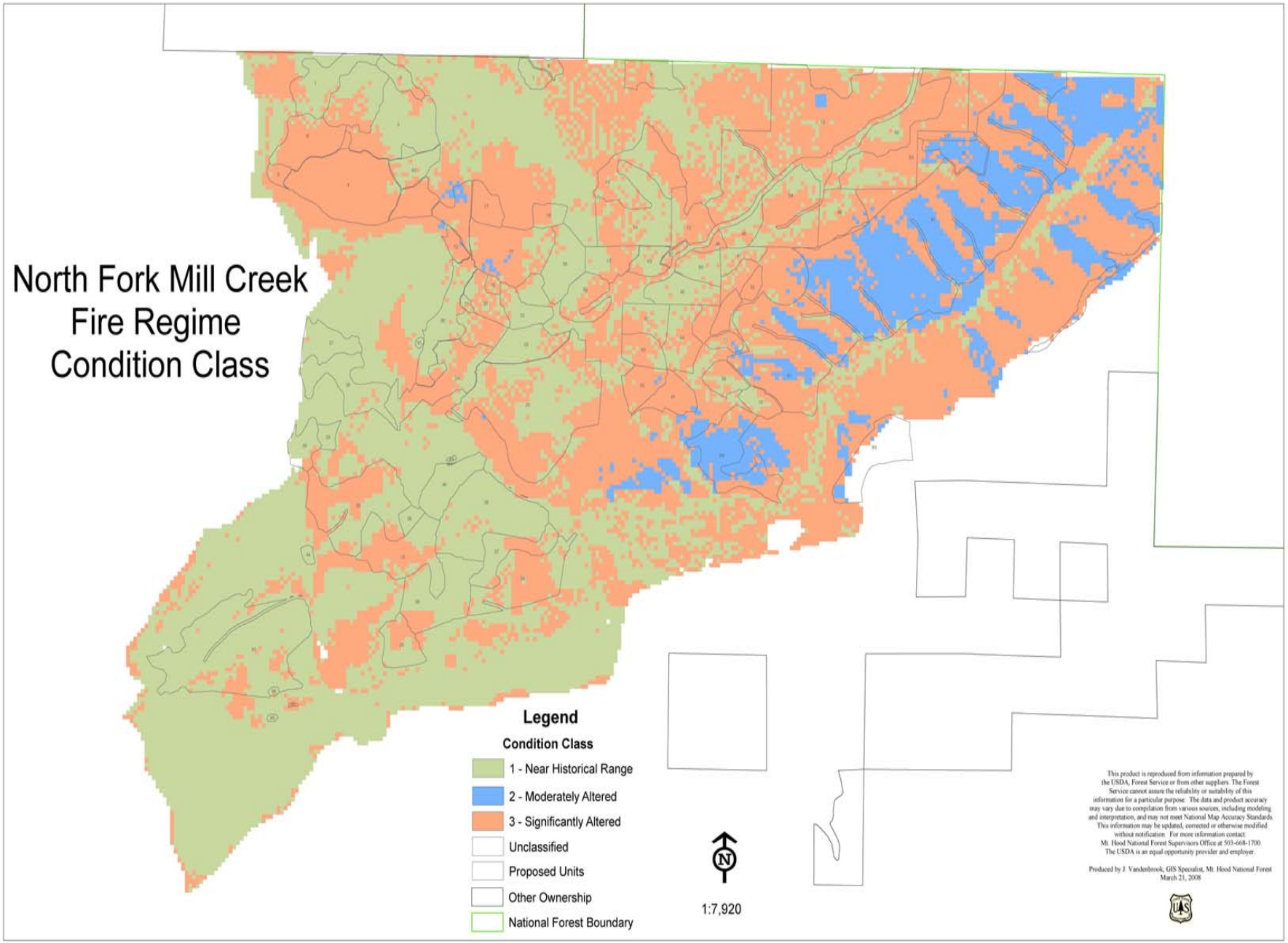

Figure 3-4: Condition Class Map for Planning Area

Cottonwood/Aspen Enhancement

Aspen are present in four areas in the North Fork Mill Creek Planning area (Figure 3-5), primarily found in moist areas along stream corridors. Aspen (Populus tremuloides) provide many ecological benefits including: protection of watersheds from erosion, protection against rapid wildfire advance, increased biological diversity in the species-rich grass-forb understory, wood fiber, wildlife habitat, forage for domestic livestock and native ungulates, recreational sites, aesthetic considerations (e.g., fall leaf colors), and more water yield than conifers (Bartos and Campbell 1998a). Decline of aspen stands is attributed to natural succession (e.g., invasion of conifers) (Harniss 1981), fire suppression (Jones and Debyle 1985), and over browsing by domestic livestock and native ungulates (Kay 1990). Western aspen, which reproduce primarily by suckering form lateral roots, often need disturbance to stimulate the suckering response (Schier 1981). Successful vegetative regeneration of aspen is dependent upon three key components: hormonal stimulation, growth environment, and protection of the resulting suckers. Each of these factors involves one or more of the silvical characteristics of aspen discussed above.

Any manipulation of aspen ecosystems has to satisfy all of these requirements to successfully regenerate the species. Manipulation techniques that are potentially available to perpetuate aspen stands include: Doing nothing, commercial harvest, prescribed fire, mechanical root stimulation, removal of vegetative competition, protection of regeneration from herbivory, and regenerating from seed. Choosing the appropriate technique for a given aspen stand depends upon its age, vigor, stocking, associated vegetation, accessibility, the abundance of other aspen in the landscape, and the importance ascribed to maintaining aspen at a particular location. None of the above techniques would be used in all situations.

Fire meets all the requirements of the aspen regeneration triangle. It stimulates suckering by killing overstory stems and by killing near-surface root segments and thereby interrupting the flow of auxin to surviving down stem root segments. Fire removes competing understory vegetation and conifer seedlings and it allows sunlight to reach the forest floor. The vegetation consumed by the fire provides a nutrient pulse for new suckers and the blackened surface warms soil in the root zone, further stimulating sucker growth (Hungerford 1988). In addition to stimulating aspen suckering, fire could also exert a large influence on soil properties in burned stands, depending on the intensity of the burn. Increases in plant available nutrients usually occur following fire because of the transfer of nutrients from the ash to soil (Schlesinger 1997). Fire is an important component in both establishing new stands of aspen and in assisting aspen in maintaining its position on the landscape (Jones and DeByle 1985). Conifers growing in the understory of aspen stands would eventually overtop the aspen canopy in the absence of fire or some other disturbance. In time aspen would disappear from that location on the landscape. If however, fire should consume both conifer and aspen overstory, the aspen root system would often survive.

Prescribed fire prescriptions in the North Fork Mill Creek Planning area would be developed to meet silivcultural objectives and to keep burn severity to a low and medium burn severity in and around moist areas in aspen stands found in the planning area. No hand lines would be constructed through the interior of any of the aspen stands. Hand lines in conjunction with wetlines would be utilized on the perimeter of the aspen stands as control lines to regulate prescribed fire spread. Historically sensitive aspen trees found in the planning area would be protected by pulling back debris from the base of leave trees. Reflective heat wrap would also be used in conjunction with pulling back of debris before ignition takes place. Fenced off enclosures would be recommend to aid aspen suckers becoming

reestablished after prescribed fire. Enclosures would help reduce browsing pressure from deer, elk and livestock.

Figure 3-5: Historic Aspen Stand

Environmental Effects

Effective treatments to reduce fire hazard include treatments that lower existing fuel concentrations, lower future fuel concentrations, or decrease the ladder fuels (brush and small trees) which provide vertical connectivity into the crowns of the overstory trees. Commercial thinning, underburning, pruning, mowing, whip-felling, handpiling, and sapling thinning may be effective in reducing fire hazard.

The No Action alternative does not propose any projects in The North Fork Mill Creek Planning area and fire suppression would continue to occur.

Alternative 1 – Proposed Action would allow for a breaking up of continuous blocks of high fuel hazard areas. This breaking up of the high hazard areas would have an effect on a fire moving through the area as well as providing a safer area for suppression resources to either suppress new starts and in turn may alleviate some of the environmental damage and slow down the forward movement of the wildfire, thereby allowing for a higher success of suppression operations.

Alternative 2 would not allow for a breakup of continuous blocks of high fuel hazard areas. By not reducing the acres of the high hazard areas it would not reduce the effect on a fire moving through the area as well as providing a safer area for suppression resources to either suppress new starts. In turn it could not potentially alleviate some of the environmental damage and also slow down the forward movement of a wildfire fire, reducing the success of suppression operations.

Hand piling, pruning, burning, and underburning would reduce fuel loadings, fuel bed depth, and

understory vegetation (ladder fuels). Mowing would reduce fuel bed depths and understory vegetation, but would not decrease fuel loadings. Underburning after the mowing would reduce the fuel loading and maintain manageable fuel conditions for future maintenance.

No Action Alternative – Direct and Indirect Effects
The No Action Alternative proposes no projects and fire suppression would continue to occur. In the short-term (one to five years), the fire hazard would remain constant, at a high risk. In the future, dead or dying trees would fall down increasing the fire hazard. Natural fuels (pine needles and other dead vegetation) would continue to accumulate. Natural processes of decay are not likely to remove the down and dead woody debris before the next fire cycle. As the available fuel increases, so would the potential for a large stand replacing wildfire event.

The risk of injury to the public and firefighters would increase as the fuel loadings and fire hazards increase. Larger, fast moving, higher intensity fires would put the public and firefighters at an increased risk to injury or death. Suppression costs would increase due to larger fires and the increased need for mechanized equipment and aircraft. Resource damage caused by fire suppression efforts would increase. There would be an increased threat of damage to the North Fork Mill Creek Planning Area.

When large amounts of dead and down debris increase and there is an increase in ladder fuels, a fire would burn very hot and exhibit extreme fire behavior. Such fire behavior could result in loss of productivity and biodiversity in the stands, surface soils could be severely damaged, and it could take many years to restore the ecosystem.

Overall, the North Fork Mill Creek Planning area would be left in its current condition. Air quality would remain unaffected, until a large fire event occurred. The Dalles and/or Hood River Valley would be impacted by such an event, with very high particulate matter imparted into the local air sheds, with potential health effects.

Proposed Action Alternative – Direct and Indirect Effects
Alternative1 would treat a total of 2885 acres, 1177 with mechanical thinning, 954 acres of thinning and burning, 26 acres of sapling thinning, 45 acres of aspen enhancement and 684 acres with prescribed burning only. This is about 42 percent of the 6607 acres of the planning area. This would reduce overall fuel loadings, thereby decreasing the Flame Length (FL) and Rate of Spread (ROS) in the event of a fire start in these areas, allowing suppression forces to safely and effectively contain and control a fire in the area of the Planning area

Thinning would reduce the ladder fuel component in stands that are overstocked, allowing for suppression forces to contain and control future fire starts more efficiently and safely, thus reducing the risk to private property.

Opening crown spacing to reduce the probability of a wildland fire transition from a surface fire to a crown fire has some trade offs. For example, thinning opens up stands to greater solar radiation and wind movement, resulting in warmer temperatures and drier fuels throughout the fire season. Also, activity fuels from thinning or pruning may result in increased fuel load, unless mitigated as an integral part of the treatment. These side effects of canopy fuel treatment must be considered when determining the overall effect of a treatment on potential fire behavior. Although opening the crown spacing could increase surface rates of spread, it also makes the fire easier to control and even under severe weather conditions an open stand is less likely to support a crown fire (Graham & McCaffery, 2003). Even

though there is an increase in the rates of spread, flame lengths and fire line intensities are reduced to a level that could allow for initial attack by fire line personnel. When surface fires frequently burn, they tend to minimize surface and ladder fuel accumulations, which decreases the likelihood that crown fires would develop.

Low severity surface fires were relatively common (generally occurring every 4 to 25 years) in dry ponderosa pine and Douglas-fir forests prior to the 20th century (Agee 1993, Hann and others 1997). An appropriate fuel treatment would be a strategy of thinning (removing ladder fuels and decreasing tree crown density) followed by prescribed fire, piling and burning of fuels or other mechanical treatments that reduce surface fuel amounts. This approach would reduce canopy ladder and surface fuels, thereby reducing both fireline intensity and rates of spread severity and severity of potential wildfires (RMRS-GTR-120). Fuel models currently found in the North Fork Mill Creek planning are fuel models 2, 8, 9, and fuel model 10. Fuel models 9 and 10 are the predominant fuel models found in the planning area.

Thinning followed by slash treatment at the Haymen fire and Davis fire sites produced the most impressive results, with less than 80 percent canopy scorch while adjacent untreated areas were nearly completely consumed (Chong, Martinson, and Omi 2007). For example modifying a fuel model profile from a fuel model 10 (currently found in the North Fork Mill Creek planning area) to a fuel model 8 would alter rates of spread and flame lengths to a more manageable condition. This would allow land managers to conduct prescribed burns with less difficulty, less smoke and less risk of the fire escaping. For comparison purposes, Fire Behavior runs were done using Behave Plus 4.0.0. Tables 3-5 to 3-10 illustrates the differences in rate of spread, flame length and probability of mortality; and Figures 3-6 and 3-7 shows an example of fuel models.

Table 3-5: Fuel Model 8 Rate of Spread

Surface Rate of Spread (maximum) (ch/h)					
Mid flame wind speed	**10 % slope steepness**	**20 % slope steepness**	**30 % slope steepness**	**40 % slope steepness**	**50 % slope steepness**
2.0	1.1	1.2	1.5	1.8	2.3
4.0	2.3	2.4	2.7	3.0	3.5
6.0	3.9	4.0	4.3	4.6	5.1
8.0	5.7	5.8	6.1	6.4	6.9
10.0	7.8	7.9	8.2	8.5	9.0
12.0	10.0	10.0	10.0	10.0	10.0
14.0	10.0	10.0	10.0	10.0	10.0
16.0	10.0	10.0	10.0	10.0	10.0
18.0	10.0	10.0	10.0	10.0	10.0
20.0	10.0	10.0	10.0	10.0	10.0

Rate of Spread: A three person engine crew could build fire hand line12 ch/h with hand tools.

Table 3-6: Fuel Model 8 Flame Lengths

Flame Length (ft)					
Mid flame wind speed	**10 % slope steepness**	**20 % slope steepness**	**30 % slope steepness**	**40 % slope steepness**	**50 % slope steepness**
2.0	0.9	1.0	1.1	1.2	1.3
4.0	1.3	1.3	1.4	1.5	1.6
6.0	1.7	1.7	1.7	1.8	1.9
8.0	2.0	2.0	2.0	2.1	2.2
10.0	2.3	2.3	2.3	2.4	2.4
12.0	2.6	2.6	2.6	2.6	2.6
14.0	2.6	2.6	2.6	2.6	2.6
16.0	2.6	2.6	2.6	2.6	2.6
18.0	2.6	2.6	2.6	2.6	2.6
20.0	2.6	2.6	2.6	2.6	2.6

Flame Length: Four foot flame lengths are the limit fire line personal could safely and efficiently construct hand lines near a fire with hand tools.

Table 3-7: Fuel Model 8 Probability of Mortality

Probability of Morality (%)					
Mid flame wind speed	**10 % slope steepness**	**20 % slope steepness**	**30 % slope steepness**	**40 % slope steepness**	**50 % slope steepness**
2.0	7 %	7 %	7 %	7 %	7 %
4.0	7 %	7 %	7 %	7 %	7 %
6.0	7 %	7 %	7 %	7 %	7 %
8.0	7 %	7 %	7 %	7 %	7 %
10.0	7 %	7 %	7 %	7 %	7 %
12.0	7 %	7 %	7 %	7 %	7 %
14.0	7 %	7 %	7 %	7 %	7 %
16.0	7 %	7 %	7 %	7 %	7 %
18.0	7 %	7 %	7 %	7 %	7 %
20.0	7 %	7 %	7 %	7 %	7 %

Probability of Mortality is the likelihood that a tree will be killed by a fire.

Figure 3-6: Example of a Fuel Model 8

Table 3-8: Fuel Model 10 Rate of Spread

Surface Rate of Spread (maximum) (ch/h)					
Mid flame wind speed	**10 slope steepness**	**20 slope steepness**	**30 slope steepness**	**40 slope steepness**	**50 slope steepness**
2.0	3.8	4.3	5.2	6.4	8.0
4.0	8.2	8.7	9.6	10.8	12.4
6.0	13.7	14.2	15.1	16.3	17.9
8.0	20.0	20.6	21.4	22.7	24.3
10.0	27.1	27.7	28.5	29.8	31.3
12.0	34.9	35.4	36.3	37.5	39.1
14.0	43.2	43.7	44.6	45.8	47.4
16.0	52.0	52.6	53.4	54.7	56.2
18.0	62.4	61.9	62.8	64.0	65.6
20.0	71.2	71.7	72.6	73.8	75.4

Rate of Spread: A three person engine crew could build fire hand line12 chains per hour with hand tools. The areas highlighted in yellow are outside the capability of a three person engine for handline production.

Table 3-9: Fuel Model 10 Flame Lengths

Flame Length (ft)					
Mid flame wind speed	**10 slope steepness**	**20 slope steepness**	**30 slope steepness**	**40 slope steepness**	**50 slope steepness**
2.0	3.8	4.1	4.4	4.9	5.4
4.0	5.5	5.6	5.9	6.2	6.6
6.0	6.9	7.1	7.2	7.5	7.8
8.0	8.3	8.4	8.5	8.7	9.0
10.0	9.5	9.6	9.7	9.9	10.2
12.0	10.7	10.7	10.9	11.0	11.2
14.0	11.8	11.8	11.9	12.1	12.3
16.0	12.8	12.9	13.0	13.1	13.3
18.0	13.8	13.9	14.0	14.1	14.3
20.0	14.8	14.9	14.9	15.1	15.2

Fuel Model 10 Flame Length: Four foot flame lengths are the limit fire line personal could safely and efficiently construct hand lines near a fire with hand tools. The areas highlighted in yellow are over four foot flame lengths, and are too intense for direct attack by fire line personal.

Table 3-10: Fuel Model 10 Probability of Mortality

Probability of Mortality (%)					
Mid flame wind speed	**10 % slope steepness**	**20 % slope steepness**	**30 % slope steepness**	**40 % slope steepness**	**50 % slope steepness**
2.0	8 %	9 %	11 %	16 %	25 %
4.0	19 %	22 %	27 %	37 %	51 %
6.0	41 %	45 %	5 %	61 %	72 %
8.0	62 %	66 %	71 %	77 %	82 %
10.0	76 %	78 %	81 %	84 %	88 %
12.0	84 %	85 %	86 %	88 %	90 %
14.0	88 %	88 %	89 %	91 %	92 %
16.0	90 %	90 %	91 %	92 %	93 %
18.0	92 %	92 %	92 %	93 %	93 %
20.0	92 %	93 %	93 %	93 %	94 %

Figure 3-7: Example of a Fuel Model 10

Prescribe burning would have a two to three day impact on local airshed/air quality. This would include underburning and burning of handpiles. Units 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

Fuels Treatments

Commercial timber, Aspen enhancement and harvest Natural fuels (litter, brush, and trees) would be treated in Alternative 1. Treatment methods would be hand piling, pile burning, underburning, mowing and harvesting. The treatments would be used over a large area to reduce the fuel loadings and modify the fuel profiles of the planning area.

Commercial Timber harvest and sapling thinning

Treatment of any residual surface left over from timber harvest would be machine piled and burned. Underburning could also be used to treat any residual fuel left on harvested units. Surface fuels would be reduced to 15 tons per acre.

Aspen Enhancement

Thinning and underburning of aspen stands in the planning area would promote regeneration. Fire would stimulate suckering by removing overstory stems and stimulating root segment near the surface. Underburning would also remove competing understory vegetation and conifer seedlings and allow sunlight to reach the forest floor.

Hand Piling

The piling of understory brush, small trees, and down dead woody material by hand crews, into piles of woody debris that may be later burned or utilized. Chainsaws and hand tools would be used to cut the material to aid in the piling operation. The piles would be burned during the fall season.

Effects: Ladder fuels are reduced as a result of the piling of brush and small trees. The fuel loading is

reduced by the piling of the down dead woody material. The piles are burned in the fall season. Effects of this treatment on the stand are possible damage to residual trees, vegetation or soil when the pile is burned. Scorch of residual trees could occur if the pile is located too close to the dripline of residual trees.

Pile Burning
Burning the created landing and/or hand piles. The hand piles would contain woody material from brush, small trees, and other dead woody material found on the surface. The landing piles would contain the woody material (limbs, needles, bark and portions of the trunk) removed from trees during the harvesting procedure. Landing piles are much larger than the hand piles. This disposes of the piled fuel concentrations. The pile burning would occur in the fall season. A burn plan would be written which outlines the parameters under which the burning would occur.

When possible, utilization of piles would be encouraged rather then burning. Utilization is very dependent on existing market conditions. In past years, firewood has been salvaged from landing material on several timber sales. Also, landing piles could be utilized by the public to cut fire wood for local home use. After salvage operations, there is a small amount of clean up remaining, which consists of burning the residual piles.

Effects: Burning the pile eliminates the high concentrations (fuel loading) of woody material when the pile was created. Soil moistures and conditions (wet, frozen or dry) would have a strong influence on the effects of the fire on the soil. Soil microorganisms could be killed in areas of severely burned soil. Areas directly beneath and immediately adjacent to the burning piles would be affected. This damage would occur in the areas of large piles that maintain longer durations of heat. The effects of burning piles on the soil could be minimized by limiting the size of the piles and the amount of moisture in the soil. Pile burning is normally accomplished in the late fall after adequate moisture, either rain or snow, is present to prevent the spread of the piles. This timing would also limit the effects on the soil. Localized reductions in organic matter, loss of soil productivity in the immediate area and reduced water infiltration could result. Local, short-term effects on air quality would occur. These effects would include increases in carbon dioxide, carbon and particulates in the airshed. Cumulative effects of multiple burns in the same geographic area could contribute to a decrease in the air quality. Scorching of tree crowns is possible where landing piles are located close to residual leave trees. This scorching could result in tree mortality or reduced vigor. Trees killed by scorch could be left as future snags for wildlife benefits if not felled for public safety.

Escaped fires resulting from unexpected weather may occur and cause damage to the surrounding vegetation. Piles would need to be monitored and extinguished if weather conditions show that damage from escape would occur.

Mowing/Mastication
The treatment consists of mowing the understory of brush, small trees, and other vegetation. A mowing attachment is towed behind a dozer or tractor, or attached to the head of an excavator. The vegetation is chopped into small pieces and left on the surface.

Effects: Ladder fuels are reduced by mowing. Effects of this treatment on units are possible damage to residual trees due to scraping while the machine is maneuvering through units.

Underburning
Underburning is the use of prescribed fire underneath existing or residual trees to treat natural and /or created fuels such as, dead woody material, needle litter and dead brush. The majority of the units in the project area would require thinning and/or mowing before underburning could be done safely and effectively. Underburning unit boundaries would be coordinated with individuals from archaeology, silviculture, fire management and the Tribes. In most of the units needing to be underburned, the burning would be completed one to four years after the original hand piling or mowing. Most brush and some young trees are consumed or killed during this treatment. The underburning is conducted in the spring and fall seasons. A burn plan would be written which outlines the parameters under which the burning would occur.

Effects: The treatment reduces the total fuel accumulation and fuel ladders. The effects on trees vary by species, size and bark thickness. Ponderosa pine is a fire tolerant species that has evolved with fire and is able to withstand low to moderate intensity fires. Other tree species such as Douglas-fir and grand fir are less fire tolerant then ponderosa pines and are susceptible to more damage and higher mortality rates, particularly in the smaller size classes. Some trees would die due to crown scorch, ladder fuels carrying the fires through the tree crown, and large fuel accumulations around the tree base could cause cambium damage. Root damage and tree mortality could occur if soil moistures are too high or residual heat created by large fuel accumulations occurs. During any burning operation, a possibility exists that a burn may escape control and become a wildfire. All firelines would be completed by hand, mechanical equipment, or small all-terrain vehicles (ATV) pulling a fireline plow. Firelines should be rehabilitated after burning if there is a possibility of resource damage.

The effects of underburning on the soil and litter layer are dependent on the intensity of the burn. If soil temperatures are too hot, detrimental soil conditions could occur. To limit soil impacts and to meet other management objectives, these underburns would need to be of a low to moderate intensity. The duff or litter layer should not be reduced by more than 50 percent. Additionally, the fire would release nutrients stored in the litter and slash and allow these nutrients to become available for the remaining stand. These nutrients are especially valuable to the establishment of new growth after a fire. Burn plans should specify fuel amounts consumed in each size class.

Seedlings, saplings, brush and grasses would be consumed or killed during the underburning. Sprouting of the grasses and brush may occur if soil moistures and seed sources are receptive. This sprouting would create browse for foraging animals. Seeds and saplings may need to be fire lined for protection, for future stocking levels to be met (see silviculture prescriptions). Large dead, down and woody debris materials could be consumed during burning. Some of the large down may be consumed, but due to the nature of the fuel reduction, and consultation with the Eastside Wildlife Biologist, this is acceptable as the scale of the area treated is small compared to the entire landscape of the planning area.

Fire’s effect on bitterbrush varies widely and is difficult to predict. Generally, fire would kill the tops of the plants. It is documented that bitterbrush would resprout after fire and that it would regenerate from seed either cached in the ground or from seeding in, from adjacent stands. However the success of resprouting varies greatly often depending on site specific qualities and we could not currently predict a successful response from resprouting. Additionally, younger plants seem to resprout better then older ones. Underburning in bitterbrush plant communities should be monitored to determine when second entry underburning should occur. The historic fire return intervals of 15 years were too frequent to allow bitterbrush to survive in any quantity across the landscape.

Local, short-term effects on air quality would occur. These effects would include increases in carbon dioxide, carbon and particulates (PM 2.5 & 10 microns) in the airshed. Cumulative effects of multiple burns in the same geographic area could contribute to a decrease in the air quality.

Fireline Construction
In the units to be underburned, firelines would need to be constructed to serve as control lines during burning operations. Existing roads or skid trails would be utilized as firelines where practical. The firelines would be constructed either with hand crews with hand tools, with a small plow pulled by an ATV, or with another form of mechanized equipment (if needed due to fuels or topography). Firelines would be constructed to minimum standards needed to control the burns. Normally a 4 to 6 foot clearing with a 1 to 1.5 foot wide mineral soil line would be sufficient. The clearing would be cleared of all downed woody fuels, no duff, grasses or other ground cover would need to be removed. Brush may need to be cut out if line locations could not avoid them.

Effects: The mineral soil line has the potential to channel water which could cause erosion. The construction of water bars in the firelines would serve to limit erosion problems. Water bars would be constructed on all slopes greater than 10 percent. The erosion potential would decrease over time as normal needle cast and other litter starts to cover up the firelines. This process would start within one year and the lines should be completely covered in three to five years.

Combined fuel treatments
In some instances a combination of treatments would occur in the same unit, such as mowing/mastication, thinning, piling, pile burning, and underburning. Underburning would occur at least one year, and possible several years after other treatments (hand pile, pile burn, thinning, and/or mastication).

All prescribed burning would occur under the guidance of a site specific burn plan that would be developed for each burn area prior to ignition. The burn plan includes the weather and fire behavior prescriptions, resource needs, contingency plans, mitigations, smoke management requirements, lighting techniques, risk assessment, hazard analysis, and site specific resource objectives. Burn plans are written in accordance with the current 5140 directive (FM-5140), and must meet all required elements prior to approval of the plan by the Forest Supervisor.

Alternative 2 – Direct and Indirect Effects
Alternative 2 would treat approximately 1277 acres, 68 acres with mechanical thinning, 537 acres of thinning and burning, 25 acres of sapling thinning, 47 acres of aspen enhancement and 610 acres with prescribed burning only. This is about 19 percent of the planning area. This alternative would not allow for a breakup of continuous blocks of high fuel hazard areas. By not reducing the acres of the high hazard areas it would not reduce the effect on a fire moving through the area as well as providing a safer area for suppression resources to either suppress new starts. In turn it could not alleviate some of the environmental damage and also slow down the forward movement of a wildfire fire, reducing the success of suppression operations.

The impacts from reducing the fuel loadings to specific fuel models, and the impacts from the various fuel treatments are the same as described above for Alternative 1.

Summary of Effects for Alternatives 1 and 2
Fuel treatments would have a direct effect on canopy base height and crown bulk density. Commercial

and non-commercial fuel treatments would raise the average canopy base height by thinning from below and reduce horizontal canopy continuity. Underburning would also scorch the lower live limbs and help raise canopy base height. Where currently the treatment units have a general height of 1 to 8 feet to the base of the average lower canopy, there would be an increase to around 15 to 20 feet. This would also have an effect of reducing the overall crown bulk density. By increasing average canopy base heights, surface fires would have a greater tendency to stay on the ground and not ignite larger tree canopies. Horizontal canopy bulk crown density would be reduced, thus reducing crown fire sustainability.

Fire spreads by burning through surface fuels and by spotting. Spotting is greatly enhanced when torching and crowning loft fire brands in the convection column. These fire brands could cause spot fires over ½ mile away from the main fire. Fires that spread by spotting are much more difficult to contain than fires spreading through the surface fuels.

The proposed reduction of canopy, ladder and surface fuels would greatly reduce the potential for long range spotting from the treatment units. A passive or active crown fire burning towards a treated area may spot into it or burn on the surface and in the crowns as it reaches it, but fire would drop to the surface upon entering the treated area and intensities would be reduced allowing suppression resources a better opportunity at containment in all but the most extreme conditions.

In terms of historic conditions the main difference between the two alternatives is the number of acres within the planning area that are moved from a condition class 2 or 3 to a condition class 1. As described previously, condition class 1 (CC1) stands are at or near their historical range of conditions. Condition class 2 (CC2) are areas that have missed at least one fire return interval and are considered in a moderately altered condition from the historical range in attributes such as vegetation species composition and structure. Condition Class 3 (CC3) are areas where fire frequencies have departed by multiple return intervals and vegetation attributes are considered to be in a significantly altered condition. Management actions that can effect a change in condition class are those that remove fuels and include (but are not limited to) mechanical thinning which removes fuels from the site, piling of fuels and burning.

The emphasis of the proposed mechanical thinning treatments under Alternative 2 to focus on those stands which were less than 80 years old and were areas that had some level of regeneration (clearcut, shelterwood, seedtree) harvest prescribed in the past. Generally, these stands would be classified as either a CC1 and CC2 and also include areas that would meet the definition of CC3. For Alternative 2 the area prescribed for mechanical treatment (thinning, thinning plus burning, and aspen/cottonwood enhancement) is approximately 667 acres. In addition, around 610 acres are identified for prescribed burning treatments. These areas are located in the easternmost portion of the planning area and are currently classified as either CC2 or CC3. The CC2 areas are generally those grassy meadow areas with conifer encroachment from the adjoining stringers of timber located in the draws and riparian areas. The timbered stringers would generally be classified as CC3. Proposed treatment in these areas include pretreatment by hand of understory vegetation followed with prescribed fire to reduce fuel loadings. Post treatment condition is expected to be a CC1 in the grassy areas and the timbered stringers would be moving towards a CC2. In order to protect other resource values (water quality and wildlife habitat), treatments in the timbered stringers need to be lighter than what probably would have occurred naturally if fire had burned through the area. Overall, this alternative would result in moving, or maintaining, 1277 acres (19%) in a state that has fuel loadings and vegetation attributes more indicative of historic conditions.

For Alternative 1 (the proposed action) the stands proposed for treatment are not only the 667 acres of stands less than 80 years old, but also an additional 1525 acres of stands that are over 80 years old. These stands range in classification from Condition Class 1 through Condition Class 3 Proposed thinning and fuels treatments (burning, piling, mastication) in these stands would move those areas into a state more indicative of Condition Class 1 or Condition Class 2. The area proposed for prescribed burning (610 acres) is the same as for Alternative 2. Overall, this alternative would result in moving, or maintaining, 2802 acres (42% of the area) in a state that has fuel loadings and vegetation attributes more indicative of historic conditions.

- No Action alternative does not propose any projects in The North Fork Mill Creek Planning area and fire suppression would continue to occur.

- Alternative 1 – Proposed Action would allow for a breaking up of continuous blocks of high fuel hazard areas. This breaking up of the high hazard areas would have an effect on a fire moving through the area as well as providing a safer area for suppression resources to either suppress new starts in turn may alleviate some of the environmental damage and also slow down the forward movement of the wildfire, allowing for a higher success of suppression operations.

- Alternative 2 would not allow for a breakup of continuous blocks of high fuel hazard areas. By not reducing the acres of the high hazard areas it would not reduce the effect on a fire moving through the area as well as providing a safer area for suppression resources to either suppress new starts. In turn, it may not alleviate some of the environmental damage and also slow down the forward movement of a wildfire fire, reducing the success of suppression operations.

Old growth left in the Planning area would benefit from reduced potential mortality from the effects of fire. The other characteristics of old growth would be sustainable through time if future repeated maintenance fire is used every 15-30 years.

Treatments of underburning would be done over two entries around 5 years apart to reduce surface fuels while maintaining visual objectives. To achieve the level of surface fuel reduction needed, prescribed fire intensities could have the potential to heavily scorch and/or torch individual and small groups of trees. These effects could be lessened by utilizing a lower intensity initial underburn that would consume a good portion of the fine fuels while avoiding stark changes in visual quality.

Roads would be utilized as much as possible for underburn perimeters to lessen the need to construct firelines. Approximately 3 miles of hand fireline would need to be constructed by handcrews for the underburning proposed. Handlines would be constructed using hand tools or with a small plow pulled by an ATV leaving 12 to 18 inches wide of bare ground that would create a barrier to surface fire spread. Fires create potential for erosion and waterbars would be constructed on firelines as described in the soils section. Water bars used during burning would be angled into the burn area to catch any burning material that rolls down the fireline to direct it back into the fire. After underburns are declared out, the waterbars would be angled away from the burn area to direct water flow out of the burn to prevent erosion in the ash.

Future fire suppression costs have the potential to be reduced within the next 15 to 25 years because of anticipated reduction in future fire intensity. These reduced intensities would give more options to fire suppression managers and resources during suppression actions.

The road decommissioning/closures, trail construction, and culvert removal/replacement components of

Alternatives 1 and 2 do not have any impact on fuels.

Cumulative Effects for All Alternatives
Cumulative effects examine the effects of the alternatives taken in combination with past, present and reasonably foreseeable actions. The cumulative effects analysis includes the area bordered on the south by The Dalles Watershed Fuelbreak Project as well as the Billy Bob Hazardous Fuels Reduction project and past harvest activities.

No Action Alternative. Under the No Action Alternative, impacts to the current fuels profile in the projects area would be negligible in the short-term and moderate to high in the long-term. The No Action Alternative implies continuance of current conditions and current management and exacerbation of the currently overstocked fuels conditions. Ignitions would continue to occur. Under the No Action Alternative, fuel conditions would continue to move to a dense high dead to live ratio situation. Resistance to control would increase while the ability to provide for firefighter and public safety would continue to decrease. Ignitions can be anticipated to move both on to and out off The North Fork Mill Creek Project Area in the absence of human made or natural barrier to fire.

Alternative 1. The North Fork Mill Creek Planning area under Alternative 1 would benefit from by commercial harvesting, thinning, aspen enhancement and underburning 2885 acres out of 6600 acres in the planning area. Because Alternative 1 treats a substantial portion of the landscape, the vegetation would move 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.

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 fuels reduction projects, including The Dalles Watershed Fuelsbreak and Billy Bob Fuels Hazardous Fuels Reduction project.

Alternative 1 – Proposed Action would enhance the effectiveness of the neighboring fuels reduction projects by reducing the likelihood of an intense wildfire starting in either The Dalles Watershed or in the North Fork Mill drainage in treated areas. This would be done by breaking up continuous blocks of high fuel hazard areas. There is a possibility of smoke intrusion in the communities of the Hood River Valley, Moiser, The Dalles, Dufur, and areas within the Columbia River Gorge National Scenic Area. All prescribed 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. See the Air Quality/Smoke Management section for more details.

Alternative 2. The North Fork Mill Creek Planning area under Alternative 2 would benefit from by thinning, aspen enhancement and underburning 1277 acres out of 6600 acres in the planning area. This treatment is less than 20 percent of the North Fork Mill Creek Planning area. Wildland fire behavior would be altered in treated stands. Much of the existing condition would be maintained. Fuel levels would remain high until an uncontrolled wildfire occurred. Wildfires not immediately controlled could be expected to be stand replacing events due to high fuel levels. This alternative would continue to

perpetuate the current condition of vegetation in the North Fork Mill Creek Planning area which has been influenced by past fire suppression activities.

Past actions affecting the project areas 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 fuels reduction projects, including The Dalles Watershed Fuelbreak and Billy Bob Hazardous Fuels Reduction project. Alternative 2 would not be as effective as Alternative 1. Alternative 2 would not allow for a breakup of continuous fuels blocks of high hazard areas. There would still be the a possibility of smoke intrusion in the communities of the Hood River Valley, Moiser, The Dalles, Dufur, and areas within the Columbia River Gorge National Scenic Area . All prescribed 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. See the Air Quality/Smoke Management section for more details.

Air Quality / Smoke Management

Existing Conditions

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 six miles Southwest of the North Fork Mill Creek Planning area. The Badger Creek Wilderness, a Class II Airshed is nine miles south of The North Fork Mill Creek Planning area. The city of the Dalles is a state receptor site is 12 miles Northwest 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 prescribed burning activities would comply with Forest Service Manual direction (FSM 5100, Chapter 5140)

Currently, and in the future, all planned ignitions are and would be conducted according to the Operational Guidance for the Oregon Smoke Management Program (OSMP). The Operational Guidance contains the direction for meeting the terms of the OSMP. The Environmental Protection Agency has approved the OSMP as meeting the requirements of the Clean Air Act, as amended. The OSMP, which is administered by the Oregon State Forester, regulates the amount of forestry related burning that could be done at any one time. The amount of burning that could occur on any one day depends upon the specific type of burning, the tons of material to be burned, and the atmospheric conditions available to promote mixing and transportation of smoke away from sensitive areas. For each activity requiring prescribed fire, the Forest Service requires a written, site-specific prescribed burning 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.

Smoke sensitive areas near the North Fork Mill Creek planning area also include: the communities of the Hood River Valley, Moiser, The Dalles, Dufur, and areas within the Columbia River Gorge National Scenic Area. 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.

Smoke management concerns may require that some stands that have proposed underburning be treated by hand and/or machine piling. Pile burning could be accomplished during the passage of weather fronts that move smoke out of the area very quickly, whereas underburning requires very specific environmental condition to implement.

Environmental Effects

Direct and Indirect Effects
The direct effect of prescribed smoke for each action alternative would be directly related to the volume of timber to be removed. The direct effects of prescribed 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 prescribed 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.

Cumulative Effects
The cumulative effects on air quality of prescribed 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.

Vegetation Resources

A more detailed vegetation resource/silviculture report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below. Reference material is contained in the full specialists report.

Existing Conditions

Information on the vegetative conditions of the larger landscape within which North Fork Mill Creek Restoration Project lies is provided largely by an analysis conducted in the recent past by the Mt. Hood National Forest: the Mill Creek Watershed Assessment. Refer to the Silvicultural Report in the project record for maps with the boundaries of the landscape area.

The Mill Creek Watershed Assessment 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 Mill Creek Watershed Assessment (http://www.fs.fed.us/r6/mthood/documents/Watershed_Analyses/Mill_Creek_WA.pdf). The Silvicultural Report for the project provides an additional summary of this landscape information as related to the project. The previous landscape analysis provides the landscape context for the analysis of vegetation at the North Fork Mill Creek project level.

The analysis area is 6607 acres. The analysis area boundary for disclosing effects at this more site-specific level is the North Fork Mill Creek watershed, as well as parts of Neal and Mosier Creek headwaters, where stands were evaluated for possible treatment actions. The Silvicultural Report provides detailed documentation of individual stand conditions and the selection process. Information sources included stand records and field surveys conducted in the 1980s and 1990s, as well as field reviews conducted in the year 2007 (on file at the Hood River Ranger District in Mt.Hood/Parkdale, Oregon).

Landscape Scale
The Mill Creek Watershed Analysis describes the landscape of the east slope of Mt. Hood. Two dominant vegetative zones are included in the North Fork Mill Creek watershed. Dry grand fir, lodgepole pine and white pine are predominant in the west half of the drainage. The eastern half of the drainage on National Forest System (NFS) lands features open, grass covered slopes and forests of hot, dry ponderosa pine, with Oregon white oak dominating the lower elevations and drier sites.

Typically, across this landscape the fir and Douglas-fir dominated forests are dense single or multi-storied stands. The drier sites where ponderosa pine is more common may be less densely stocked, and are typically in a multi-storied condition. Douglas-fir is often a major component in the mid and lower canopies except on the driest sites, where ponderosa pine is prevalent, along with Oregon white oak. The lodgepole pine stands at mid to upper elevations in this landscape are often mixed with other species (Douglas-fir, grand fir) and most commonly form dense, single-storied canopies.

The analyses completed at the larger landscape scale (refer Mill Creek Watershed Assessment) 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 100 or so years of fire exclusion and suppression in combination with European settling 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 really 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 had 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.

An increase in the amount of Douglas-fir forest type has occurred, with a correlating decrease in ponderosa pine and western larch dominated forest. However, the more notable changes have occurred in the structure classes and patterns of vegetation across this landscape. Increased tree densities, higher proportion of multistoried stands, reduction in amount of young, seedling/sapling forest (especially in the ponderosa pine and Douglas-fir types), and more continuous coverage of forest canopies across the landscape are the major elements that have changed. In many areas, the forest conditions are outside the historical ranges, influencing the normal functioning of ecological processes across the landscape (MacCleery 1998). The nature and effect of these changes are discussed more thoroughly in the assessments referenced above and under the section on "Influence of major ecological processes and disturbances" later in this section.

The lower slopes of the Cascade Range (where the project lies) have a relatively high natural level of forest fragmentation. This inherent level of fragmentation is the result of a diverse topography and dissected slopes, with abrupt changes from one site and vegetation type to another. In historical times, this would result in fires of a wide variety of sizes, frequencies, and intensities. Fires in the stands on the dry southerly aspects tended to be more frequent and often burned onto the northerly aspects. There they would either die out quickly, due to the more moist fuel conditions, or they might burn at a low to moderate intensity through portions of the area. Under certain conditions, the fire would move into tree crowns and be carried quickly along due to the dense canopy on these northerly slopes, resulting in a stand-replacing fire.

Under this natural disturbance regime, a fairly fine-grained landscape mosaic of different forest patches would be created, and a predictable and repeated pattern of vegetation tended to develop in the foothills of Mt. Hood. Semi-open ponderosa pine forests dominated the warm, dry southerly aspects, with somewhat more dense single or multi-storied ponderosa pine/Douglas-fir forests (sometimes mixed with lodgepole pine) on the cooler, moister northerly aspects. Older overstory trees of ponderosa pine and Douglas-fir would often exist in both of these areas.

Currently, the landscape exhibits a different pattern of forest cover and structure types than it has historically because of fire suppression, past logging, and the natural succession of the forest (USDA 2004). The average patch size has decreased and the number of patches has increased. Crown closure has increased. Stands once differentiated by stocking levels, canopy levels, and crown closure have become structurally more similar and continuous across the landscape. These changes have affected the normal functioning of ecological processes, such as fire, insects, and disease relationships (refer to discussions under later sections of this section).

Site-Specific or Project Area Scale

All proposed treatments in the project occur within the upper end of the North Fork Mill Creek watershed and the headwaters of Mosier and Neal Creeks. Douglas-fir dominated forests growing on warm, dry grand fir habitats cover the upper slopes of the drainages. These forests are of concern because of the dramatic change in condition that these areas have experienced over the past 100 years. There is an estimated total of 3980 acres of this Douglas-fir and grand fir forest type in the upper reaches of Mill Creek. Near the National Forest boundary in the northeast corner of the project area, the hot, dry pine-oak and Douglas-fir type covers 2625 acres.

Tree density within these Douglas-fir stands is relatively high compared to what most commonly existed historically on these sites (refer also to discussion in Chapter 3, Fire/Fuels Management). It is important to understand that this dense Douglas-fir forest type is not in itself a condition that was never experienced in the past. There were pockets of forest on similar sites across the historical landscape that by chance escaped one or more fires and developed the dense canopy and/or multi-storied conditions similar to those that are seen in the project area today. Historically, fires burning relatively frequently in forests dominated by thick-barked tree species would have created mortality mainly to understory trees, reducing competition for the residual western larch and ponderosa pine. Seed beds were created for regeneration in openings for the establishment of new cohorts (Oliver & Ryker 1990)

However, because of fire suppression and exclusion across the entire Mt. Hood Forest over the last century (particularly the lower and moderate intensity “thinning” types of fire), these dense Douglas-fir- dominated forests have developed over far more area than historically occurred. This has resulted in increased fuels and risk of larger scale, high severity fire, with the associated threat to resource and human values.

Accentuating the effects of fire suppression has been the logging that occurred beginning in the 1850s in much of the Douglas-fir forest type in Mill Creek. Prior to this, there appears to have been numerous mature, overstory ponderosa pine and western larch in these stands, and probably some overstory Douglas-fir as well. From evidence of the stumps that remain, it is estimated that from 30 to perhaps 60 trees per acre of these mature and older trees existed on these sites. Most of these larger pine trees were removed by logging, sometime between 1850 and 1940. The understory seedling and sapling Douglas-fir and grand fir that occupied the site at that time, along with new regeneration that occurred after logging, has grown into the dense, mature stands of fir that exist on the sites today. Table 3-11 presents stand size class distribution within the project area boundary.

Table 3-11: Stand Size Class Distribution

Stand size class	Acres	Percentage of area
Grassland	310	4
Seedling/sapling	970	15
Pole/immature/multi-story	2060	31
Mature/overmature	3260	49

One half of the analysis area contains stands of mature to overmature (large diameter) trees. Further, an additional 280 acres are multi-story stands with large legacy trees (see Figure 3-8). Even though there were larger pine removed over the last century or so, there is no shortage of large diameter trees of the various species in the watershed. Individual legacy ponderosa pines have become surrounded by grand fir ingrowth and many show signs of drought stress (flat tops and fading crowns) from being out competed by the aggressive water-using specie.

Figure 3-8: Dense multi-storied stand.

Table 3-12: Existing Site and Vegetative Condition of Proposed Treatment Stands within North Fork Mill Creek Restoration Project Area.

Stand Group	Forest Type: Vegetation Composition	Forest Structure; Density, Size & Age Classes	Vegetation Condition	Other
A1	Dry Grand Fir Type. GF, DF, WH, WRC, LP, minor amounts PP, WL. Undergrowth low shrubs and grass (ninebark, mountain maple, pinegrass), shrubs suppressed and decadent. Very few understory seedling or sapling trees; moss mat across portions of area.	Dense single and two storied forest, from 300-500+ tpa overall, with main canopy composed mostly of DF trees in 8-16" dbh range. These trees are typically 70-110 years old. Remnant groups and scattered individual old overstory DF and PP (+-200 years, up to 28" dbh, normally < 5 tpa but some areas at higher density). Very few snags; low to moderate amount downed wood.	Generally healthy, no serious insect or disease.	Occasional, scattered stumps indicate where larger overstory PP were removed 30-50+ years ago. Light downed fuels. Generally east and north facing slopes.
A2	Dry Grand Fir Type. GF, DF, WH, WRC LP, minor amounts PP, WL. Undergrowth low shrubs and grass (ninebark, mountain maple, pinegrass), shrubs suppressed and decadent. Short-lived GF seedling or sapling trees in gaps created by root disease.	Dense single and two storied forest, from 300-500+ tpa overall, with main canopy composed mostly of DF trees in 8-16" dbh range. These trees are typically 70-110 years old. Remnant groups and scattered individual old overstory DF and PP (+-200 years, up to 28" dbh, normally < 5 tpa but some areas at higher density). Many snags; moderate to high amount downed wood.	Dwarf mistletoe in DF, heaviest infection in older trees. Root rot pockets common, infecting grand fir and Douglas-fir. Poor health and form in this group.	Shallow, rocky soils in parts of area, especially along ridgelines. Some stands with evidence of partial cutting many decades ago (over 60 years), removing much of the overstory PP and WL. Heavy downed fuels from root rot mortality. Generally east and north facing slopes.
A2B	As above, with better representation of PP and WL.	As above	As above.	Generally south and west facing slopes. Proposed for underburning.
B1B	Hot, Dry Pine-Oak and Douglas-fir Type. Composed mainly of PP and DF with GF encroachment.	Dense second growth stands 40-80 years, 10-18" dbh.	Generally healthy, no serious insect or disease.	Proposed for underburning

Stand Group	Forest Type: Vegetation Composition	Forest Structure; Density, Size & Age Classes	Vegetation Condition	Other
B2	Hot, Dry Pine-Oak and Douglas-fir Type. Composed mainly of PP and DF with GF encroachment.	Dense single and two storied forest, from 300-500+ tpa overall, with main canopy composed mostly of DF trees in 9-16" dbh range. These trees are typically 70-110 years old. Remnant groups and scattered individual old overstory DF and PP (+-200 years, up to 28" dbh, normally < 5 tpa but some areas at higher density). Many snags; moderate to high amount downed wood.	Dwarf mistletoe in DF, heaviest infection in older trees. Root rot pockets common, infecting grand fir and Douglas-fir. Poor health and form in this group. Overstocked for this vegetation type.	Generally east and north facing slopes
B2B	As above	As above.	As above.	Generally south and west facing slopes. Proposed for underburning.
C	Dry Grand Fir and Douglas-fir with inclusions of aspen and cottonwood.	Decadent *Populus* spp. Encroached upon by DF and GF.	Declining	Aspen and cottonwood stands have become decadent from lack of natural fire and are reproducing poorly.
D	DF, PP, GF. Shrub species include ocean spray, ceanothus, manzanita, chinkapin, maple	Sapling to immature (early seral) stands from regeneration harvest 15-30 years ago. 300-800 tpa. Tree diameters up to 9" dbh. Light retention overstory	Dwarf mistletoe infection in remnant overstory DF and PP. Brush providing competition in some stands.	
E	Hot Dry Pine Oak and Douglas-Fir Type. Bunchgrass meadow with individual PP/DF/OWO			

Abbreviations: PP = ponderosa pine; DF = Douglas-fir; LP = lodgepole pine; GF = grand fir; WL = western larch; WH = western hemlock; OWO = Oregon white oak; WRC = Western Red Cedar
dbh = diameter breast height; tpa = trees per acre
Acreages are derived from Geographic Information System data and are not exact.

Table 3-13: Summary of Stand Groups for Project Area

Stand Group	Proposed Action Acres (Logging System)	Proposed Action Units	Alternative Action Acres (Logging System)	Alternative Action Units
A1	154 (Tractor)	7, 8, 13, 27, 30, 62	34 (Tractor)	7, 8, 13
A2	973 (Tractor)	1, 2, 3, 4, 5, 6, 19, 20, 21, 22, 23, 31, 35, 36, 37, 38, 39, 40, 41, 42, 43, 58, 59, 60, 61	0	
	11 (Cable)	59C	0	
A2B	350 (Tractor)	16, 17, 18, 24, 25, 26, 28, 29	97 (Tractor)	16, 24, 26, 28
B1B	149 (Tractor)	14, 15, 49, 51, 52	114 (Tractor)	14, 15, 52
B2	91 (Tractor)	9, 44, 47, 57, 63	24 (Tractor)	47, 63
	20 (Cable)	41C	0	
B2B	425 (Tractor)	10, 11, 12, 45, 46, 48, 50, 53, 54, 55	296 (Tractor)	10, 11, 12, 45, 46, 48, 50, 53, 54, 55
	30 (Cable)	52C, 56C	30 (Cable)	52C, 56C
C	25	70, 71, 72	47	81, 82, 83, 84, 86, 87
D	47	81, 82, 83, 84, 86, 87	24	70, 71, 72
E	610	91, 92, 94	610	91, 92, 94
TOTALS	**2885**		**1276**	

Influence of major ecological processes and disturbances
Ecological processes and disturbances directly affect the diversity of plant and animal communities within an area over space and time. The better this interrelationship is understood, the better we will be able to assess the integrity and sustainability of our ecosystems and plan our actions to maintain healthy, properly functioning ecosystems into the future. 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 analyses referenced earlier. The primary or most obvious disturbances or factors of change, influencing vegetation in the project area include fire, diseases, insects and timber harvest. For example, western larch, a productive species tolerant to insects and diseases, has been replaced by less productive, shade-tolerant species, where insects and diseases cause far more serious damage to the replacement forests. These replacement forests also tend to be overstocked with vertical structure; they are highly vulnerable to abnormally intense wildfires (Carlson et al. 1995). A brief discussion of insects, diseases, and timber harvesting follows below. A discussion of Fire/Fuels Management occurs in an earlier section of this chapter. For further information, refer to the Silvicultural Report in the project record.

Insects and diseases are 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 fire cycles, they probably existed most commonly at endemic levels (i.e., present in an area but causing low or moderate levels of mortality). However, 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).

Dwarf mistletoe
The pathogen currently causing the most obvious affect on the forests in the Mill Creek area is dwarf mistletoe (*Arceuthobium spp.*) on Douglas-fir. It is also found in many of the western larch and ponderosa pine. 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 are western larch snags throughout much of the project area, with evidence that dwarf mistletoe was the cause of mortality.

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.

Historically, wildfires have been the most important single factor governing the distribution and abundance of dwarf mistletoes (Alexander and Hawksworth 1975 in Hawksworth and Wiens

1996; Conklin and Armstrong 2001). Fires are frequently effective in limiting dwarf mistletoe populations because trees usually return to burned sites much faster than the parasite does. In addition, heavily infested trees have highly flammable witches' brooms and lower live crowns, which may increase intensity of fire and tree (and associated mistletoe) mortality. In some situations, fire can increase, rather than decrease, abundance and distribution of mistletoe populations. Low and mixed severity, spotty fires may leave live, infected trees on the site that infest new tree regeneration. Without fire, dwarf mistletoe continues to infect the trees coming up underneath the overstory. The infected understory trees are unlikely to grow to a very large size to become "old growth" stands. The sugars and nutrients produced by the tree are diverted to the branch that has the dwarf mistletoe plant growing in it, allowing very little diameter or height growth for the tree. A tree with mistletoe brooms can provide nesting habitat for birds and small mammals, and they are very common on the eastside of the Mt. Hood National Forest. Douglas-fir trees with dwarf mistletoe generally provide excellent fuel in a crown fire, as well as ladder fuels for a ground fire to reach crowns. Dwarf mistletoe creates a special kind of "structure", but it alters the natural "functioning" of the tree. Thinning in an infected stand does little to slow the infection, because the understory is already infected. Management options are few in a stand infected with dwarf mistletoe.

The absence of fire and partial cutting in the early 1900s in the project area has contributed to Douglas-fir- dominated, dense, and often multi-canopied stand conditions, which are particularly favorable to dwarf mistletoe. Dwarf mistletoe spread rate is fastest in the multi-storied stands where mistletoe seeds from infected overstory trees "rain down" on susceptible understory trees. Seedlings and saplings growing under a heavily infected overstory are killed at an accelerated rate. They often die before reaching maturity or cone-bearing age.

In the project area, the severity of dwarf mistletoe infection is very high in older age classes of Douglas-fir as well as in western larch and ponderosa pine. Many of the older (150+ year) Douglas-fir in the stands within the project area are infected with dwarf mistletoe, most with 100 percent of the crown affected. Huge witches' brooms are common on these trees; some are already dead. Stands that were harvested in the past with moderate to light retention levels allowed increased sunlight to reach the trees and incipient levels of infection soon grew to heavy levels of infection. The degree of infection in the younger Douglas-fir trees (<120 years) varies across the project area, from very low levels in some stands to very high levels in others. Generally, where heavily infected Douglas-fir overstory exists, the infection level in the adjacent and understory trees is also high and would be expected to continue to increase as long as the source of infection exists.

Root disease

The dense, multi-canopied Douglas-fir and grand fir dominated forests in the area are perfect conditions for the proliferation of root disease. Most of the stands in the watershed have some level of root disease present, found most often in the Mill Creek drainage as laminated root rot (*Phellinus weirri*). Highly susceptible species include Douglas-fir, grand fir, mountain hemlock, and white fir. Species that are tolerant or resistant to laminated root rot include lodgepole pine, western white pine, ponderosa pine, and western red cedar (Goheen and Willhite 2006). These 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). We recognize that root decay and stem decay are perfectly 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. Once again, in the absence of fire, root decay has become very active, probably outside its range of natural variability in these stands. Fire does not eliminate root disease, but there is evidence that it slows it down, especially when its host is consumed. 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. These organisms now have far more of their favored habitat available to them (dense, multi-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, ponderosa pine and larch. Not only were the less susceptible species removed, the cutting of Douglas-fir accelerated the spread of the root disease through the remnant stumps. Also see Forest Health Protection Site Report (Hildebrand and Hostetler 9/2007). Root disease pockets throughout the analysis area have created an abundance of downed wood and snags (see Figure 3-9).

Figure 3-9: Downed wood fuel concentrations from root disease mortality.

Timber harvesting has been a major contributor to the change in vegetative conditions that have occurred across the Mill Creek area. This impact has been more significant in some forest types, particularly the lower elevation ponderosa pine and drier Douglas-fir. Removal of the ponderosa pine in many of these forests, in combination with fire exclusion, has accelerated their development towards a multi-aged and multi-storied Douglas-fir condition. This, as described in other sections, has altered the normal functioning of ecosystem processes (Arno et al. 1995).

In the project area, records show about 1900 acres of the area proposed for management has previously been treated, during the period from 1973 to 1999 (see Table 3-14 below). The district does not have records of historical harvest between 1880 and 1970, only information from field observations.

Table 3-14: Acres by harvest type in North Fork Mill Creek project area.

Decade	Clearcut	Shelterwood	Thinning
1973-1979	17	11	720
1980-1989	295	373	93
1990-1999	27	39	327
2000-2008	0	0	0
Total	**339**	**423**	**1140**

Environmental Effects

The baseline condition against which changes to the vegetation will be measured is the current condition. Criteria used to determine effects on vegetation include: (1) total acres treated and acres treated within each affected forest type (particularly the dense Douglas-fir dominated forests); (2) changes in forest structure and composition; (3) how our actions compare to what conditions might have been historically (i.e. under a more natural disturbance regime, as discussed under "Fire Ecology" section in this Chapter); (4) effects on residual trees; and (5) effects on insect and disease processes and forest vulnerability to these elements.

This section only analyzes the impacts of the vegetation management treatment. It does not analyze the proposed trails, proposed culvert removals and replacements, seasonal and year-long road closures, or road decommissioning components of Alternatives 1 and 2 because there are no direct, indirect or cumulative effects to the vegetation from these projects.

Effects on Forest Types within the Project Area

No Action Alternative

No acres are treated under this alternative, and thus there are no direct or indirect effects to the vegetation. Existing conditions as described above under "Affected Environment" would be maintained. In the short-term, there would be no measurable direct or indirect change in the current condition of the area relative to insect and disease levels and vulnerability of the stands to infestations. The warm Douglas-fir sites, currently occupied by densely stocked Douglas-fir and grand fir stands, would experience the continuing spread of root disease and resultant mortality over the long-term, as well as continued and spreading infestation and mortality from dwarf mistletoe.

Alternative 1 – The Proposed Action

The proposed action would treat a total of approximately 2885 acres; 1177 with mechanical thinning, 954 acres of thinning and burning, 26 acres of sapling thinning, 45 acres of aspen enhancement and 684 acres with prescribed burning only. This equates to about 42 percent of the 6607 acre project area.

Most of the fuels reduction treatment proposed occurs within the Douglas-fir dominated forests of concern, located on the warm, dry/moist grand fir Douglas-fir habitat associations. About 1432 acres of this type would change from what is currently dense, mostly closed canopy forest to a semi-open condition. This represents 36 percent of the total acres of this forest type within the vegetation analysis area. About 27 acres of the aspen cottonwood enhancement fall within the dry grand fir type. Treatment would reduce the amount of grand fir on the small sites and encourage the regeneration of aspen and cottonwood. Approximately 742 acres of the hot, dry pine-oak and Douglas-fir would be thinned, or about 28 percent of the forest type in the analysis area.

Units 91, 92 and 94 in this alternative are low intensity underburns in open ponderosa pine/grass vegetation types. The treatments would result in little change in the current structure or species composition on these sites. A few trees per acre could be expected to be killed, and these would mainly be seedlings and saplings and thin-barked trees. An open forest with grass undergrowth would still remain after treatment.

Alternative 2
This alternative would treat a total of approximately 1277 acres; 68 with mechanical thinning, 537 acres of thinning and burning, 25 acres of sapling thinning, 47 acres of aspen and cottonwood enhancement, and 610 acres with prescribed burning only. This equates to about 13 percent of the project area.

A small representation of the fuels reduction treatment proposed occurs within the mixed conifer stands located on the warm, dry/moist grand fir Douglas-fir habitat associations. About 166 acres of this type would change from what is currently dense, mostly closed canopy forest to a semi-open condition. This represents four percent of the total acres of this forest type within the vegetation analysis area. Approximately 500 acres of the hot, dry pine-oak and Douglas-fir would be thinned, or about 19 percent of the forest type in the analysis area.

Units 91, 92 and 94 in this alternative are low intensity underburns in open ponderosa pine/grass vegetation types. The treatments would result in little change in the current structure or species composition on these sites. A few trees per acre could be expected to be killed, and these would mainly be seedlings and saplings and thin-barked trees. An open forest with grass undergrowth would still remain after treatment.

Effects on Forest Structure and Composition:

Alternative 1 – Proposed Action
Low intensity prescribed burn treatments (Units 91, 92 and 94). About 610 acres of land would be burned with a low intensity underburn. There would be a relatively minor change to the vegetation with this treatment. This burn would perpetuate the current condition of naturally open, grassy slopes, and scattered ponderosa pine trees of all sizes and ages. Most of these trees would survive the burn, though some of the smaller seedlings and saplings may be killed. The underburn would remove some of the needle and litter layer that has accumulated over many decades and stimulate growth of the grasses and forbs. The lower limbs of some trees may require pruning prior to burning to prevent torching and subsequent mortality.

Thinning treatments (all remaining units). This alternative would mechanically thin about 2151 acres of forest, including 23 acres of sapling stands. The stands being treated are either reforested stands ("plantations") from early regeneration harvest, or stands that were selectively harvested over many decades. In this treatment, 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, larger diameter trees, and favoring ponderosa pine and western larch over Douglas-fir and grand fir. Thinning from below must retain some young trees of desired species if stands are to retain a healthy age structure. (Perry et al. 2004). This treatment would be followed by piling to reduce the amount of fine fuels and slash concentrations left after treatment. Stands thinned and then followed with underburning would see a slight reduction in the thin-barked grand fir component due to some mortality from the burn treatment. Overall, the average stand diameters would increase. Trees girdled to reduce the spread of dwarf mistletoe would provide a long-term snag and downed wood component. About 1800 acres of stands to be treated have a high incidence of root disease. Treating the rot pockets with patch cuts and replanting with species that are both root rot resistant and fire resistant would improve species diversity, move the stand composition toward historical conditions, while improving the resilience to fire and improving forest health. Western larch and ponderosa pine could be restored as long as openings are large enough to allow for full sunlight on young trees struggling to become established (Arno and Fischer 1995). Openings created in these root disease pockets will provide the conditions necessary for the highly shade intolerant larch to become established, especially if followed by some application of fire to reduce the brush competition and improve germination conditions. Restoration should strive for landscape heterogeneity to protect habitat and other environmental values (ibid.).

Alternative 2

Low intensity prescribed burn treatments (Units 91, 92 and 94). About 610 acres of land would be burned with a low intensity underburn. There would be a relatively minor change to the vegetation with this treatment. This burn would perpetuate the current condition of naturally open, grassy slopes, and scattered ponderosa pine trees of all sizes and ages. Most of these trees would survive the burn, though some of the smaller seedlings and saplings may be killed. The underburn would remove some of the needle and litter layer that has accumulated over many decades and stimulate growth of the grasses and forbs. The lower limbs of some trees may require pruning prior to burning to prevent torching and subsequent mortality.

Thinning treatments (all remaining units). This alternative would mechanically thin about 641 acres of forest, and thin another 23 acres of saplings either by hand or by mechanical means. The stands being treated are reforested stands ("plantations") from early regeneration harvest. In this treatment, 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, larger diameter trees, and favoring ponderosa pine and western larch over Douglas-fir and grand fir. This treatment would be followed by piling to reduce the amount of fine fuels and slash concentrations left after treatment. Stands thinned and then followed with underburning would see a slight reduction in the thin-barked grand fir component due to some mortality from the burn treatment. Overall, the average stand diameters would increase (Lindh & Muir 2004). Trees girdled to reduce the spread of dwarf mistletoe would provide a long-term snag and downed wood component. Very few acres of land would be restored to the historical composition of western larch and ponderosa pine.

Alternatives 1 and 2

The most notable direct change to vegetation in treated areas would be a substantial reduction in tree densities. These acres of forestland would be reduced from the current 250-600+ trees per acre down to about 50-100 trees per acre. Currently dense, closed canopy stands would change to a semi-open condition, where most trees would be spaced such that their crowns would not be touching (boles about 30 feet apart) (see Figure 3-10). This would reduce competition among trees for moisture and light, improving growth and vigor in residual trees (Cochran and Seidel 1995; Williamson 1982). Substantially more sunlight would reach the forest floor, stimulating growth of understory grass, forb and shrub species. Future underburning would stimulate the growth of these grasses and shrubs even further.

Ecosystem processes are dynamic, not static; they do not necessarily undergo an ordered development toward a single endpoint, but instead more likely undergo rapid transitions between different metastable states toward multiple endpoints (Choi 2007).

Figure 3-10. Target canopy cover

Species composition would change slightly, with ponderosa pine increasing in proportion within those units where it currently exists. This is because ponderosa pine would be chosen over Douglas-fir as a leave tree whenever possible. However, because Douglas-fir is currently so overwhelmingly dominant in most stands, this increase in proportion of ponderosa pine would be quite small. If root disease pocket treatments are about an acre or more in size, then pine and larch may be planted there to improve species diversity and reduce the likelihood of mortality on that site from root disease (Rippy et al. 2005). Because root disease spreads from intertwined

root systems, species susceptible to laminated root rot should not be left near or in root rot centers (O'Hara et al. 1992). Grand fir killed by root disease do not remain standing for very long due to the progression of stem decay, nor are they preferred snag habitat. Ponderosa pine, and especially western larch, needs full sunlight to thrive as seedlings and saplings (Schmidt and Shearer 1995; Oliver and Ryker 1990) and may be successfully restored to the forest in these small patches if cleared of competing vegetation and shade. The patch sizes created may only be marginally large enough to promote western larch (ibid).

Stand structures that are single storied and essentially even-aged, composed of 80-110 year old Douglas-fir, would remain so, only more open-canopied. Few to no old overstory trees would exist, because there were none in the original stand. Stands currently with a more multi-storied structure and a wide range in ages of trees would also be more open after treatment, but still in the multi-age/multi-canopied structure. These areas would appear park-like after treatment, with widely spaced trees and a relatively clean, green forest floor after a year or so. Carbon sequestration would increase in rapidly growing healthy trees, and the dead trees would no longer be emitting carbon. Reducing the canopy cover would stimulate growth in the herbaceous layer.

Aspen and Cottonwood Enhancement
Thinning and underburning the few aspen and cottonwood stands in the area would promote regeneration of these hardwoods. Fire would stimulate suckering by killing overstory stems and by killing near-surface root segments and thereby interrupting the flow of auxin to surviving down stem root segments. Fire removes competing understory vegetation and conifer seedlings, and allows sunlight to reach the forest floor. The vegetation consumed by the fire provides a nutrient pulse for new suckers and the blackened surface warms soil in the root zone, further stimulating sucker growth and the flow of cytokinin (Bartos 2001). Dense suckering over large burned areas can act as a deterrent to browsing animals. Protecting new aspen suckers from damage is an important consideration, regardless of the manipulation technique being used (Shepperd 2001).Small exclosures would keep cattle and native ungulates from browsing too heavily on the new suckers (Shirley and Erickson 2001). While the area proposed for treatment is not large, the aesthetic value attached to aspen could be meaningful for many people. Restoring remnant patches by reducing conifer ingrowth and encouraging reproduction may promote these areas as unique habitat niches for both animal and man (McCool 2001).

Comparison to Historical Conditions:
The character of the existing stands in the North Fork Mill project area are heavily influenced by past fire suppression and logging activity, as described earlier under "Affected Environment". The treatments are proposed to counteract this influence, reducing tree densities and altering forest conditions to be closer to an estimated historical condition. Reducing the risk of active crown fire may necessitate heavier thinning, depending on stand structure and the acceptable degree of risk (Perry et al 2004).

Thinning maintains the overwhelmingly Douglas-fir dominated forest, though density and structure are altered to a more desirable, sustainable condition. Some improvement of conditions would occur for ponderosa pine and western larch regeneration, survival, and growth by creating small openings, releasing existing pine, and applying periodic underburning. Over time, it is hoped that ponderosa pine and western larch may find some space to regenerate successfully

within these treatment units, as both of these species are highly shade intolerant. Reducing understory ladder fuels and downed woody debris would lower the risk of crown fires. Periodic underburning would restore more natural processes to the site and the landscape, reintroducing fire with all its known and unknown benefits to these plant communities.

The prescribed burn treatments in both alternatives are an attempt to functionally replace wildland fire with prescribed fire. The forests in the project area are adapted to fire, of variable intensities and sizes (as described more thoroughly in Fire/Fuels Management section). The prescribed burns would result in effects similar to that of a "natural" wildland fire. The treatments are meant to simulate the important role fire has historically played in these ecosystems for recycling of nutrients and organic biomass, and regeneration or stimulation of the vegetation. However, the effect of a prescribed fire does not in all cases equate to that of a wildland fire, often due to season of burning. Prescribed fire is likely to be at lower intensity than a wildland fire on that site, primarily to reduce the risk of fire escape. Higher intensity fires may burn much of the duff and debris layer on the forest floor. Fires of different intensities favor different complements of plant species because of the variability in a plants tolerance and resistance to fire. These tradeoffs are sometimes necessary to ensure that the prescribed fire could remain under control, or to ensure that other management objectives are met (such as avoiding excessive loss of live trees during burning operations).

Effects on Residual Trees in Thinned Areas:
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). According to Cochran and Seidel (1995), "Thinning commercially from below down to densities of 50 percent of normal is reasonable, and thinning even to lower densities may be proper where the object is to produce large diameter trees in a short time….. Mosaics of stands of dense, small-diameter trees and stands of large diameter trees with an open, park-like appearance maintained by underburning are possible within the same landscape."

There is an increased risk of blowdown, bending and breakage of the residual trees from snow loading. Trees that have grown for many decades in densely stocked conditions and are relatively small in diameter as a result (i.e. <9" 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.

Mechanized equipment would be used to fell and remove the trees in the commercially thinned units. 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. Abundant natural regeneration could be expected to establish following the initial entry and periodically re-treating the stands would be necessary to keep the seedlings from growing into ladder fuels. The remaining overstory trees are likely to live many decades, but they would eventually die and require replacement to maintain the desired forest structure. In the long-term, the need for reducing wildfire risk must be balanced with the need to maintain a healthy viable population of trees along with other resource considerations (Hunter et al. 2007).

Mechanical treatments in combination with prescribed fire have been shown to be the most effective in altering fire behaviour by increasing the wind speed necessary to initiate a crown fire, thus providing the most protection for residual trees post-treatment (Moghaddas and Stephens 2007). “Silvicultural treatments that target canopy bulk density, canopy base height, and canopy closure have the potential to reduce the development of all types of crown fires if surface fuels are relatively low or are concurrently treated.” (Peterson et al. 2005)

The general objective is to reduce physical contact of tree canopies and fire spread through the canopy. During extreme fire weather, fire can spread through horizontal and vertical heat flux and spotting from embers, so relatively wide spacing of canopies is necessary to effectively reduce crown fire hazard. An example of a field-based rule is that the distance between adjacent tree crowns should be the average diameter of the crown of codominant trees in the stand.

Variable density thinning combines thinning from below and on other silvicultural thinning techniques by removing trees from some patches and leaving small stands of trees in other patches. This technique reduces fuel continuity within the canopy, thereby reducing crown fire hazard. For any target stem density, variable –density thinning generally increases spatial heterogeneity of trees and canopy structure. Surface and activity fuels must be removed (to less than 15 tons/acre) (ibid).

Insect and Disease Processes and Forest Vulnerability:

Dwarf mistletoe

A direct reduction in dwarf mistletoe populations would occur with treatments proposed under the alternatives, the only difference being the number of acres treated. . This would occur mostly because many of the trees parasitized by dwarf mistletoe would be removed from the site in the thinning treatment. There would still be several dwarf mistletoe-infected trees left throughout the area, because in some areas there would be no choice but to leave these trees in order to meet structure retention objectives. Rate of dwarf mistletoe spread through the stand would likely be decreased from present conditions because of the wide space between the trees, and the girdling of some of the infected overstory trees. Trees with light infections may quickly become heavily infected when the presently shaded and overcrowded tree is given increased access to sunlight, nutrients and water. Further, small openings such as those proposed would still allow 20 to 40 percent of the future growth in the larch to be affected by dwarf mistletoe due to spread from the perimeter (Carlson et al. 1995). Understory burning has been shown to reduce stand infection, mainly from crown scorch (Conklin and Armstrong 2001), but fire is most effective as a stand-replacing function when the regenerating stand has a chance to become well-established before being influenced by adjacent parasitized trees. It is recognized that trees girdled because of dwarf mistletoe infection may eventually become hazard trees. The structural benefit they provide in the long-term overrides the future maintenance cost for their felling or removing.

Root disease

Recommendations for the North Fork Mill area from the Region 6 Pathologist “include clearing the laminated root rot patches, or clearing a buffer around the patches. Clearings of sufficient size could be prepared and planted with ponderosa pine, rust-resistant western white pine, western larch, and western red cedar. Between patches of laminated root rot, thin (both commercial and pre-commercial) to 16’ by 16’ or greater, to help retard the spread of root

disease." (FHP trip report 2007). The project design includes these actions. The pathologist also states that clearing all Douglas-fir and grand fir within 50 ft of infected stumps or root wads would stop the spread of laminated root rot. The effects of thinning and small patch 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 abundant 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).

Table 3-15 illustrates the difference in treatments between alternatives in how they would influence insect and disease conditions. Alternative 1 would work toward restoring healthy forest conditions on 884 acres of mixed conifer stands with a high incidence of root disease and/or dwarf mistletoe. Alternative 2 treats zero acres of this stand group. Alternative 1 would treat 234 more acres of hot, dry pine/oak and Douglas-fir stand group containing root disease and/or dwarf mistletoe than would Alternative 2.

Table 3-15: Acres treated by Stand Group

STAND Group	Alternative 1 Acres	Alternative 2 Acres
A1 –Dry grand fir, generally healthy	154	34
A2-Dry grand fir, insect and disease problems	884	0
A2B- Dry grand fir, insect and disease problems, proposed for underburning after thinning	350	97
B1B- Hot, dry pine/oak and Douglas-fir, generally healthy, proposed for underburning after thinning.	149	114
B2-Hot, dry pine/oak and Douglas-fir, insect and disease problems	129	24
B2B Hot, dry pine/oak and Douglas-fir, insect and disease problems, proposed for underburning after thinning.	455	326
C Aspen and Cottonwood Enhancement	47	47
D- Sapling thinning	24 (17 pine/oak, 7 grand fir)	24 (17 pine/oak, 7 grand fir)
E – Underburn w/o mechanical thin	610	610

Cumulative Effects on Vegetation

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 Appendix B in the Silvicultural Report (project record) for evaluation of all possible activities that were originally considered in this cumulative effects analysis for vegetative conditions.

No Action Alternative

This alternative perpetuates the current condition of the vegetation in the North Fork Mill Creek project area, which has been heavily influenced by the past fire suppression and logging activities as described earlier. There is higher probability and increasing risk of mixed and uncharacteristically lethal fire (stand-replacing) in the western half of the analysis area under this alternative (see effects discussion under the section on "Fire and Fuels"). A future fire of this sort would result in dramatic changes to the vegetation condition, uncharacteristic of what the area historically experienced. The dense, continuous forest canopies in this area, with substantial fuel loadings and ladder fuels, would be susceptible to lethal crown fires, killing all trees over large areas of forestland.

Alternative 1 – Proposed Action

The total acreage treated by thinning or prescribed burning in the action alternative is 2885 acres. This is a fair amount of vegetative change when considered at the watershed scale, specifically the 6600 acre North Fork Mill Creek analysis area as described earlier. Because Alternative 1 treats a substantial portion of the dense Douglas-fir stands of concern, it improves overall landscape vegetation towards a condition that would have occurred under a natural disturbance regime. Insect and disease intensity across the landscape would be decreased, and may continue to decrease with the application of periodic prescribed burning or future fires managed for resource benefit. Treatments under this alternative may improve the ability of fire suppression forces to contain fires before they spread, by altering fire behavior. As described under Fire/Fuels Management section, future fires in the project area are likely to be low intensity and non-lethal, easier and safer to control. Fire behavior would be more within what the site historically experienced on most similar sites, which would help ensure that key ecosystem elements and processes are sustained. The potential for severe and undesirable impacts to the forest and site from a future high intensity fire would be reduced.

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.

Alternative 2

The total acreage treated by thinning or prescribed burning in Alternative 2 is approximately 1277 acres. This is less than 20 percent of the North Fork Mill Analysis Area. It also would treat four percent of the dry grand fir type in the analysis area, doing little to improve the deteriorating conditions in the drainage. Future fire behaviour would be altered in stands treated in the hot dry pine/oak and Douglas-fir stand groups by lowering fire intensity and flame lengths.

Much of the existing conditions as described above under "Affected Environment" would be maintained. In the short-term, there would be little measurable direct or indirect change in the current condition of the area relative to insect and disease levels and vulnerability of the mature and late seral stands to infestations. The untreated dry grand fir sites, currently occupied by densely stocked Douglas-fir and grand fir stands, would experience the continuing spread of root disease and resultant mortality over the long-term, as well as continued and spreading infestation and mortality from dwarf mistletoe. Fuel levels would remain high until a natural cleansing event occurs. Fires not immediately controlled could be expected to be stand-replacing events due to the fuel levels and species composition in the drainage.

This alternative perpetuates the current condition of the vegetation in the North Fork Mill Creek project area, which has been heavily influenced by the past fire suppression and logging activities as described earlier. There is higher probability and increasing risk of mixed and uncharacteristically lethal fire (stand-replacing) in the western half of the analysis area under this alternative. A future fire of this sort would result in dramatic changes to the vegetation condition, uncharacteristic of what the area historically experienced. The dense, continuous forest canopies in this area, with substantial fuel loadings and ladder fuels, would be susceptible to lethal crown fires, killing nearly all trees over large areas of forestland. This, of course, would have associated effects on forest structure and composition and other resources.

Transportation Systems

A more detailed transportation report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below. Reference material is contained in the full specialists report. This section incorporates by reference the Mt. Hood National Forest Road Analysis Report (USDA Forest Service, 2003), which provides detailed information regarding the Forest roads, describing maintenance levels, maintenance costs, and management direction.

Existing Conditions

In April 1981, the "Reduced Road Reconstruction Policy" was implemented on the Mt. Hood National Forest. (Copy available in project file.) The stated objective was to reduce the total cost of developing, maintaining and operating the transportation system. Also, the policy statement 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. Reconstruction and maintenance for timber sales was limited to the proportionate share of the total traffic on a road (Commensurate Share Policy).

For the structural design of the subgrade, base and surfacing the axel loading over the life of the timber sale (3 to 5 years) was used. The design used the Normal Season of Use generally from June 1st through October 31st. A term used during this time period was "All Weather Road" and the resulting design was intended to meet the conditions within the Normal Operating Season unless unusual conditions existed, such as higher moisture then was normal.

The Arterial and Collector roads that were reconstructed during this period of the "Reduced Road Reconstruction Policy" do not have a structural design capacity for soil moisture in the subgrade that is above optimum moisture for soil strength (ref. Standard Specifications for Transportation Materials and Method of Sampling and Testing: Tests T 90 and T99).

Roads are asphalt, gravel, and native surface. Road drainage consists of ditch to culverts or insloped or outsloped surface to draindips or berms. Roads in the Planning Area provide access for administrative, public, and commercial users. Some of the roads are used during winter for winter recreation.

Limited road maintenance dollars have resulted in a backlog of road maintenance. This has resulted in roads brushing in, drainages becoming non-functional, and road surfaces needing repair. Lack of maintenance negatively affects safety for the users, increased potential for damage and loss of road structure, and higher levels of sedimentation. Roads brushing in reduce visibility for safe driving. Failed drainages increase the road damage. Damaged road surfaces, such as pot holes, ruts, washboards, breached water bars and pavement cracking, can be obstacles to drivers and increase the rate of degradation of the road structure.

Table 3-16: National Forest System Roads that are within the project area.

Roads	Mile Post	Miles	Closed	Comments
1700000	6.53 to 8.66	2.13		Entering National Forest System
1700000	8.66 to 11.03	2.37		End Bituminous Surface Treatment – Begin Aggregate
1700012	0.00 to 0.10	0.10	0.10	
1700013	0.00 to 0.72	0.72	0.72	
1700660	0.00 to 2.35	2.35	0.00	
1700661	0.00 to 1.21	1.21	1.21	
1700662	0.00 to 3.04	3.04	3.04	
1700663	0.00 to 0.35	0.35	0.35	
1700664	0.00 to 0.22	0.22	0.22	
1700665	0.00 to 0.14	0.14	0.14	
1700720	0.00 to 0.40	0.40	0.40	
1700740	0.00 to 0.40	0.40	0.40	
1700780	0.00 to 0.09	0.09	0.00	
1710000	0.00 to 0.93	0.93	0.00	
1710620	0.00 to 0.00	0.13	0.13	
1710630	0.00 to 0.94	0.50	0.50	
1710631	0.00 to 0.40	0.40	0.40	
1710632	0.00 to 0.10	0.10	0.10	
1710640	0.62 to 1.28	0.66	0.00	Aggregate
1710640	1.28 to 1.90	0.62	0.00	Native
1710643	0.00 to 0.32	0.32	0.32	
1710644	0.00 to 0.61	0.61	0.00	
1710645	0.00 to 0.45	0.45	0.00	
1710690	0.00 to 0.40	0.40	0.40	
1710710	0.00 to 0.15	0.15	0.15	Road into Long Prairie
1711000	0.00 to 1.01	1.01	0.00	
1711000	1.01 to 4.05	3.04	0.00	
1711620	0.00 to 1.12	1.12	0.00	Aggregate
1711620	1.12 to 2.19	1.07	0.00	Native
1711621	0.00 to 1.68	1.68	0.00	
1711623	0.00 to 0.19	0.19	0.19	
1711624	0.00 to 0.92	0.92	0.92	Native
1711630	0.00 to 2.67	2.67	0.00	Native
1711640	0.00 to 0.40	0.40	0.40	
1711650	0.00 to 1.51	1.51	1.51	
1720193	0.00 to 2.30	2.30	0.00	
Total		**34.70**	**11.60**	

Summary of National Forest System Roads for Existing Conditions within Planning Area

- Total National Forest System (NFS) Classified Road = 34.7 miles
- Total NFS Classified Road that are Closed = 11.6 miles
- Total NFS Classified Road that are Open = 23.1 miles
- 10.3 square miles within the planning area
- 3.4 mile per square mile total road density for the planning area

- Open road density = 2.24 miles per square mile.
  This is less than the 2.5 miles of open road density of the Forest Plan Standards and Guideline (FW-208, Page Four-72) for this allocation.

Inventoried Winter Range

The Inventoried Winter Range is 2909 acres or 4.55 square miles. The miles of open road are 8.67 miles as shown in Table 3-18 below. The open road density is 1.9 miles per square mile. This is within the 1.9 miles of open road density of the Forest Plan Standards and Guideline (FW-208, Page Four-72) for this allocation.

Table 3-17: Acres of Inventoried Winter Ranger

Inventoried Winter Range	Acres
Normal Winter Range	702
Severe & Normal Winter Range	2207
Total	**2909**

Table 3-18: Roads within Inventoried Winter Range

Wear	Road #	Miles
Normal	1700662	0.35
Severe	1700662	1.06
Normal	1700665 *	0.00
Severe	1700665 *	0.00
Normal	1710640	0.14
Normal	1710644	0.58
Normal	1711000	0.72
Severe	1711000	1.37
Normal	1711621	0.49
Normal	1711630	0.51
Severe	1711630	2.09
Normal	1711650	0.58
Severe	1711650 *	0.00
Severe	1720192 **	0.00
Severe	1720193	0.77
Total		**8.67**

* = Closed Road
** = Road not within Project

Mt. Hood National Forest Plan B-10 Allocation Deer/Elk Winter Range

The Forest Plan B-10 Allocation Deer/Elk Winter Range is 2183 acres or 3.41 square miles. The open road density per square mile is 1.1 miles as shown in Tables 3-19 and 3-20 below. This is within the 1.5 miles of open road density of the Forest Plan Standards and Guideline (B10-036, Page Four-275) for this allocation.

Table 3-19: Acres of Deer/Elk Winter Range (B-10 Lands)

MHF Forest Plan Allocation	Acres
B10	1741
B10/B5	442
Total	**2183**

Table 3-20: Roads within Deer/Elk Winter Range (B-10 Lands)

Land Use Allocation	Road #	Miles
B10	1710640	0.212
B10	1711000	1.797
B10/B5	1711000	0.131
B10	1711630	0.819
B10/B5	1711630	1.021
B10	1711650 *	0.00
Total		**3.77**

* = Closed Road

Analysis Methodology and Assumptions

Roads were analyzed for three different seasons of haul: wet operation season, normal operating season and dry operating season. Given the existing conditions and life expectancy of roads, wet season haul would not protect the integrity of existing roads. A cost analysis to reconstruct main haul roads to withstand the wet operating season, or the normal operating season is economically prohibitive and beyond the financial capability of this project or any road maintenance or reconstruction funding source available. The roads were designed for hauling timber during the normal operating season, generally June through October (reference Mt. Hood December 18, 1989 extended season haul policy). The proposed action alternative was analyzed for the normal operating season haul. Soil moisture in the subgrade must be below its plastic limit to meet this design parameter.

Environmental Effects

No Action Alternative – Direct and Indirect Effects

Road use, access, reconstruction and maintenance would be reduced. Timber sales from the adjacent planning areas would continue. The road system would continue to deteriorate, increasing the backlog of maintenance and create higher reconstruction cost for future projects. The reduction of maintenance and reconstruction will have a negative effect on safety to the traffic, an increased negative impact to soil movement and water quality.

Proposed Action Alternative – Direct and Indirect Effects

Log Haul Analysis

Log Haul has the most critical effect on the transportation resource. The amount of moisture present in the subgrade or base course is a concern. Past commercial haul during wet conditions of the base and subgrade have weakened the structural capacity of aggregate surfaced as well as asphalt surfaced roads. Even with normal traffic, road damage is likely to occur. With heavy

vehicles use on saturated base and subgrade, the damage would be accelerated. The haul route analysis is shown in Table 3-21.

Table 3-21: Haul Route Analysis for Alternative 1

Road[1]	Miles	Brushing	Drainage[2]	Surface[3]	Blading[3]	Comments[4]
1700000 From MP 0.00 to 4.00	4.00	X	X	X	X	BST/AC
1700000 From MP 4.00 to 4.80	0.80	X	X	X	X	Agg
1700000 From MP 4.80 to 8.66	3.86	X	X	X	X	BST
1700000 From MP 8.66 to 11.03	2.37	X	X	X	X	Agg
1700013 From MP 0.00 to 0.70	0.72	X	X	X	X	Agg
1700660 From MP 0.00 to 2.34	2.34	X	X	X	X	Agg
1700661 From MP 0.00 to 1.21	1.21	X	X	X	X	Nat
1700663 From MP 0.00 to 0.35	0.35	X	X	X	X	Agg
1700664 From MP 0.00 to 0.22	0.22	X	X	X	X	Agg
1700720 From MP 0.00 to 0.40	0.40	X	X	X	X	Agg
1710000 From MP 0.00 to 0.93	0.93	X	X	X	X	National Forest Boundary Agg
1710000 From MP 0.93 to 2.30	1.37	X	X	X	X	Junction w/1710640 Agg
1710620 From MP 0.00 to 0.13	0.13	X	X	X	X	Nat
1710630 From MP 0.00 to 0.94	0.94	X	X	X	X	Nat
1710631 From MP 0.00 to 0.40	0.40	X	X	X	X	Nat
1710640 From MP 0.00 to 1.28	1.28	X	X	X	X	Agg
1710640 From MP 1.28 to 1.90	0.62	X	X	X	X	Nat.
1710644 From MP 0.00 to 0.61	0.61	X	X	X	X	Agg
1710690 From MP 0.00 to 0.40	0.40	X	X	X	X	Nat
1711000 From MP 0.00 to 1.01	1.01	X	X	X	X	Agg
1711000 From MP 1.01 to 4.05	3.04	X	X	X	X	Nat.
1711620 From MP 0.00 to 1.12	1.12	X	X	X	X	Agg

Road[1]	Miles	Brushing	Drainage[2]	Surface[3]	Blading[3]	Comments[4]
1711620 From MP 1.12 to 2.19	1.07	X	X	X	X	Nat.
1711621 From MP 0.00 to 1.68	1.68	X	X	X	X	Nat
1711623 From MP 0.00 to 0.19	0.19	X	X	X	X	Nat
1711624 From MP 0.00 to 0.92	0.92	X	X	X	X	Nat.
1711630 From MP 0.00 to 2.67	2.67	X	X	X	X	Nat. Decommission or fix
1711640 From MP 0.00 to 0.40	0.40	X	X	X	X	Nat
1711650 From MP 0.00 to 1.51	1.51	X	X	X	X	Nat
1720193 From MP 0.00 to 0.11	0.11	X	X	X	X	Nat
TOTAL MILES	**36.67**					

1 Roads are asphalt, gravel, and native surface.
2 Road drainage consists of ditch to culverts or insloped or outsloped surface to drain dips or berms.
3 Deep patching, patching and reconditioning of aggregate surface roads would use standard construction specifications. All work would be within the existing road structure.
4 Abbreviations: Asphalt Concrete = AC; Native Material = NAT; Crushed Aggregate = AGG; Bituminous Surface Treatment = BST

Hauling during freeze/thaw conditions has damaged the surface and base materials. As frost penetrates the road prism, it pulls moisture up into the subgrade and base course material, saturating the subgrade. When the moisture in the subgrade and base course freezes, the ice expands, pushing soil and rock particles apart. This action reduces the compaction in the subgrade and base course, which in turn reduces the structural capacity of the road. During this freeze/thaw condition, moisture content normally reaches the saturated condition leaving the base and subgrade in a weakened condition. During this period, an 80,000 pound legal loaded truck will produce five times or more stress on the travelway than it would produce during optimum moisture conditions for the base and subgrade.

Plowing snow for winter haul eliminates insulation, which allows deeper frost penetration. Plowing also stores snow along the shoulders of the road. As the snow melts, the subgrade is saturated and prolongs the time it takes for the road to dry out in the spring. Snowplowing for use will accelerate damage caused from saturated soils and freeze/thaw. It will also set up a corridor for collecting and concentrating water during rain-on-snow events that could accelerate damage to the road and drainage structure.

The proposed action would involve log haul (See haul Route Analysis for details). Commercial haul would be prohibited when moisture is greater than the plastic limit in the subgrade and during freeze/thaw cycles, which would mitigate damage to road surfaces during the normal operating season.

The Commensurate Share 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. This policy would reduce the cumulative effects of commercial haul over a similar time frame. Timber sales from the adjacent planting areas would continue independent of this project. With the current mitigation measures and design features for the proposed action, there would be no unacceptable damage to Forest System Roads and no cumulative effects. Removing danger trees would increase safety for all users.

Only the road maintenance work needed for the haul route would be completed. All these maintenance activities would not be completed as part of this project. If road maintenance work is needed for log haul on a road proposed for decommissioning, the decommissioning would happen after the log haul is completed.

Road Density Analysis

Table 3-22 shows the road density of the proposed action, including the proposed road closures and decommissioning.

Table 3-22: National Forest System Roads that are within the project area with proposed road closures and decommissioning.

Roads	Mile Post	Miles	Closed	Comment
1700000	6.53 to 8.66	2.13	0.00	Entering NFL
1700000	8.66 to 11.03	2.37	0.00	End BST – Begin Agg.
1700012	0.00 to 0.10	0.10	0.10	
1700013	0.00 to 0.72	0.72	0.72	
1700660	0.00 to 2.35	2.35	2.35	
1700661	0.00 to 1.21	1.21	1.21	
1700662	0.00 to 3.04	3.04	3.04	
1700663	0.00 to 0.35	0.35	0.35	
1700664	0.00 to 0.22	0.22	0.22	
1700665	0.00 to 0.14	0.14	0.14	
1700720	0.00 to 0.40	0.40	0.40	
1700740	0.00 to 0.40	0.40	0.40	
1700780	0.00 to 0.09	0.09	0.00	
1710000	0.00 to 0.93	0.93	0.00	
1710640	0.62 to 1.28	0.66	0.66	Agg
1710640	1.28 to 1.90	0.62	0.62	Nat.
1710645	0.00 to 0.45	0.45	0.00	
1710710	0.00 to 0.15	0.15	0.15	Rd into Long Prairie
1711000	0.00 to 1.01	1.01	0.00	
1711000	1.01 to 4.05	3.04	0.00	
1711620	0.00 to 0.55	0.55	0.55	Agg
1711620	1.12 to 2.19	1.07	0.00	Nat
1711621	0.00 to 1.68	1.68	0.00	
1711623	0.00 to 0.19	0.19	0.19	Ck Distance
1711624	0.00 to 0.92	0.92	0.92	Nat
1711630	0.00 to 2.67	2.67	0.00	Nat
1720193	0.00 to 2.30	2.30	0.00	
Total		**29.76**	**12.02**	

Summary of National Forest System Roads for Alternative 1

- Total National Forest System (NFS) Classified Road = 29.7 miles
- Total NFS Classified Road that are Closed = 12.0 miles
- Total NFS Classified Road that are Open = 17.7 miles
- 10.3 square miles within the planning area
- 2.9 mile per square mile total road density within the planning area

- Open road density = 1.72 miles per square mile.
  This is less than the 2.5 miles of open road density of the Forest Plan Standards and Guideline (FW-208, Page Four-72) for this allocation.

Inventoried Winter Range

The Inventoried Winter Range is 2909 acres or 4.55 square miles. The open road density per square mile is 0.87 miles as shown in Tables 3-22 below. This is below the 2.0 miles of open road density of the Forest Plan Standards and Guideline (FW-208, Page Four-72) for this allocation.

Table 3-23: Roads in Inventoried Winter Range

Wear	Road #	Miles
Normal	1700662	0.350
Severe	1700662	1.058
Normal	1700665	0.00
Severe	1700665	0.00
Normal	1710640	0.143
Normal	1710644	0.580
Normal	1711000	0.000
Severe	1711000	0.000
Normal	1711621	0.489
Normal	1711630	0.000
Severe	1711630	0.000
Normal	1711650	0.581
Severe	1720193	0.774
Total		**3.98**

Mt. Hood National Forest Plan B-10 Allocation Deer/Elk Winter Range

The Forest Plan B-10 Allocation Deer/Elk Winter Range is 2183 acres or 3.41 square miles. The proposed action will result in no open roads (Table 3-23) during the seasonal closure that will exceed the 1.5 miles of open road density of the Forest Plan Standards and Guideline (B10-036, Page Four-275) for this allocation.

Table 3-24: Roads in Deer/Elk Winter Range (B10 Lands)

Land Use Allocation	Road #	Miles
B10	1710640	*0.000
B10	1711000	**0.000
B10/B5	1711000	**0.000
B10	1711630	**0.000
B10/B5	1711630	**0.000
B10	1711650	*0.000
Total		**0.000**

* = Closed Road
** = Seasonal Closure

Alternative 2 – Direct and Indirect Effects

Log Haul Analysis

The log haul route analysis was completed in the same manner as Alternative 1 and is summarized in Table 3-25.

Table 3-25: Haul Route Analysis for Alternative 2

Road[1]	Miles	Brushing	Drainage[2]	Surface[3]	Blading[3]	Comments[4]
1700000 0.00 to 4.00	4.00	X	X	X	X	BST/AC
1700000 4.00 to 4.80	0.80	X	X	X	X	Agg
1700000 4.80 to 8.66	3.86	X	X	X	X	BST
1700000 8.66 to 11.03	2.37	X	X	X	X	Agg
1700013 0.00 to 0.72	0.72	X	X	X	X	Agg
1700660 0.00 to 2.34	First 0.4	X	X	X	X	Agg
1710000 0.00 to 0.93	0.93	X	X	X	X	National Forest Boundary Agg
1710000 0.93 to 2.30	1.37	X	X	X	X	Jct w/1710640 Agg
1710640 0.00 to 1.28	1.28	X	X	X	X	Agg
1710640 1.28 to 1.90	0.62	X	X	X	X	Nat.
1710644 0.00 to 0.61	First 0.35	X	X	X	X	Agg
1711000 0.00 to 1.01	1.01	X	X	X	X	Agg
1711000 1.01 to 4.05	First 2.50	X	X	X	X	Nat.
1711620 0.00 to 1.12	1.12	X	X	X	X	Agg
1711620 1.12 to 2.19	1.07	X	X	X	X	Nat.
1711624	0.92	X	X	X	X	Nat.

0.00 to 0.92						
1711630 0.00 to 2.67	2.67	X	X	X	X	Native surface; Decommission or fix
1711650 0.00 to 1.51	1.51	X	X	X	X	Nat
1720193 0.00 to 0.11	0.11	X	X	X	X	Nat
TOTAL MILES	**27.61**					

1 Roads are asphalt, gravel, and native surface.
2 Road drainage consists of ditch to culverts or insloped or outsloped surface to drain dips or berms.
3 Deep patching, patching and reconditioning of aggregate surface roads would use standard construction specifications. All work would be within the existing road structure.
4 Abbreviations: Asphalt Concrete = AC; Native Material = NAT; Crushed Aggregate = AGG; Bituminous Surface Treatment = BST

Similar to Alternative 1, only the road maintenance work needed for the haul route would be completed. All these maintenance activities would not be completed as part of this project. If road maintenance work is needed for log haul on a road proposed for decommissioning, the decommissioning would happen after the log haul is completed.

Alternative 2 uses the same National Forest System Road 1700000 as Alternative 1 for the primary access. The reduction of 1,524 acres treated will result in less commercial haul for Alternative 2. With the appropriate mitigation and maintenance requirements being required this reduction of commercial haul will not have significantly different effect from Alternative 1.

The reduction of 9.06 mile of Haul Roads for Alternative 2 is Maintenance Level 1 and 2 roads. Funding needed maintenance, restoration and decommissioning for Maintenance Level's 1 and 2 roads is difficult and unpredictable to obtain. This reduction in treated miles could have a negative impact for Alternative 2.

Comparison Between Alternatives

Table 3-26: Comparison of Existing Condition to Alternatives 1 – Proposed Action and Alternative 2

Item	Exiting Condition	Proposed Action Alternative 1	Alternative 2
Road Density in Planning Area	3.36 miles/sm total existing all roads	2.88 miles/sm total existing all roads	Same as Alternative 1
Open Road Density in Planning Area	2.24 miles/sm open road	1.72 miles/sm open road	Same as Alternative 1
Inventoried Winter Range	1.91 miles/sm open road	0.87 miles/sm open road	Same as Alternative 1
B-10 Allocation	1.11 miles/sm open road	0.00 miles/sm open road	Same as Alternative 1

Table 3-27: Comparison in Haul Route Analysis between Alternatives 1 and 2

Item	Alternative 1	Alternative 2	Difference from Alternative 1
Miles of National Forest System Roads for access	36.67	27.61	- 9.06
Acres Treated	2,800	1,276	- 1,524

Table 3-28: Road Comparison between Alternatives 1 and 2

Alternative 1		Alternative 2	
Road	**Miles**	**Road**	**Miles**
1700000 0.00 to 4.00	4.00	**1700000** 0.00 to 4.00	4.00
1700000 4.00 to 4.80	0.80	**1700000** 4.00 to 4.80	0.80
1700000 4.80 to 8.66	3.86	**1700000** 4.80 to 8.66	3.86
1700000 8.66 to 11.03	2.37	**1700000** 8.66 to 11.03	2.37
1700013 0.00 to 0.70	0.72	**1700013** 0.00 to 0.72	0.72
1700660 0.00 to 2.34	2.34	**1700660** 0.00 to 2.34	First 0.4
1700661 0.00 to 1.21	1.21	**1710000** 0.00 to 0.93	0.93
1700663 0.00 to 0.35	0.35	**1710000** 0.93 to 2.30	1.37
1700664 0.00 to 0.22	0.22	**1710640** 0.00 to 1.28	1.28
1700720 0.00 to 0.40	0.40	**1710640** 1.28 to 1.90	0.62
1710000 0.00 to 0.93	0.93	**1710644** 0.00 to 0.61	First 0.35
1710000 0.93 to 2.30	1.37	**1711000** 0.00 to 1.01	1.01
1710620 0.00 to 0.13	0.13	**1711000** 1.01 to 4.05	First 2.50
1710630 0.00 to 0.94	0.94	**1711620** 0.00 to 1.12	1.12
1710631 0.00 to 0.40	0.40	**1711620** 1.12 to 2.19	1.07
1710640 0.00 to 1.28	1.28	**1711624** 0.00 to 0.92	0.92
1710640 1.28 to 1.90	0.62	**1711630** 0.00 to 2.67	2.67
1710644 0.00 to 0.61	0.61	**1711650** 0.00 to 1.51	1.51
1710690 0.00 to 0.40	0.40	**1720193** 0.00 to 0.11	0.11
1711000 0.00 to 1.01	1.01	**TOTAL MILES**	**27.61**

Alternative 1		Alternative 2	
Road	**Miles**	**Road**	**Miles**
1711000 1.01 to 4.05	3.04		
1711620 0.00 to 1.12	1.12		
1711620 1.12 to 2.19	1.07		
1711621 0.00 to 1.68	1.68		
1711623 0.00 to 0.19	0.19		
1711624 0.00 to 0.92	0.92		
1711630 0.00 to 2.67	2.67		
1711640 0.00 to 0.40	0.40		
1711650 0.00 to 1.51	1.51		
1720193 0.00 to 0.11	0.11		
TOTAL MILES	**36.67**		

Soil Productivity

A more detailed soil productivity report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below. Reference material is contained in the full specialists report.

Existing Conditions

Background and Introduction
The productivity and health of entire plant communities depend on the maintenance of healthy soils. Regional soil productivity protection standards were originally implemented in 1976, and have been revised several times since then (Pacific Northwest Region Monitoring and Evaluation Report, 2001). These standards are incorporated into the Mt. Hood Land and Resource Management Plan (Forest Plan) as part of the soil productivity chapter. Compared to some watersheds, soil distribution is relatively simple across the watersheds where this analysis area is located. 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, etc.), which for this report and analysis are located in the Soil Survey of The Dalles Watershed (High, 1989, unpublished survey). This planning area, directly north and adjacent to The Dalles Watershed, was remapped to expose more detail and match the numbering system used in The Dalles Watershed Soil Survey. As a result, it is useful as a starting point for site-specific planning such as this and is the survey that will be used in this analysis. Mapped at a scale of four inches to the mile, The Dalles Watershed Soil Survey is much more detailed than the Soil Resource Inventory (SRI, Howes, 1977), which covers the entire Mount Hood National Forest at one inch to the mile, and has been commonly used in other planning areas as a starting point for analysis.

Planning Area Characterization
The North Fork Mill planning area is approximately 6,600 acres, spanning an elevation range of 2,200 to 4,200 feet. Average annual precipitation ranges from 50 inches on the westside to 30 inches on the eastside, occurring mostly during the winter months. This planning area also contains the headwaters of Mosier and West Fork Neal Creeks.

Geology
This planning area has two distinctly different terrains. Each terrain has its own set of physical characteristics that are greatly influenced by the underlying geology and geologic history. The largest terrain unit encompasses the gently sloping ground in Neal Creek, Mosier Creek, and upper North Fork Mill Creek drainages. The rock units are relatively young lava flows and pyroclastic deposits. The lava flows formed a "cap rock", partially protecting this area from fluvial and glacial erosion. The product of this geologic history is a gently rolling upland with a low drainage density and almost no landslide hazard. The rocks have a low fracture density and as a result groundwater movement is slow. The upper surface of lava flows weather along their fracture planes to form large sub-rounded boulders. The elevations in this upper terrain unit are high enough to have supported small glaciers that only slightly modified the landscape. The low-angle slopes, poorly developed drainage system, thin glacial till deposits, and low permeability bedrock have all contributed to the development of numerous meadows in the area.

The second terrain unit is the steep-sided valley of lower North Fork Mill Creek. Older lava flows in this valley are highly fractured and more susceptible to erosion than the surrounding flatter area. Groundwater movement is rapid, drainage density is high, and many hillslope processes are active here. Many tributary channels to North Fork Mill Creek can experience debris flows that deliver material to the valley floor. These channels and their adjacent continuously steep hillslopes are identified as having a very high landslide hazard. Other steep hillslopes, not directly connected to the drainage system, are areas with a high landslide hazard.

Soil Types and Associated Landscapes

Soils across the planning area have been derived from glacially modified volcanic ash deposits ranging in depth from less than seven inches to greater than 20 inches. Due to the prevailing wind patterns, as Mount Hood would erupt, ash clouds would be carried downwind and deposited across the area. Subsequent winds, precipitation events, and landslides have altered, and continue to alter, the original depositional pattern by removing soil completely in some places exposing bedrock, and depositing it in others resulting in deep deposits. Despite the variability in soil depth, surface soil characteristics such as texture are fairly consistent across the proposed vegetation treatment areas and across the watersheds as a whole. The same holds true for the areas proposed for underburning treatments (prescribed fire).

Soil characteristics are quite different between the two basic landscapes or terrains as explained above within the planning area; gentle terrain in Neal, Mosier, and upper North Fork Mill Creek, and steep terrain in lower North Fork Mill Creek. The differences in soil development characteristics between the two landscapes are summarized in Table 3-29 and explained in detail below.

Table 3-29: Soil types on the Mt Hood National Forest within the planning area and useful ecological characteristics.

North and West – Neal, Mosier, Upper North Fork Mill		*South and East – Lower North Fork Mill*
Soil types	13/14 → 1 → 5 → 6 → 10 → 4 → 7 → 8 → 3	
Soil characteristics	Glacial, Deeper, Lower rock content, Gentle slopes →	Steep, High rock content, Shallow
Vegetation	Cedar/W. Hemlock → Moist Grand fir → Dry Grand fir/Doug fir → Pond. Pine → Grassland	
Climate	Cooler, wetter →	Warmer, dryer
Organic matter	Average appx. 29 tons and six logs per acre →	Average 10 tons and one log per acre*
Fire frequency/type	Less frequent/stand replacing →	More frequent/underburn
Landslides	Very rare, usually small →	More frequent, larger

* From Managing Coarse Woody Debris in Forests of the Rocky Mountains (Graham et al., 1994)

Gentle terrain in Neal, Mosier, and upper North Fork Mill Creek:

Soils within this area are developing on gentle, glaciated terrain where slopes rarely exceed 30 percent. The primary activities proposed here are conifer thinning, sapling thinning, trail construction, road decommissioning, road closures, culvert removal/replacement, and aspen enhancement. Soil types occurring where activities are proposed include 1, 4, 5, 13 and 14 as described in the Soil Survey of The Dalles Watershed. Soils 1, 4, and 5 are deep, loamy, well-drained, productive soils that contain slightly higher gravel and rock content than described in the soil survey. The deep, loamy nature of the soils allows them to store adequate moisture for the growing season. Factors limiting growth here include cool temperatures and nutrient

availability. Nutrients on these sites are stored in the duff layer, woody debris, and very thin light brown topsoil that is found just above the thin (an inch or less), nutrient poor bleached horizon.

Soils 13 and 14 are moist to wet, and support the aspen/cottonwood stands identified for enhancement in the proposed action. Soils here are silty with a dense clay pan that perches and stores water year round. These soils are nearly black with accumulated organic matter. However, productivity is somewhat limited by anaerobic conditions from the high water table, which confines the available rooting zone to the soil surface.

Steep terrain in lower North Fork Mill Creek:
Soils within this area are developing on very steep terrain where the average slope is approximately 50 percent. The primary activity proposed here is underburning (prescribed fire). Soil types occurring where activities are proposed include 3, 5, and 7. These soils differ from those occurring on the gentle ground in the following ways: they are generally not as deep due to eons of erosion on steep terrain; there are large patches that become droughty during the summer months because of aspect, high rock content, shallow depth and lack of precipitation; they have evolved under a more frequent fire regime, resulting in stands of large diameter fire resistant tree species that support more of a grass/forb understory where the canopy is not closed; and they store more nutrients in the mineral soil itself, rather than just a thin topsoil, duff, and old logs. These soils have a dark, well-structured surface horizon evident of high organic matter content referred to as a mollic horizon. They develop where perennial grasses and forbs dominate (or used to dominate) the understory. The decay of fine roots from grasses and forbs leads to an accumulation of organic matter in the topsoil. This area is a mosaic of vegetation types, where organic matter would come and go with natural wildfires; yet remain shady enough in pockets to deter the growth of an understory. Fire exclusion has brought about a domino effect of broad scale changes to vegetation species composition and structure, which has allowed fire sensitive species to encroach resulting in denser stands of trees, thus affecting soil properties. As more open stands close in, understories of grasses, forbs, and shrubs are shaded out, changing the soil development pathway from mollic to soils that typically develop under coniferous forest. Sites then begin to store their nutrients more in duff, coarse woody debris, and additional trees, rather than in the topsoil. This is not a desirable situation on this landscape because if fire occurs under these conditions it could result in an uncharacteristically severe loss of organic matter.

In addition, the non native species present on soil type 3 (dry meadow/grasslands) tend to be annual, weedy, shallow rooted species, such as cheatgrass, rather than the more desirable deep-rooted perennial bunchgrasses and forbs. As a result, erosion risk tends to increase. As topsoil is lost these sites tend to become less productive over time, further increasing the opportunity for invading non native plant species - overall a negative downward trend.

In the most productive forested areas on this landscape, soils were found to be sufficiently deep and loamy to support either dense stands of trees or more spaced out larger trees (sometimes both in the same stand). Factors limiting growth include hot summer temperatures and availability of water and nutrients.

Soil Analysis Methodology

In order to form a basis to predict impacts, the soil types have been divided into two main categories and further subdivided into a total of four general types based on slope steepness. The two main categories are soils that formed under a more frequent fire return frequency (based on vegetation types and surface soil characteristics) versus those under a more infrequent fire return frequency. Soils developed under more frequent fire returns tend to have a more developed, darker topsoil that 'stores and protects' site organic matter from loss during fire. Soils developed over time where fire is less frequent tend to be lighter in color and store nutrients above ground in the duff and woody material. These two types are further divided into soils on less than 30 percent slope and those on greater than 30 percent slope. A summary of soil mapping units and their associated management interpretations as adjusted by field observation is located in Table 3-30 below. Useful observations from the table include:

- All soils potentially impacted by machinery have a severe compaction hazard
- Erosion risks for soils on less than a 30 percent slope (those with C [0 to 15 percent] or D[16 to 30 percent] after the number) are rated from slight on undisturbed soils, to high on bare soils, and very high for bare compacted soils
- Erosion risks for soils on greater than a 30 percent (those with E after the number) slope are rated from slight on undisturbed soils to moderate for bare soils with high rock content, to very high for bare, fine textured soils

In the table, soil types written in *italics* are the ones where underburning is proposed, and soils shaded in green (gray if viewed in black and white) are the ones where vegetation manipulation is proposed. Soil types written in **bold** (13 and 14) are the aspen enhancement sites. The remaining soils with no highlights are mapped within the planning area, but have no actions proposed on them. See Figure 3-11 for a map of soil types.

Table 3-30: Summary of soil types in the analysis area and associated management interpretations adapted from The Dalles Watershed Soil Survey.

Soil Map Units	Compaction Hazard	Erosion Risk		
		Undisturbed	Bare Soil	Bare and Compacted Soil
More Frequent Fire <30% slope				
3C	Moderate	Slight	Moderate	High
3D	Moderate	Slight	High	Very High
5C	Severe	Slight	Moderate	Very High
5D	Severe	Slight	High	Very High
8C	Moderate	Slight	Moderate	High
More Frequent Fire >30% slope				
3E	N/A	Slight	Moderate	N/A
5E	N/A	Slight	High	N/A
7E	N/A	Slight	Very High	N/A
8E	N/A	Slight	Very High	N/A
Less Frequent Fire <30% slope				
1C	Severe	Slight	Moderate	High
4D	Severe	Slight	High	Very High
13C/14C	Extreme	Slight	Moderate	Very High
Less Frequent Fire >30% slope				
1E	N/A	Slight	Very High	N/A
4E	N/A	Slight	Very High	N/A
6E	N/A	Slight	Very High	N/A
10E	N/A	Slight	Very High	N/A

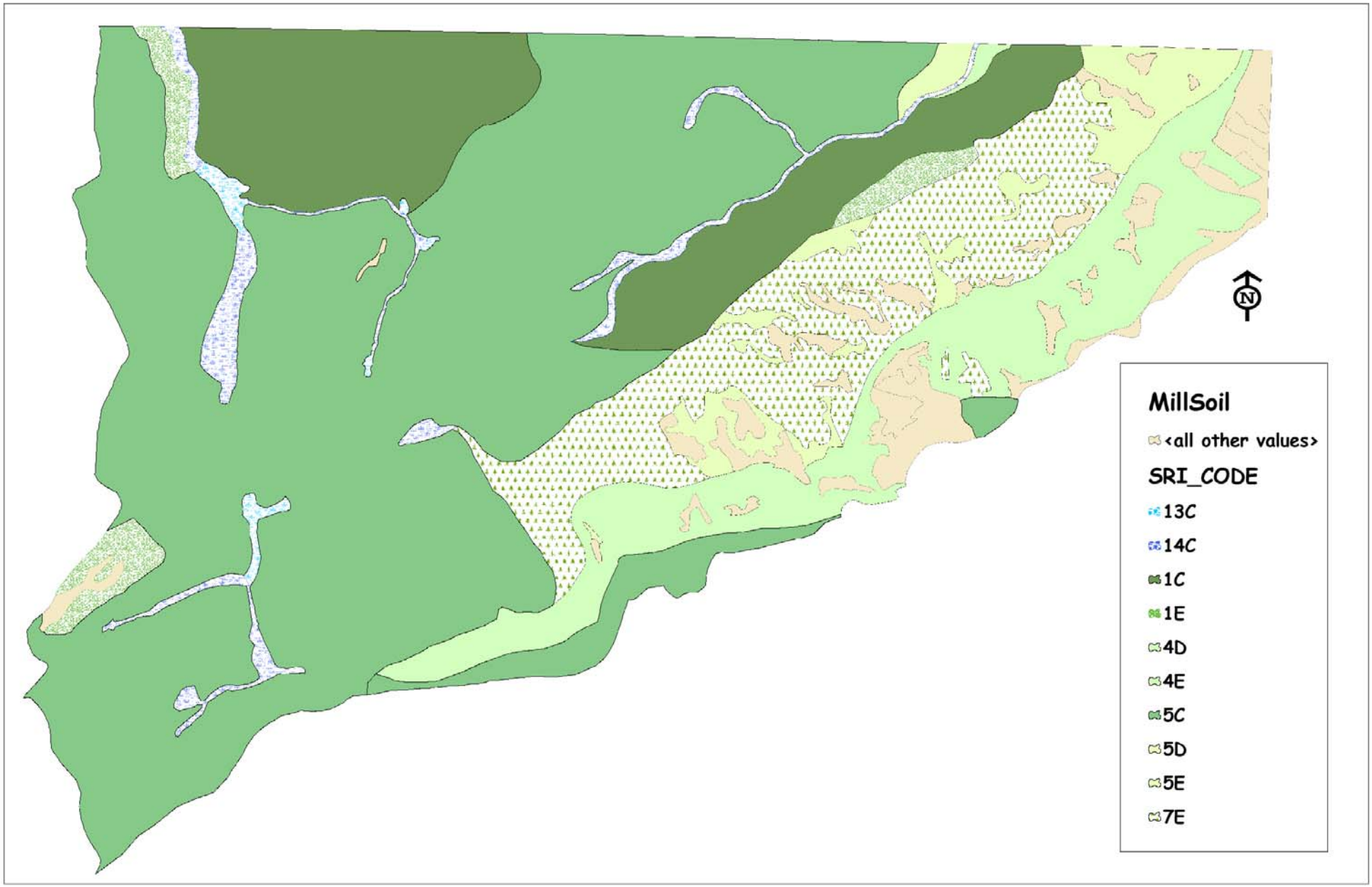

Figure 3-11: Soil map units in the North Fork Mill Planning Area are fairly simple in the solid greens, more complex and variable in the tans and stippled patterns. 'All other values' consists of smaller mapped units lumped together in lower North Fork Mill Creek Canyon

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Analysis Area, Applicable Standards and Guidelines, and Methodology
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 3-31) as the method of measure to answer the following questions:

> 'If the proposed ***actions*** are 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 consequences of taking no action?'

In other words, what are the risks to the soil and related/associated values from projects in the action alternatives? Is it possible to reduce risks through mitigations measures or design criteria? What would happen if no action is taken? For this analysis and project types (vegetation management, underburning, trail construction, road decommissioning, road closures, and culvert removal/replacement), the following three measures will be used to assess impacts:

1. The risk of erosion and subsequent sedimentation of adjacent water bodies.

   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. under three differing circumstances – ***undisturbed; bare soil; and bare and compacted*** soil. Surface soils within each of the two landscape terrains will respond to disturbances in different ways, resulting in erosion hazard ratings appropriate for each.

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

   Detrimental Soil Condition: The Mount Hood National Forests standard of no more than 15 percent detrimental soil condition in an activity area following project completion will 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 moderate to severe compaction risk due to inherent soil properties.

3. The risk of altering the soil biological ecosystem because of insufficient amounts of down woody debris to feed the forest carbon and nutrient cycles in less frequent fire plant communities, or the burning of uncharacteristically high amount of organic matter in more frequent fire plant communities.

   Soil Biology (organic matter levels): Poorly 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 will 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, burn or compact soil or that remove groundcover are considered to result in a greater risk to soil productivity. The analysis will also consider restorative actions, mitigation measures and design criteria, and best management practices to minimize impacts. 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), temporary road and landing obliteration, erosion control activities, and landing slash burning. Other components of Alternative 1 - Proposed Action and Alternative 2 would not have a meaningful or measurable affect on soil productivity.

Table 3-31: 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 Mt. Hood National Forest Land and Resource Management Plan.

<table>
<tr><th colspan="2">Summary of Forest Plan Soil Standards</th></tr>
<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 (risk)</th><th>Effective Groundcover</th></tr><tr><td>Slight to Moderate</td><td>60%</td></tr><tr><td>High</td><td>75%</td></tr><tr><td>Very High</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>

The methodology used to gather data needed for this effects analysis include field visits as well as previous field experience in this and adjacent watersheds, which include the Fivemile planning area to the south (1996), South Fork Mill watershed to the south (2006), Mill Creek Watershed Analysis (1997), and the 17 road fuel break on the west (2002). Professional observation and knowledge of how soils respond to the proposed types of management actions was used to predict impacts.

Assumptions and Design

- Damage on skid trails would not exceed 12-feet in width;

- Conceptual layout of logging system patterns have been designed to ensure less than 15 percent of the area is impacted (ground disturbance – detrimental soil condition) within each proposed treatment that uses ground-based equipment;

- Undisturbed soils meet the Forest Plan groundcover standards;
- Underburns would be low severity, with very little moderate and even less high severity in aerial extent;
- Ground impacts would take place during the normal operating season, when soil damage risk is lower than for the same activities occurring in winter;
- Recreation trails would be constructed and maintained to standards that reduce erosion hazards; and
- Road decommissioning and culvert removals/replacements would follow standard and proven procedures to ensure success with minimal impacts.

If a proposal to implement winter logging is presented, the following should be considered by the District Ranger 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 on the Barlow Ranger District):

A. The proposal should be considered on a unit-by-unit basis using soil types in the area as a guide 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 could 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 a sale administer 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 (pounds per square inch) than track mounted equipment, no rubber tired skidders should be used even on skid trails once soils become nearly saturated (approach their liquid limit)

Environmental Effects

Current and Predicted Changed Conditions Caused by Activities Described in Action Alternatives

Soil Erosion Risk

No active erosion from previous vegetation management was observed during the field reconnaissance for this project. All vegetation treatment areas (thinning, underburning, and aspen enhancement) are expected to meet the effective groundcover standard in aerial extent following ground disturbing activities. However, these activities (especially thinning) would result in the largest amount of exposed soil compared to the other actions that are proposed.

Trail construction and maintenance would result in bare, compacted soil, and thus would increase the risk of soil erosion. The highest risk areas are very short segments on steeper slopes near Mosier Creek and West Fork Neal Creek. The highest likelihood for sufficient soil movement to actually reach running water is in the first year or two after construction. Bridge installations at crossings would help minimize impacts that would occur on stream banks and within the stream channel. The remainder of trail construction is on gentle to nearly flat terrain, and while the erosion risk for bare and compacted soils is high, the actual movement of soil material would be within a very short timeframe and limited to very short distances.

Road decommissioning and culvert removals/replacements would follow standard and proven procedures to ensure success with minimal impact. Erosion risk would be very slightly lower due to a minimal increase in vegetated area. Overall watershed function is increased by these projects, explained in detail in the Water Quality Specialist report.

Detrimental Soil Conditions

The results of field surveys from the Mill Creek watershed are shown in Table 3-32 below. Areas examined showed existing detrimental damage, primarily on non-system roads and old skid trails.

Table 3-32: Summary of stands monitored with shovel probe transects in the North Fork Mill Planning Area.

Watershed	Acres	Silviculture Treatment*	Logging System	Fuel Treatment	Previous Entries	% Current Detrimental Soil Impacts
Mill Creek	12	Unknown	Ground	None	1	6
Mill Creek	12	Unknown	Ground	None	1	<1
Mill Creek	74	Unknown	Ground	None	1	4

* Stands appeared to have no particular silvicultural prescription other than to remove scattered trees within the area. No evidence to indicate fuels treatments occurred post-harvest.

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 use of lower 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, a recently thinned area 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 impact at all, and not even close to what would be considered detrimental.

Due to the nature in which they occur on the land, trail, road, and culvert projects are typically

not evaluated against this standard. In other words, they are not at all like a timber sale unit, where amount of area meeting detrimental soil condition can be measured against a known, bounded project area.

Organic Matter Levels
It is likely organic matter would be reduced to levels below Forest Plan standards in the higher fire frequency areas within the thinning and underburning areas. Since the overarching goal is to reintroduce fire into an area where it should be naturally occurring, it is a trade-off to meet the purpose and need. Organic matter levels are expected to be met on the more northerly facing slopes where fire returns are a bit longer. Trail, road, and culvert projects should not change the current levels of organic matter.

No Action Alternative – Direct and Indirect Effects

Soil Erosion Risk
The risk of erosion within the analysis area would remain as it is because the amount of groundcover protecting the soil surface from erosional influences is prevalent. The expected effect is the landscape would respond and change proportionate to the severity of natural events, such as storms or wildfire. Uncharacteristically hot wildfire due to fuel build ups may occur, depending on many unpredictable factors such as field conditions during burning, etc. These effects would likely be localized, but some areas may experience a decrease in site productivity.

Detrimental Soil Conditions
It is assumed that damaged soils 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 to occur as they are in a general sense. 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. The aspect of this alternative in terms of organic matter risk is the unpredictability of uncharacteristic wildfire severity in higher fire frequency stands that have experienced conifer encroachment. Recent observations of local wildfires (i.e. Ball Point on the Barlow Ranger District) that have occurred under these same conditions show high fire severity is possible in blocks of tens to hundreds of acres.

Alternative 1: Proposed Action – Direct and Indirect Effects

Soil Erosion Risk
For thinning treatments the soil erosion risk would increase with the proposed action because bare soil would be exposed during implementation. As amount of bare, bare/compacted soil increases, so does the risk of soil movement. Actual resource damage (erosion and/or sedimentation) depends on weather events that would 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 reduce erosive energies. The effectiveness of these Best Management Practices (BMP), is discussed by Rashin et al. (2006) in a publication of the Journal of the American Water Resources Association. Comparing the proposed action to their application of studied BMP would indicate the proposed buffers, logging system criteria, etc. 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 proposed action design uses setbacks from nearly double to 10 times that distance, in addition to directional felling, etc that would further reduce erosion features and disturbance. Therefore, by maintaining proper amounts of protective groundcover along with BMP design criteria, the risk of erosion and subsequent sediment delivery caused by the thinning treatments is extremely small.

Underburning treatments are occurring on the steepest landform in the planning area. The soils and vegetation here have evolved with fire, and therefore it is not expected to release measurable amounts of erosion. At most there could be some minor wind and/or water erosion on the surface soils, which is not expected to enter North Fork Mill Creek.

The aspen/cottonwood enhancement (ACE) areas would one of the highest risk projects that could produce localized sedimentation because the area of disturbance is directly adjacent to high water tables and small stream channels that are typically found emerging from these stands. These areas are also very flat, and provided that streambanks and small channels are protected, any exposed soil that could end up as sediment in the stream channel would be extremely small and would not move very far. Fortunately, the soils found here are nearly black with organic matter, which provides a great amount of resiliency to the forces of disturbance that expose soil to erosional forces.

Road associated projects also use BMP guides that have proven effective to minimize impacts.

Detrimental Soil Conditions
There would be an increase in the amount of detrimental soil damage within the thinning treatment areas caused by heavy equipment. This increase is not expected to exceed Forest Plan standards, and therefore no accompanying decrease in site productivity. The Changed Condition section above explains how logging systems are expected to impact the ground based treatment areas related to detrimental soil impacts.

There would likely be small isolated pockets of high burn severity in the underburning treatments. It is doubtful this would amount to more than 1 or 2 percent of the overall underburning area.

Trail construction, road decommissioning/closures, and culvert alteration projects would also cause minor amounts of detrimental soil conditions following implementation. However, the 15 percent standard is not used to measure these projects due to the lack of methodology to define the overall project area. These types of projects are typically viewed strictly in terms of erosion

risk.

Organic Matter Levels
In thinning areas there would be substantial future organic matter left standing in addition to material on the ground, although it is likely localized acreage would be lower than Forest Plan standards for organic matter in the higher fire frequency areas within the thinning project on south and west facing slopes. When this occurs, it is not expected to be a substantial impact to nutrient cycling because these are ecosystems where fire typically moved through very quickly, thus retaining substantial organic matter reserves in the mineral topsoil due the way in which they have developed. The same conclusion applies for the underburning treatments.

Trail, road, and culvert projects are not expected to have a measurable effect on forest organic matter levels.

Alternative 2 – Direct and Indirect Effects

Soil Erosion Risk
This alternative proposal reduces the amount of acreage impacted from the vegetation treatments (thinning). All other actions and their associated predicted effects would be the same. Therefore, overall erosion risk in this alternative would be slightly less, simply due to less exposed ground.

Detrimental Soil Conditions
This alternative proposal reduces the amount of acreage impacted from the vegetation treatments (thinning). The lower amount of impact will be proportional to the amount of reduced treatment areas compared to the proposed action. Although there would be an increase in the amount of detrimental soil damage within the thinning treatment areas compared to no action, the increase is not expected to exceed Forest Plan standards, and therefore no accompanying decrease in site productivity. All other actions and their associated predicted effects would be the same.

Organic Matter Levels
Effects occurring on treated acres would be the same as Alternative 1, and effects on acres dropped from this alternative would be similar to the no action alternative.

Cumulative Effects
Analysis of soil impacts for this kind of project inherently incorporates cumulative effects on an activity area basis, since we are examining previous impacts plus expected. On a larger scale, there is unauthorized Off-highway vehicle (OHV) use occurring in Ramsey Creek south of the project area, which has resulted in obvious localized erosion and subsequent sediment input directly into the stream. The amount of sediment has not been measured. Efforts are undertaken to discourage the OHV use when it is observed in the field (placing logs, limbs, rocks in the trail, etc).

Table 3-33: Summary Table of Environmental Effects for Alternative 1 and 2.

Project		Erosion Risks on Project Site`	Erosion Risk Off-Site	Detrimental soil condition > 15%	Organic Matter Levels to Forest Plan Standard
Thinning*	**Alt 1**	Increased	May move short distances off site, but very unlikely to reach watercourses	Not likely to exceed 15%	Not likely to meet standard as currently written on some south and west slopes. Would likely meet on north and east
	Alt 2	Slight increase	Highly unlikely	Not likely to exceed 15%	Same as Alt 1, but on fewer acres
Sapling Thinning		None	None	No	No appreciable change – more small sized Organic Matter on the ground
Aspen Enhancement		Increased	Not likely to move off site	No	Yes
Underburning		Increased	Not likely to move off site	No	No
Trail Construction		Increased	Short-term (2 yrs) risk to enter watercourse crossings where steep side slopes occur above crossing	N/A	N/A
Road Decommissioning and Closures		Increased	Not likely to move off site	N/A	N/A
Culvert Projects		Increased	Short-term (less than 1 yr) – highly likely	N/A	N/A

* Alternative 2 impacts, or risk of impacts, would be proportionally less based on the acreage proposed as compared to the acreage in the proposed action alternative. All other project effects are the same.

Watershed Resources

A more detailed watershed resources report is located in the Water Quality Specialist Report in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below. Reference material is contained in the full specialists report.

Existing Conditions

Almost all of the North Fork Mill Restoration Project is located within portions of three 7th field sub-watersheds, 24B (West Fork Neal Creek), 21K (Mosier Creek) and 14A (North Fork Mill Creek). Nintythree acres or a little over 1 percent of the planning area is locted in 21A (Neal Creek 7th field sub-watershed). All of the above mentioned 7th field sub-watersheds are located within the Neal Creek, Upper Mosier Creek and North Fork Mill Creek 6th field watersheds. The 5th field watersheds include Hood River, Mosier Creek and Middle Columbia/Mill Creek. North Fork Mill Creek (14A) 7th field sub-watershed is part of the Mill/Fivemile/Eightmile Creeks Tier 1 Key Watershed as identified in the Northwest Forest Plan (NWFP). See Figure 3-12 for map of area.

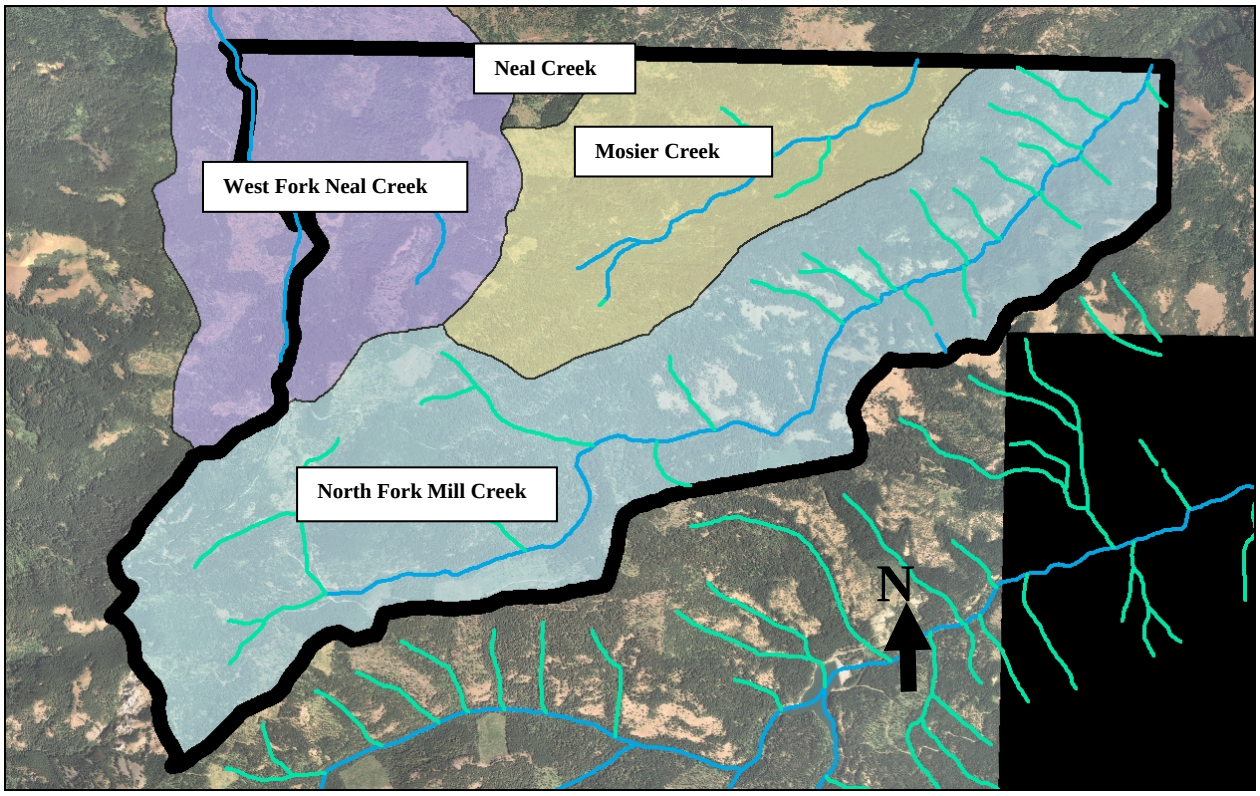

Figure 3-12: Map showing the location of the three major 7th field watersheds and the small portion of Neal Creek that are part of the North Fork Mill Planning Area. The planning area is outlined in black and is in the central portion of the map.

There are many streams, springs and wetlands located within these sub-watersheds. The primary streams include West Fork Neal Creek (24B), Mosier Creek (21K), and North Fork Mill Creek

(14A). There are approximately 90 miles of stream in the National Forest portion of these 7th field sub-watersheds in the following categories: 46 miles of perennial streams (flow year around) and 44 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 land. 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 75 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 1200 miles of stream have been surveyed. Some of the information collected during these surveys includes the number of pools and riffles, amount of large wood, riparian area condition and types, and numbers of fish and other aquatic organisms.

By direction of the CWA, where water quality is limited, DEQ develops Total Maximum Daily Load (TMDL) plans to improve water quality to support the beneficial uses of water. For water quality limited streams on National Forest System lands, the USDA Forest Service provides information, analysis, and site-specific planning efforts to support state processes to protect and restore water quality. Currently, Hood River Basin has a completed TMDL and the Miles Creek Basin is in the process of TMDL development. Once the TMDL plan is completed, streams would be removed from the 303(d) list and stream recovery would be achieved through an implementation plan. Following is a table (Table 3-34) displaying the 2004/2006 State of Oregon 303(d) list for streams that are in the planning area. The list only includes criteria that this project may have some effect on.

All listed segments that occur on National Forest land are either attaining the criteria or there is insufficient data for listing, except salmon and trout rearing and migration water temperatures on Mosier Creek.

Table 3-34: 2004/2006 State of Oregon 303(d) List for Streams in the Planning Area

Stream Name	River Mile	Parameter	Season	Criteria	Status
North Fork Mill Creek	0 to 3.8	Temperature	Year Around (Non-spawning)	Salmon and trout rearing and mitigation; 18.0 ^{o}C 7-day-average maximum.	Cat 5: Water quality limited, 303(d) list, TMDL needed.
	3.8 to 13.1	Temperature	Year Around (Non-spawning)	Core cold water habitat: 16.0 ^{o}C 7-day-average maximum.	Cat 2: Attaining some criteria/uses.
	0 to 123	Temperature	October 15-May 15	Salmon and steelhead spawning: 13.0 ^{o}C 7-day-average maximum.	Cat 2: Attaining some criteria/uses.
Mosier Creek	0 to 16.1	Sedimentation	Undefined	The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation or industry may not be allowed.	Insufficient data
	0 to 16.2	Temperature	Year Around (Non-spawning)	Salmon and trout rearing and mitigation; 18.0 ^{o}C 7-day-average maximum.	Cat 5: Water quality limited, 303(d) list, TMDL needed.
	0.4 to 1.2	Temperature	October 15-May 15	Salmon and steelhead spawning: 13.0 ^{o}C 7-day-average maximum.	Cat 2: Attaining some criteria/uses.
West Fork Neal Creek	0 to 9	Temperature	Summer	Rearing 17.8 ^{o}C	Attaining
	0 to 9	Sedimentation	Undefined	The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation or industry may not be allowed.	Insufficient data

Stream Temperature

Water temperature data has been collected by the Forest Service on the above mentioned stream systems for many years. Data has been collected on continuous temperature recording dataloggers in North Fork Mill Creek for the past 9 years and West Fork Neal Creek for the past 14 years (see Figure 3-13). Grab samples were also collected during stream surveys in North Fork Mill Creek and West Fork Neal Creek.

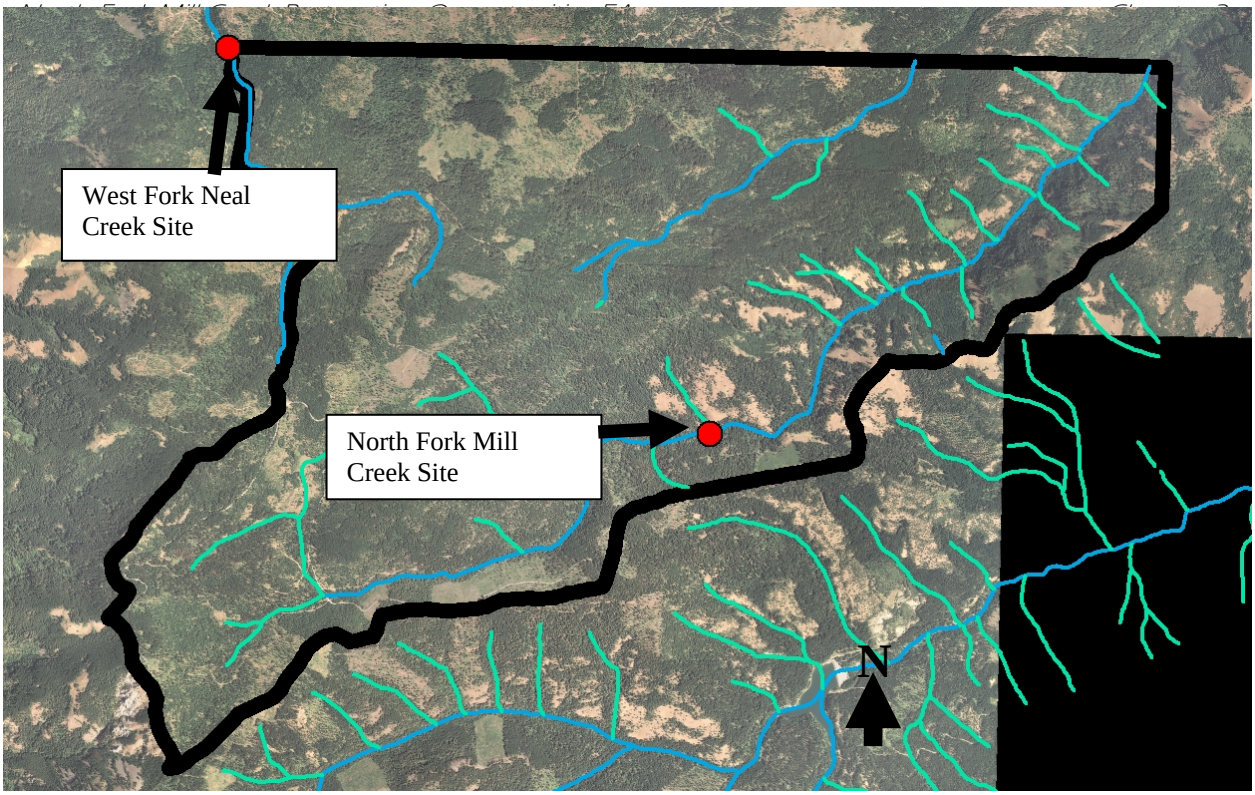

Figure 3-13: Water temperature monitoring sites in the North Fork Mill Restoration Project area. Monitoring sites are shown as red circles on the map and the North Fork Mill Project area is shown in black.

The highest 7-day average maximum stream temperatures (in °C) for the years deployed are shown in Table 3-35.

Table 3-35: 7-day Average Maximum Stream Temperatures (in °C)

Stream	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
N. Fk Mill Ck	ND	ND	ND	ND	ND	14.0	14.0	14.6	14.5	13.4	14.7	14.3	15.4	14.9
W. Fk Neal Ck	14.8	14.4	14.6	13.5	14.9	13.3	13.2	13.7	14.3	13.8	13.8	12.8	17.9	13.6

ND = Not Deployed for that Year at that Site

The section of North Fork Mill Creek from river mile 0 to river mile 3.8 is listed on the 2004/2006 State of Oregon 303(d) list of impaired water bodies for salmon and trout rearing and migration water temperatures that exceed a 7-day average maximum of 18.0°C. This section is located approximately 3 miles downstream of the National Forest boundary. As displayed in the table above, the highest 7-day average maximum stream temperatures for the site on National Forest land ranged from 13.4°C to 15.4°C for the nine years of deployment.

The section of Mosier Creek in the project area is also listed on the 2004/2006 State of Oregon 303(d) list of impaired water bodies for for salmon and trout rearing and migration water temperatures that exceed a 7-day average maximum of 18.0°C . As displayed in the table above, the Mosier Creek site has been below the 18.0°C standard every year that equipment has been deployed.

In summary, temperature standards are being met in all streams within the planning area. Continuos recording data loggers have been deployed in area streams since 1994, and standards have never been exceeded during that period of record.

Sediment and Stream Channel Condition

Both West Fork Neal and North Fork Mill Creeks have low channel gradient headwaters and steeper, more confined middle sections. The upper section of N. Fk Neal Creek (area around Long Prairie) is a "C4" Rosgen channel type that is actively downcutting. Rosgen (1996) identifed riparian vegetation as having a "very high" controlling influence on the stability of a C4 channel. He also identified this channel type as having a "very high" sensitivity to disturbance from increases in sediment.

Frequent trampled streambanks due to cattle use were identified on portions of West Fork Neal Creek during a 1993 stream survey, from river mile 6.45 to 8.8 (area within the Long Prairie Grazing Allotment). This was further verified during field visits conducted in the summer and fall of 2004 as part of the Long Prairie Grazing Allotment project. Numerous areas of bank trampling, fine sediment introduction, channel downcutting and riparian vegetation removal were noted and mapped along a 0.5 mile section of West Fork Neal Creek in the Long Praire area. A total of 27 areas of bank trampling and 23 stream cattle crossings or an average of 1 crossing or trampled bank every 50 feet of stream were identified. This represents approximately 1500 ft2 of concentrated disturbance in the 0.5 mile section of stream. This is a high use area for cattle due to the location of the main corral where the cows are turned out and gathered every year.

The upper reaches of North Fork Mill Creek (area around Gibson Prairie) are of similar channel type and similar general channel condition to those described for West Fork Neal Creek. North Fork Mill Creek is undergoing more severe channel downcutting around Gibson Prairie than W. Fk. Neal, due in part to the loss of riparian vegetation from grazing. The Mill Creek Watershed Analysis (Ch-III-Q3-1) noted degradation of Gibson Prairie due to cows keeping "riparian grasses short" and physically altering the stream banks. "The ephemeral streams within the meadow complex are actively downcutting which has resulted in a lowered water table, effectively draining the meadow." This was also verified during field visits during the summer of 2004. As a result of this damage, measures to reduce these impacts were identified in the Long Prairie Environmental Assessment and are in the process of being implemented. These include the construction of exclosure fences around impacted riparian areas, some of which are already in place. Since the allotment is currently not being used, the effectiveness of the fences are not known at this time.

Another potential source of coarse and fine sediment is roads. Sediment can wash off road surfaces into adjacent streams. 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 judgement by local Forest Service hydrologists, fish biologists, and earth scientists. Table 3-36 total specified road densities for 7th field sub-watersheds within the planning area.

Table 3-36: Road Densities for 7th Field Sub-watersheds

Sub-watershed	Road Density (mi/mi^2)
West Fork Neal Creek-24B	4.0
Mosier Creek - 21K	3.2
North Fork MillCk - 14A	3.2

Stream surveys of West Fork Neal Creek noted an average of 27% fine substrate (silt/sand, organics) from river mile 0 to 2.0 (1993 ODFW survey) and river mile 2.3 to 8.8 (1999 USFS survey). This higher percentage of fine sediment in the channel may be due, in part, to cumulative sources such as bank trampling and channel incision in the Long Prairie area.

In summary, one of the major sources of anthropogenic sediment was identified and mitigated during the Long Prairie Grazing Allotment Environmental Assessment process. Numerous measures to reduce sediment input from grazing were proposed and are in the process of being implemented. These measures are expected to reduce sediment input from this activity. In addition, road density indicates that roads may also be a potential source of fine sediment to area streams.

Riparian Area Condition

Native riparian vegetation plays a key role in forming habitat for fish and other aquatic species. Roots help stabilize stream banks, preventing accelerated bank erosion and providing for the formation of undercut banks, important cover for juvenile and adult fish. Riparian areas with native vegetation could supply downed trees (large wood) to streams. In turn, downed trees in streams influence channel morphology characteristics such as longitudinal profile; pool size, depth, and frequency; channel pattern; and channel geometry. Turbulence created by large wood increases dissolved oxygen in the water needed by fish, invertebrates and other biota. The extent of the hyporheic zone adjacent to and under the stream surface is increased by large wood in streams.

Riparian forest canopy protects streams from solar radiation in summer, and could moderate minimum winter nighttime temperature, preventing the incidence of anchor ice or freeze-up in streams (Beschta, et al., 1987). Changes in water temperature regime could affect the survival and vigor of fish, and affect interspecies interactions (FEMAT, 1993).

Riparian areas are dynamic. Disturbance characteristics of uplands such as fire and windthrow, as well as disturbances associated with streams, such as channel migration, floods, sediment deposition by floods, and debris flows, shape riparian areas (FEMAT, 1993). The most likely anthropogenic modifications in the project area are past cattle grazing and timber harvest activity. As discussed in the “Stream Channel Condition and Sediment” section of this report, cattle have removed riparian vegetation in localized areas in the allotment. This is done by grazing as well as trampling and is most evident in high use areas such as Long Prairie and Gibson Prairie. Since the C4 channel type is very sensitive to riparian vegetation removal, this has caused some channel modification in the form of downcutting most noteably in upper North Fork Mill Creek.

In addition to riparian vegetation removed due to cattle activity, riparian vegetation has been removed by past timber harvest activity. An analysis of the percentage of Riparain Reserves that

have been removed by timber harvest on National Forest land is displayed in Table 3-37. This gives a general idea about the current condition of the riparian area.

Table 3-37: Percentage of Riparain Reserves Removed by Timber Hharvest

Sub-watershed	% Riparian Reserve Harvested
West Fork NealCk-24B	4%
Mosier Ck - 21K	0%
North Fork MillCk - 14A	20%

North Fork Mill Creek (14A) has a Riparian Reserve harvest level of 20%. The other 7th fields have a very low harvest level. These created openings were pre-Northwest Forest plan, so very few large trees were left adjacent to streams. The Riparian Reserves are recovering as planted trees are growing and providing shade and other benefits to the aquatic system.

According to the Desired Future Condition of the Forest in the Mt. Hood National Forest Land and Resource Management Plan (LMRP, page Four-6), "…there will be little apparent change in Forestwide riparian areas…These areas will reflect relatively high vegetative and structural diversity most closely associated with mature and old growth stand conditions. Many individual areas, totaling roughly 10-15 percent …reflect early seral stage vegetation associated primarily with past timber harvest activities. Riparian areas for intermittent streams, seeps, and springs increasingly show a shift toward early seral stage vegetation…".

Effects Analysis & 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 was 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 LMRP standard as Special Emphasis Watersheds. 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. Mt. Hood National Forest resource specialists have adjusted the model to reflect hydrologic recovery in east-side Cascade Mountain forest stands, since the model was originally based on west-side timber stands (February 23, 1998 memo - Forest Plan Management Direction - Interpretation #8).

Some considerations about strengths and weaknesses associated with the analysis approach discussed above include the strength and weaknesses identified in Table 3-38.

Table 3-38: Strengths and Weaknesses in Water Quality Analysis

Method	Strength	Weakness
Aggregate Recovery Percentage (ARP) Model	Gives a good general idea about potential hydrologic recovery in a basin. Model works well when followed up with field data such as stream surveys.	Model utilizes a number of GIS results and a growth simulation model to determine recovery. These may differ somewhat from what is actually on the ground due to mapping inaccuracies and actual site conditions.
Water Erosion Prediction Project (Disturbed WEPP) model	Provided more site-specific erosion data for effects analysis. This led to a more accurate effects analysis.	Recent research indicates that the WEPP model tends to overestimate erosion amounts (Geren, 2006).
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.
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.

Environmental Effects

No Action Alternative – Direct and Indirect Effects

Stream Temperature

Stream temperatures would remain at current levels in the watershed due to no reduction in streamside shading. Primary shade zones (areas of riparian vegetation directly adjacent to streams) along perennial streams would continue to fill in with understory 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.

These densely vegetated areas are more susceptible to high severity burns due to excess fuel loading from fire exclusion. In the event a wildfire burned in this watershed, riparian areas have the potential to burn hot in areas that have high fuel loading. Recent research by Tollefson and others (2004) on 33 burned watersheds in the central, western Cascades of Oregon indicates that fire severity in intense events may be similar between intermittent stream channels and adjacent upland areas. It had been thought that the riparian areas might burn with a lower severity due to the presence water and other fire resistant features. Research on the effects of wildfire on stream

temperature is limited, but there is quite a bit of research on burning after clear-cut logging. In the central Oregon Cascades, clear-cut harvesting along a stream increased summertime maximum stream temperatures by 4° F. This same area was burned the following year and stream temperatures increased 14° F when compared to an undisturbed forest watershed (Levno and Rothacher 1969). In the central Oregon Coast Range, clear-cut harvesting along a stream increased maximum stream temperatures by 17° F; after a hot slash burn, an additional increase of 10° F was measured the following summer (Brown 1972). The above-mentioned studies indicate that riparian vegetation can experience a high severity burn that has the potential to increase water temperature.

Sediment

Sediment delivery to streams in the project area is expected to remain at current levels. Vegetation that impedes erosion and sediment delivery would be maintained. In the event a wildfire buned in this watershed, areas that have high fuel loading have the potential to experience high severity burns. These areas have the potential to have high sediment input to adjacent surface water through increased landsliding and surface erosion, and increased stream channel and bank erosion from increased runoff and sediment bulking from ash deposits. Sediment yields for the Wilson River watershed in Oregon were 252 tons per square mile per year or 5.7 times higher than for a comparable unburned watershed, after the 1933 Tillamook Fire. The number of days that the river experienced very high turbidity (sediment concentrations greater than 27 mg. per liter) increased from 18 to 102 days per year (Anderson 1976). It is not known to what extent salvage operations in the burned area contributed to this sediment increase. Increased sediment yields were found after a wildfire burned three relatively steep watersheds (average slopes of 50%) in the central Washington Cascades (Helvey 1980, Helvey et. al. 1985). An increased susceptibility to debris torrents was noted following the fire and was an important factor in causing incresed sediment yields.

While much of the sediment increase can occur within the first year after the fire (Agee 1993, Debano et. al. 1998), it may take many years for sediment levels to reach pre-fire levels depending on fire severity. DeBano et al. (1996) demonstrated that following a wildfire in ponderosa pine, sediment yields from a low severity fire recovered to normal levels after three years, but moderate and severely burned watersheds took 7 and 14 years, respectively. Robichaud and Brown (1999) reported first year erosion rates after a wildfire from 9 to 22 tons per acre decreasing by one to two orders of magnitude by the second year and to no sediment by the fourth in an unmanaged forest stand in eastern Oregon. Erosion rate reduction was due to recovery of natural vegetation. First year growing season shrubs, forbs and grasses accounted for 28 percent of the total ground cover whereas after the second growing season, total ground cover was 82 percent. In the event of a high severity burn, there could be severly impaired water quality due to high trubidity levels. It may take many years (5 – 10) for turbidity levels to decrease to background levels.

In summary, water quality parameters such as stream temperature and sediment are not expected to appreciably change in the project area. Current riparian areas are overstocked with shrubs and trees due primarily to fire exclusion creating ample stream shading. If a wildfire does occur in this project area, it would likely lead to seriously impared water quality conditions for quite some time. The overstocked riparian areas would encourage higher intensity fires due to high fuel loading that could lead to higher burn severities. As described above, these high severity burn

areas have the potential for high turbidity and increased stream temperatures.

Proposed Action Alternative – Direct and Indirect Effects

Stream Temperature – Vegetation Treatments

This alternative proposes to treat approximately 238 acres of vegetation within Riparian Reserves. The thinning prescription for riparian areas is designed to "emphasize creating species diversity of riparian vegetation and thin dense understories to maintain survival of late-seral trees by creating a stand that is moving toward a natural, pre-fire exclusion structure and composition with high large woody debris recruitment potential." In addition, underburning "may take place in this area in order to restore plant species composition and structure that would occur under natural fire regimes" (North Fork Mill Riparian Area Prescription, available in the project record). Vegetation removal 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 "Sufficiency Analysis for Stream Temperature" (2004) 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 Forest Service, Bureau of Land Management (BLM) and State of Oregon Department of Environmental Quality (DEQ) and identifies how to maintain sufficient stream shading while providing the opportunity to treat Riparian Reserve vegetation to improve stand condition. Vegetation treatments in the North Fork Mill Restoration Project would have the benefit of minimizing negative effects that may result from a catastrophic wildfire.

The concept of the sufficiency analysis is to maintain a primary shade zone next to the stream and identify a secondary shade zone that could be treated to reach Riparian Reserve Objectives. In order to maintain sufficient shade next to the stream, the primary shade zone is untreated. The size of this zone is dependant on the current height of the trees and the hill slope. This relationship is shown in the table below (Table 3-39).

Table 3-39: 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	50 feet	55 feet	60 feet

As an example, if the height of trees in the riparian area are predominately <20' tall, the primary shade zone would be 14 feet wide for an area that had 30% to 60% hill slopes next to the stream. Based on field observations in proposed treatment units, most of the hill slopes are between 30% and 60% and existing tree heights range from <20' to 60'+. Since the proposed treatment would include removal of trees greater than 60' tall in some cases, the primary shade zone was set at 60'. This area would be left untreated next to perennial streams to maintain current stream shading and temperatures.

In addition, vegetation treatments within the secondary shade zone (60' to 100'), would leave an average canopy closure of approximately 50% which would provide consistency with the Sufficiency Analysis. Due to project design that meets and exceeds the Sufficiency Analysis, there should be no increase in stream temperature resulting from implementation of this project.

This portion of the project may have an indirect positive effect on stream temperature because the riparian prescription is designed to stimlate growth in the post-treatment stand, which should provide shade faster to adjacent streams.

Stream Temperature – Recreation Trails
Approximately 0.6 miles of new trail constuction would occur in Riparian Reserves. Over 75% of this new construction in Riparian Reserves is located in the Gibson Prairie area. Three new stream crossings, one on West Fork Neal Creek, one on Mosier Creek and one on an unnamed tributary to North Fork Mill Creek would need to be constructed. Some vegetation would need to be removed to clear a trail for these crossings. Due to the narrow width needed for the trail (2' to 3' tread width, 6' to 8' clearing width), very little vegetation that currently provides shade is expected to be removed, so no increase of stream temperature is anticipated from this activity. This conclusion is based on professional judgement that includes examination of many stream/trail crossings throughout the National Forest system.

Stream Temperature – Road Decommissioning/Culvert Replacement
These sites are already disturbed and would not remove any vegetation that currently provides shade. Road decommissioning may have a slight indirect positive effect on stream temperature due to vegetation recovery within the Riparian Reserves. These areas would be allowed to revegetate and eventually should provide some additional shading to surface water. A total of 0.4 miles of road within Riparain Reserves are projected to be decommissioned.

Road closures would not influence steam temperature because existing vegetation currently providing stream shade would not be removed or modified

Sediment – Vegetation Treatments
Some ground distubing activites in this alternative have the potential to dislodge soil particles which in turn may increase erosion and sedimentation to surrounding surface water These activities include using roads, building temporary roads, landings, skid trails, yarding corridors, burn piles, as well as areas of underburning, snowplowing, road maintenance and road repair. In addition, trail construction and maintenance and culvert replacement also have the potential to deliver eroded soil to streams. A detailed discussion of soil erosion and delivery potential is contained in the Soil Productivity section of Chapter 3. According to the soils analysis, amounts of erosion and sediment delivery are expected to be small due to flat topography in portions of the planning area, maintaining protective groundcover, and implementation of BMP design criteria.

The ability of 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 m (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 m (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. Burroughs and King (1989) found that 80% 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.

Mitigation measures and design criteria 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. erosion control blankets, straw wattles, waterbars etc.) where necessary, and lower impact road maintenance techniques (leaving vegetated buffer strips in ditchlines near streams) would substantially reduce the amount of sediment reaching the streams from this work. Burroughs and King (1989) reported that measures such as erosion control blankets alone 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, and road repair work are expected to have minimal effect on sedimentation.

As stated in the Soil Productivity section, prescribed fire (underburning) units have the potential to increase the on-site erosion risk, but are not expected to introduce additional sediment into surface water. A literature review by Beschta (1990) states, "Management practices that prevent the occurrence of hot slash burns and encourage rapid revegetation will help minimize potential increases in fire-related sedimentation from upslope sources." Relatively "cool" burns (such as the underburning units in this project) "should have little impact on erosion and sedimentation, regardless of general watershed slope."

Fuel treatment activities may increase surface erosion in the harvest units along temporary roads, landings, skid trails and yarding corridors. The amount of erosion is expected to be low and short lived due to mitigation measures and design criteria such as ground based logging restrictions on ground over 30 percent side-slope, ripping and water barring disturbed areas, and seeding disturbed areas. It is unlikely that any material would reach the aquatic system due to buffering by the Riparian Reserves, associated unmanaged zones within the Riparian Reserves, and the other required mitigation measures and design criteria such as ripping and water barring skid trails.

Sediment – Recreational Trails

As stated in the Soils Productivity section, some trail construction activities may increase the erosion risk on disturbed areas. According to the soils analysis, the highest chances of eroded

material delivery to streams are stream crossings that have steep sideslopes adjacent to the crossing. The site with the highest potential is the West Fork Neal Creek crossing (T.1S.; R.10E.; Sec. 2) because it enters and exits the channel in very steep terrain. Even though this is the highest risk site, erosion modeling using the Disturbed Water Erosion Prediction Project (Disturbed WEPP) model indicates a 0 to 1% chance of this crossing delivering sediment to a stream the first year after construction. The highest potential for erosion and delivery are within the first year after construction and would diminish over time as disturbed material stabilizes and vegetation recovers. The total amount of eroded material is expected to be very minor to none due to implementation of project design criteria aimed at minimizing erosion.

Sediment – Road Decommissioning/Culvert Replacement
In general, culvert replacement would result in short-term direct and indirect input of sediment (immediately and up to 1 to 2 years after project completion) downstream from the project site. The highest potential for increased turbidity would be immediately after water is turned back into the completed project site. It is likely that this increase would be small and last for a short period of time (several hours) based on past monitoring of similar type projects. Downstream movement of sediment would be limited due to the small amount of material and the existence of velocity breaks due to flow obstructions (wood, boulders, pools etc.). Since these pipes are on fish-bearing streams, some sediment would be delivered to areas of existing resident fish habitat. The point of anadromy in West Fork Neal Creek is 3 miles below the furthest downstream culvert replacement; it is 2.8 miles below the furthest downstream culvert replacement in Neal Creek and 1.8 miles below the furthest downstream culvert replacement in North Fork Mill Creek. There is a low to moderate risk that some fine sediment may reach the upper point of anadromy in North Fork Mill Creek, but the amount would be very small and visually imperceptible due to the long distance between the work site and this point. The culvert replacement/removal sites on West Fork Neal Creek and Neal Creek are so far upstream from the points of anadromy that there would not be any short-term direct or indirect delivery of sediment to those sites. In addition, mitigation measures and design criteria that are focused on reducing sediment production including operating in the low-water season, 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.

Culvert replacement would not only benefit fish movement, it would decrease aquatic habitat fragmentation. Larger culverts or bridges would allow wood, water and sediment to move more naturally through these crossing sites. Larger culverts or bridges would also reduce the risk of crossing erosion or failure due to the ability of the larger crossing opening to minimize channel constriction.

Culvert removal during road decommissioning would result in short-term input of sediment (immediately and up to 1 to 2 years after project completion) downstream from the project site. Expected effects would be similar to those described above for culvert replacements except the duration of turbidity increase may be longer. Mitigation measures and design criteria 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.

Ripping of the road surface would help restore infiltration and resulting movement of water

vertically through the soil profile. This in turn, should help restore flow quantity and timing and basin hydrology. Erosion and resulting sedimentation originating from these roads would also be reduced significantly due to revegetation and restoration of more natural water flow patterns.

Sediment – Road Closures
Road closures would reduce overall sediment input into area streams. Reid and Dunne (1984) found that a heavily used gravel road segment contributes 130 times as much sediment as an abandoned road. The largest reduction in sediment is expected in North Fork Mill Creek where a total of 9.2 miles of road is identified for some kind of closure with 1.8 miles of the closure occurring in Riparian Reserves.

Table 3-40 is a summary of proposed activities in the 7th field sub-watersheds and resulting qualitative changes in sediment input.

Table 3-40: Summary of Sediment Input for Alternative 1-Proposed Action

Sub-watershed	Trail Construction	Vegetation Treatments	Culvert Replacement/ Culvert Removal	Road Closure	Road Decommissioning
West Fork Neal Creek-24B	6 miles of new trail; 1 new stream crossing which would be a bridge. Low risk of very minor, short-term sediment input at West Fork Neal Creek stream crossing for 1-2 years.	1 acre aspen enhancement; 442 acres thinning; 0.4 miles new temporary road. Low risk of very minor, short-term sediment input related to aspen enhancement for 1-2 years.	7 culverts replaced, 1 culvert removed; Low-Moderate risk of minor, short-term sediment input at West Fork Neal Creek stream crossing for 1-2 years. Longer term reduction in sediment input due to larger crossing size that is less prone to erosion and failure.	1.6 miles total; 0.3 miles in Riparian Reserves. Small reduction of fine sediment input.	4.1 miles total; none of the decommissioning is in Riparian Reserves. Low risk of very minor, short-term sediment input at Mosier Creek stream crossing for 1-2 years. Small long-term reduction of sediment input.
Mosier Creek - 21K	2.6 miles of new trail; 1 new stream crossing. Low risk of very minor, short-term sediment input at Mosier Creek stream crossing for 1-2 years.	44.7 acres aspen enhancement; 927 acres thinning; 0.3 miles new temporary road. Low-Moderate risk of very minor, short-term sediment input related to aspen enhancement for 1-2 years.	1 culvert removed; Low-Moderate risk of very minor, short-term sediment input at West Fork Neal Creek stream crossing for 1-2 years. Longer term reduction in sediment input due to larger crossing size that is less prone to erosion and failure.	4.6 miles total; 0.4 miles in Riparian Reserves. Small reduction of fine sediment input.	2.8 miles total; 0.2 miles of decommissioning is in Riparian Reserves. Low risk of very minor, short-term sediment input at Mosier Creek stream crossing for 1-2 years. Small-Moderate long-term reduction of sediment input.
North Fork Mill Creek - 14A	5.3 miles of new trail; 1 new stream crossing. Low risk of very minor, short-term sediment input at a stream crossing on a tributary to North Fork Mill Creek for 1-2 years	2 acres aspen enhancement; 1344 acres thinning; 0.2 miles new temporary road. Low to Moderate risk of very minor, short-term sediment input related to aspen enhancement for 1-2 years.	1 culvert replaced, 1 culvert removed; Low to Moderate risk of very minor, short-term sediment input at West Fork Neal Creek stream crossing for 1-2 years. Longer term reduction in sediment input due to larger crossing size that is less prone to erosion and failure.	9.2 miles total; 1.8 miles in Riparian Reserves. Small to Moderate reduction of fine sediment input.	3.2 miles; 0.2 miles of decommissioning is in Riparian Reserves. Low risk of very minor, short-term sediment input at Mosier Creek stream crossing for 1-2 years. Small-Moderate long-term reduction of sediment input.

Sub-watershed	Trail Construction	Vegetation Treatments	Culvert Replacement/ Culvert Removal	Road Closure	Road Decommissioning
Neal Creek – 24A	None Planned	13.7 acres thinning; no increased risk of sediment introduction due to lack of nearby surface water.	1 culvert replaced; Low risk of very minor, short-term sediment input at Neal Creek stream crossing for 1-2 years. Longer term reduction in sediment input due to larger crossing size that is less prone to erosion and failure.	None Planned	None Planned
Alder Creek – 14D	None Planned	None Planned	1 culvert replaced; Low risk of very minor, short-term sediment input at Alder Creek stream crossing for 1-2 years. Longer term reduction in sediment input due to larger crossing size that is less prone to erosion and failure.	None Planned	None Planned

In summary, this proposal includes some activities that may cause some minor short-term direct and indirect increase in fine sediment. The largest risk is associated with culvert replacement and road decommissioning due to their location adjacent to or directly in stream channels. The majority of these projects are planned in the West Fork Neal Creek drainage. These same projects would reduce long-term sediment input after they have revegetated, which would benefit water quality.

Forest Plan Consistency

Key Watershed

The NWFP states, "The amount of existing system and non-system roads within Key Watersheds should be reduced through decommissioning of roads" (NWFP B-19). Within the Mill Creek Tier 1 Key Watershed, 25 miles of roads have been decommissioned to date since the inception of the Northwest Forest Plan. The reduction of road miles from 179 miles to 154 miles would result in an overall reduction of road related sediment through time in the Key Watershed. It is expected that approximately 0.2 miles of new temporary road would be constructed within the Key Watershed to facilitate access for this project. This would temporarily raise the miles of non-system road, but these roads would be decommissioned within 3 to 5 years of construction and total miles in this Key Watershed would return to 154. In addition, 3.3 miles of road are proposed for decommissioning in this Key Watershed so the final road mileage would be reduced to 151 miles after project implementation making this project consistent with the NWFP.

Road densities within 7th field sub-watersheds would change in the following way:

Table 3-41: Road Density by 7th Field Watersheds for Alternative 1

7th Field Sub-watershed	Existing Road Density (mi/mi^2)	Potential Road Density with Temporary Roads (mi/mi^2)	Final Road Density After Project Implementation (mi/mi^2)
North Fork Mill Creek*	3.2	3.3	2.7
Mosier Creek	3.2	3.3	2.0
West Fork Neal Creek	4.0	4.1	3.5

* 7th Field sub-watershed is within the Mill Creek Tier 1 Key Watershed.

Road densities increase slightly when temporary roads are included but total road density would be reduced below 3 mi/mi^2 in two of the three sub-watersheds after road decommissioning. As stated in the Existing Conditions section above, "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".

Special Emphasis Watersheds and Peak Flow Analysis

There are no Special Emphasis Watersheds (Mt. Hood National Forest LRMP Standard FW-065, pg. Four-55) located within the project area.

Mt. Hood National Forest LRMP Standard FW-064 states that "Watershed impact areas at the

sub-basin or area analysis level should not exceed 35 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 (Mt. Hood National Forest LRMP Standard FW-061, pg. Four-53). These increased peak flows can cause stream channel damage in the form of increased bank erosion, channel scour, channel widening, and sedimentation. An analysis of the watershed impact area for the three sub-basins that are part of the North Fork Mill Project is displayed in Table 3-42.

Table 3-42: Increased Peak Flow for Three Sub-basins (Alternative 1)

	Maximum Watershed Impact Area from LRMP	Pre-project Implementation Watershed Impact Area	Post-project Implementation Watershed Impact Area-
Mosier Creek	35%	5.3%	7.2%
North Fork Mill Creek	35%	3.3%	5.5%
West Fork Neal Creek	35%	15%	20.1%

All sub-basins are well below the maximum Watershed Impact Area percentage of 35% after implementation of the North Fork Mill project, so this project is consistent with this standard.

Proposed Action – Cumulative Effects

The table below (Table 3-43) 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 North Fork Mill Restoration Project, whether these projects overlap in time and space and an assessment if a measurable cumulative effect is expected. Findings of this summary are supported by the analysis above which utilizes pertinent research, mitigation measures and design criteria and applicable management standards and guidelines.

Table 3-43: Cumulative Effects Table for Water Quality

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
Existing Old Forest Service Timber Harvest Units	Suspended 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 and natural recovery.
	Stream Temperature	No	Yes	No	
	Water Quantity	Yes	Yes	No	
Forest Service Vegetation Treatment Activities Planned or Underway (South Fork Mill, Pre-commercial treatments)	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing of these projects with the North Fork Mill Restoration Project; any minor suspended sediment would not be measurable due to implementation of mitigation measures and design criteria, conformance with existing standards and guidelines on both the existing projects and North Fork Mill Restoration Project and the long distance between project areas. In the case of S. Fork Mill (The Dalles Watershed Fuelbreak) these two streams converge approximately 5 miles downstream of the North Fork Mill Restoration Project area.
	Stream Temperature	Yes	Yes	No	The North Fork Mill Restoration Project would maintain the primary shade zone in all of the projects except the trail crossings. As described in the effects section, the amount of shade providing vegetation removed is expected to be minimal, so no increase in stream temperature should result, so there should be no cumulative 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 and natural recovery on both the existing projects and . North Fork Mill Restoration Project.

		Overlap in			
Private Land Activities	Suspended Sediment	Yes	Yes	Yes	Some projects are completed so there are no remaining sediment effects due to natural recovery. Other ongoing projects on adjacent private land such as road maintenance and vegetation manipulation have a chance of some short-term introduction of fine sediment that may mix with minor fine sediment from the North Fork Mill Restoration Project. The highest risk of this would be in West Fork Neal Creek due to the culvert replacement projects, road reconstruction on the 1700 road, Long Prairie Grazing allotment, new proposed Off-highway vehicle (OHV) trails and timber harvest on private lands.
	Stream Temperature	Yes	Yes	No	Some projects are completed so there are no remaining stream temperature effects due to natural recovery. The North Fork Mill Restoration Project would maintain the primary shade zone in all of the projects except the trail crossings. As described in the effects section, the amount of shade providing vegetation removed is expected to be minimal, so no increase in stream temperature should result, and there should be no cumulative 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 North Fork Mill Restoration Project and natural recovery for some of the projects on private land.
Miscellaneous Tree Salvage (Hazard Trees)	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing of this project with the North Fork Mill 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 North Fork Mill Restoration Project would maintain the primary shade zone in all of the projects except the trail crossings. As described in the effects section, the amount of shade providing vegetation removed is expected to be minimal, so no increase in stream temperature should result, so there should be no cumulative 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 and natural recovery in both projects. .

		Overlap in			
Long Prairie Grazing Allotment	Suspended Sediment	Yes	Yes	Yes	Current unrecovered damage in riparian areas from grazing has a chance of some short-term introduction of fine sediment that may mix with minor fine sediment from the North Fork Mill Restoration Project. The highest risk of this would be in West Fork Neal Creek due to the culvert replacement projects, road reconstruction on the 1700 road, Long Prairie Grazing allotment, new proposed OHV trails and timber harvest on private lands. Long-term restoration of a more natural sediment regime is likely with recovery due to mitigation measures and design criteria in the Long Prairie Grazing Allotment project coupled with road decommissioning, culvert removal/ replacement and road closures associated with the North Fork Mill Restoration Project.
	Stream Temperature	Yes	Yes	No	The North Fork Mill Restoration Project would maintain the primary shade zone in all of the projects except the trail crossings. As described in the effects section, the amount of shade providing vegetation removed is expected to be minimal, so no increase in stream temperature should result, so there should be no cumulative increase in stream temperature.
Proposed OHV Project	Suspended Sediment	Yes	Yes	Yes	New OHV trails are proposed in the project area. There is a chance of some short-term introduction of fine sediment from OHV trail construction and use that may mix with minor fine sediment from the North Fork Mill Restoration Project. The highest risk of this would be in West Fork Neal Creek due to the culvert replacement projects, road reconstruction on the 1700 road, Long Prairie Grazing allotment, new proposed OHV trails and timber harvest on private lands.
	Stream Temperature	Yes	Yes	No	The North Fork Mill Restoration Project would maintain the primary shade zone in all of the projects except the trail crossings. As described in the effects section, the amount of shade providing vegetation removed is expected to be minimal, so no increase in stream temperature should result, so there should be no cumulative increase in stream temperature.
Invasive Plant Treatments	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing of this project with the North Fork Mill 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. .

		Overlap in			
Invasive Plant Treatments continued . . .	Stream Temperature	Yes	Yes	No	The North Fork Mill Restoration Project would maintain the primary shade zone in all of the projects except the trail crossings. As described in the effects section, the amount of shade providing vegetation removed is expected to be minimal, so no increase in stream temperature should result, so there should be no cumulative increase in stream temperature.
Past Aquatic Restoration Projects	Suspended Sediment	No	Yes	Not Measurable	There may be an overlap in timing of these project effects with the North Fork Mill Restoration Project. Any minor suspended sediment may slightly slow the recovery resulting from restoration project implementation, but this 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 North Fork Mill Restoration Project would maintain the primary shade zone in all of the projects except the trail crossings. As described in the effects section, the amount of shade providing vegetation removed is expected to be minimal, so no increase in stream temperature should result, so there should be no cumulative increase in stream temperature.
	Water Quantity	Yes	Yes	No	No cumulative water quantity effects due to mitigation measures and design criteria implementation and conformance with existing standards and guidelines in both projects and natural recovery in the past restoration projects.
Future Aquatic Restoration Projects	Suspended Sediment	Yes	Yes	Not Measurable	There may be a spatial overlap of these project effects with the North Fork Mill Restoration Project. Any minor suspended sediment may slightly slow the recovery resulting from restoration project implementation but this would not be measurable due to implementation of mitigation measures and design criteria and conformance with existing standards and guidelines in all projects on National Forest.
	Stream Temperature	Yes	Yes	No	The North Fork Mill Restoration Project would maintain the primary shade zone in all of the projects except the trail crossings. As described in the effects section, the amount of shade providing vegetation removed is expected to be minimal, so no increase in stream temperature should result, so there should be no cumulative increase in stream temperature.
	Water Quantity	Yes	Yes	No	No cumulative water quantity effects due to mitigation measures and design criteria implementation and conformance with existing standards and guidelines in all projects on National Forest Land.

Proposed Action – Summary
Stream Temperature: No detrimental cumulative effects are expected as a result of increased water temperature due to mitigation measures and design criteria designed to maintain existing primary shade vegetation adjacent to streams in all projects except the new trail/stream crossings. As described in the direct and indirect effects section, this project would maintain existing water temperatures.

Sediment: Measurable cumulative effects are possible as a result of sediment introduction from this project. The risk depends on the timing of this project and other projects listed in the table above. If these projects are spaced closely together in time (within 3 years of each other), there is a higher chance that there would be a measurable cumulative effect than if they are implemented over a longer period of time. This is due to the dispersal of sediment throughout the stream system as time goes on. The highest risk of a cumulative sediment effect is in the West Fork Neal Creek due to the amount of activity confined in a fairly small area. The highest risk portions of this project are the culvert replacement and removals since they require work in the actual stream channel.

Water Quantity: A peak flow analysis was completed for this project and is displayed in the Special Emphasis Watershed section above. This project along with other projects on and off National Forest lands were included in the Watershed Impact Area calculation (LRMP Standard FW-067, pg. Four-55) and the sub-basins were found to be in compliance with LRMP Standard FW-064 so no cumulative effects are anticipated for water quantity.

Consistency with Direction (Northwest Forest Plan and Mt. Hood NF Management Plan)
As outlined in the effects section this project is consistent with applicable direction. Major highlights include:

- Not more than 15% of a treatment area would have detrimental soil damage
- The inclusion of mitigation measures and design criteria
- 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 Aquatic Conservation Strategy for more details).

Alternative 2 – Direct and Indirect Effects
Stream Temperature
This alternative proposes to treat approximately 136 acres of vegetation within Riparian Reserves. Effects would be similar to those described for Alternative 1 due to implementation of mitigation measures and design criteria that minimize disturbance adjacent to perennial streams. In addition, the proposals for trail construction, reconstruction, road decommissioning/culvert replacement and road closures are the same as Alternative 1, so the direct and indirect effects are expected to be the same.

Sediment
Projects proposed in Alternative 2 are the same as Alterntiave 1 except there would be less temporary road construction and fewer acres of vegetation thinning. Table 3-44 is a summary of proposed activities in the 7th field sub-watersheds and resulting qualitative changes in sediment input for Alternative 2.

Table 3-44: Summary of Sediment Input for Alternative 2

Sub-watershed	Trail Construction	Vegetation Treatments	Culvert Replacement/ Culvert Removal	Road Closure	Road Decommissioning
West Fork Neal Creek-24B	6 miles of new trail; 1 new stream crossing which would be a bridge. Low risk of very minor, short-term sediment input at W. Fork Neal Creek stream crossing for 1-2 years.	1 acre aspen enhancement; 52 acres thinning; no miles new temporary road. Very low risk of very minor, short-term sediment input related to aspen enhancement for 1-2 years.	7 culverts replaced, 1 culvert removed; Low-Moderate risk of minor, short-term sediment input at W. Fork Neal Creek stream crossing for 1-2 years. Longer term reduction in sediment input due to larger crossing size that is less prone to erosion and failure.	1.6 miles total; 0.3 miles in Riparian Reserves. Small reduction of fine sediment input.	4.1 miles total; none of the decommissioning is in Riparian Reserves. Low risk of very minor, short-term sediment input at Mosier Creek stream crossing for 1-2 years. Small long-term reduction of sediment input.
Mosier Creek - 21K	2.6 miles of new trail; 1 new stream crossing. Low risk of very minor, short-term sediment input at Mosier Creek stream crossing for 1-2 years.	44.7 acres aspen enhancement; 472 acres thinning; 0.1 miles new temporary road. Low-Moderate risk of very minor, short-term sediment input related to aspen enhancement for 1-2 years.	1 culvert removed; Low-Moderate risk of very minor, short-term sediment input at W. Fork Neal Creek stream crossing for 1-2 years. Longer term reduction in sediment input due to larger crossing size that is less prone to erosion and failure.	4.6 miles total; 0.4 miles in Riparian Reserves. Small reduction of fine sediment input.	2.8 miles total; 0.2 miles of decommissioning is in Riparian Reserves. Low risk of very minor, short-term sediment input at Mosier Creek stream crossing for 1-2 years. Small-Moderate long-term reduction of sediment input.
North Fork Mill Creek - 14A	5.3 miles of new trail; 1 new stream crossing. Low risk of very minor, short-term sediment input at a stream crossing on a tributary to North Fork Mill Creek for 1-2 years.	2 acres aspen enhancement; 56 acres thinning; 0.2 miles new temporary road. Low risk of very minor, short-term sediment input related to aspen enhancement for 1-2 years	1 culvert replaced, 1 culvert removed; crossing for 1-2 years. Longer term reduction in sediment input due to larger crossing size that is less prone to erosion and failure. Low to Moderate risk of very minor, short-term sediment input at W. Fork Neal Creek stream	9.2 miles total; 1.8 miles in Riparian Reserves. Small to Moderate reduction of fine sediment input.	3.2 miles; 0.2 miles of decommissioning is in Riparian Reserves. Low risk of very minor, short-term sediment input at Mosier Creek stream crossing for 1-2 years. Small-Moderate long-term reduction of sediment input.

Sub-watershed	Trail Construction	Vegetation Treatments	Culvert Replacement/ Culvert Removal	Road Closure	Road Decommissioning
Neal Creek – 24A	None Planned	13.7 acres thinning; no increased risk of sediment introduction.	1 culvert replaced; Low risk of very minor, short-term sediment input at Neal Creek stream crossing for 1-2 years. Longer term reduction in sediment input due to larger crossing size that is less prone to erosion and failure.	None Planned	None Planned
Alder Creek – 14D	None Planned	None Planned	1 culvert replaced; Low risk of very minor, short-term sediment input at Alder Creek stream crossing for 1-2 years. Longer term reduction in sediment input due to larger crossing size that is less prone to erosion and failure.	None Planned	None Planned

In summary, sediment effects from this alternative are very similar to those described for Alternative 1. As is the case with Alternative 1, the largest risk is associated with culvert replacement and road decommissioning due to their location adjacent to or directly in stream channels. The majority of these projects are planned in the W. Fork Neal Creek drainage. These same projects would reduce long-term sediment input after they have revegetated, which would benefit water quality.

Forest Plan Consistency

Key Watershed

As is the case with Alternative 1, it is expected that approximately 0.2 miles of new temporary road would be constructed within the Mill Creek Key Watershed to facilitate access for this project. This would temporarily raise the miles of non-system road, but these roads would be decommissioned within 3 to 5 years of construction and total miles in this Key Watershed would return to 154. In addition, 3.3 miles of road are proposed for decommissioning in this Key Watershed so the final road mileage would be reduced to 151 miles after project implementation.

Road densities within 7th field watersheds would change as detailed in Table 3-45.

Table 3-45: Road Density by 7th Field Watersheds for Alternative 2

7th Field Sub-watershed	Existing Road Density (mi/mi^2)	Potential Road Density with Temporary Roads (mi/mi^2)	Final Road Density After Project Implementation (mi/mi^2)
North Fork Mill Creek*	3.2	3.3	2.7
Mosier Creek	3.2	3.3	2.0
West Fork Neal Creek	4.0	4.0	3.5

* 7th Field sub-watershed is within the Mill Creek Tier 1 Key Watershed.

These temporarily increased road densities are similar to Alternative 1 except no temporary road construction would occur in W. Fork Neal Creek. This alternative is consistent with the NWFP standards and guidelines for road construction in Key Watersheds.

Special Emphasis Watersheds and Peak Flow Analysis

As described in the Alternative 1 effects analysis, "Watershed impact areas at the sub-basin or area analysis level should not exceed 35 percent" (pg. Four-53) as part of a cumulative watershed effects analysis. The watershed impact area for the three sub-basins that are part of the North Fork Mill Project is displayed Table 3-46 below for Alternative 2.

Table 3-46: Increased Peak Flow for Three Sub-basins (Alternative 2)

	Maximum Watershed Impact Area from LRMP	Pre-project Implementation Watershed Impact Area	Post-project Implementation Watershed Impact Area-
Mosier Creek	35%	5.3%	5.8%
North Fork Mill Creek	35%	3.3%	3.4%
West Fork Neal Creek	35%	15%	15.2%

All sub-basins are well below the maximum Watershed Impact Area percentage of 35% after implementation of the North Fork Mill project, so this project is consistent with this standard. The post project values are quite a bit lower than Alternative 1 due to the reduction in the number of acres of thinning.

Alternative 2 – Cumulative Effects
Since proposed projects are very similar to those in Alternative 1, it is expected that cumulative effects would be similar to those described for that alternative. The following is a summary of those effects.

Stream Temperature: No detrimental cumulative effects are expected as a result of increased water temperature due to mitigation measures and design criteria designed to maintain existing primary shade vegetation adjacent to streams in all projects except the new trail/stream crossings. As described in the direct and indirect effects section, this project would maintain existing water temperatures.

Sediment: Measurable cumulative effects are possible as a result of sediment introduction from this project, but the effects would be less than Alternative 1 due to a reduced amount of ground disturbance associated with vegetation treatments. Due to the risk depends on the timing of this project and other projects listed in the table above. If these projects are spaced closely together in time (within 3 years of each other), there is a higher chance that there would be a measurable cumulative effect than if they are implemented over a longer period of time. This is due to the dispersal of sediment throughout the stream system as time goes on. The highest risk of a cumulative sediment effect is in the W. Fork Neal Creek due to the amount of activity confined in a fairly small area. The highest risk portions of this project are the culvert replacement and removals since they require work in the actual stream channel.

Water Quantity: A peak flow analysis was completed for this project and is displayed in the Special Emphasis Watershed section above. This project along with other projects on and off National Forest lands were included in the Watershed Impact Area calculation (LRMP Standard FW-067, pg. Four-55) and the sub-basins were found to be in compliance with LRMP Standard FW-064 so no cumulative effects are anticipated for water quantity.

Consistency with Direction (Northwest Forest Plan and Mt. Hood NF Management Plan)
As outlined in the effects section this project is consistent with applicable direction. Major highlights include:

- Not more than 15% of a treatment area would have detrimental soil damage
- The inclusion of mitigation measures
- 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 Aquatic Conservation Strategy for more details).

Aquatic Species and Associated Habitat

An Aquatic Biological Evaluation was completed as part of this analysis. The entire Biological Evaluation is incorporated by reference and is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the evaluation are summarized below. Reference material is contained in the full biological evaluation.

Existing Conditions

The North Fork Mill Creek Restoration Project is located on the Mt. Hood National Forest in T1S, R10E (Hood River County) and T1S, R11E (Wasco County). The planning area is approximately 6600 acres in size. Vegetation includes mixed conifer forests, meadows, and open grassy slopes. Average annual precipitation ranges from 50 inches on the westside to 30 inches on the eastside, occurring mostly during the winter months. Elevation ranges from 2,200 to 4,200 feet. The area supports a wide variety of human uses, including recreation, wood products, and grazing. The area is important for fisheries, wildlife, plant, and other natural values.

The planning area is located within portions of three 7th field watersheds: West Fork Neal Creek, Mosier Creek and North Fork Mill Creek. All of the above mentioned 7th field watersheds are located within the Neal Creek, Upper Mosier Creek and North Fork Mill Creek 6th field watersheds, respectively. The 5th field watersheds include Lower Hood River, Mosier Creek and Middle Columbia/Mill Creek. The North Fork Mill Creek 7th field watershed is part of the Mill/Fivemile/Eightmile Creeks Tier 1 Key Watershed as identified in the Northwest Forest Plan.

There are many streams, springs and wetlands located within these sub-watersheds. The primary streams include West Fork Neal Creek, Mosier Creek, and North Fork Mill Creek. There are approximately 90 miles of stream in the National Forest portion of these 7th field watersheds in the following categories: 46 miles of perennial streams (flow year around) and 44 miles of intermittent streams (streams that dry up for part of the year and generally do not contain fish).

The majority of proposed project activities lie within the Forest; however, there are several proposed culvert replacements in West Fork Neal Creek and one in Neal Creek below the Forest boundary. In these two streams, therefore, the analysis area (the area where potential effects could extend) extends two river miles downstream of the lowest culvert replacement site. For other activities in North Fork Mill Creek and Mosier Creek, the analysis area extends to the Forest boundary, but not beyond.

There is one culvert replacement in Alder Creek included in this proposal, which lies within the South Fork Mill Creek 7th field watershed. The analysis area for this culvert site extends downstream to Crow Creek Reservoir, approximately 1.5 miles downstream.

Aquatic Species Presence/Absence and Distribution

Fish Species: Only one fish species listed as threatened or endangered is known[1] to be present in streams within the analysis area. Middle Columbia River Evolutionary Significant Unit (ESU) steelhead trout (*Oncorhynchus mykiss*), listed as a threatened species, is found within North Fork Mill Creek in the analysis area (Figure 3-14). Lower Columbia River steelhead trout, also listed as threatened, reside in Neal Creek and West Fork Neal Creek, but well below the analysis area (two or more miles downstream). Cutthroat trout (*O. clarki*), likely the coastal variety, and resident rainbow trout (*O. mykiss*), both Management Indicator Species (MIS) in the Mt. Hood National Forest Land and Resource Management Plan (LRMP), are present in Neal, West Fork Neal, and North Fork Mill Creeks within the analysis area. Cutthroat trout are also known to reside in Alder Creek. The resident rainbow trout in North Fork Mill Creek are suspected to be the redband subspecies, which is a Regional Forester's Special Status species.

Aquatic Macroinvertebrates: There are three Regional Forester's Special Status aquatic mollusk species that are present or suspected to reside within the analysis area: the Columbia duskysnail (*Colligyrus sp. nov. 1*), Barren Juga (*Juga hemphilli hemphilli*), and the Purple-lipped Juga (*Juga hemphilli maupinensis*). One caddisfly species, Scott's Apatanian caddisfly (*Allomyia scotti*), has recently been added to the Regional Forester's Special Status species list.

Detailed descriptions of fish and macroinvertebrate distribution relative to the North Fork Mill Creek analysis area follow. Fish species are discussed by stream, macroinvertebrates are discussed separately.

North Fork Mill Creek

Fish present in North Fork Mill Creek include cutthroat trout, resident rainbow trout, and Middle Columbia River ESU steelhead trout. Middle Columbia River ESU steelhead trout are found in North Fork Mill Creek at least up to river mile (RM) 9.75, well within the analysis area (Figure 3-14 and Table 3-47). Steelhead spawning was confirmed by the presence of a redd in 2005 just above the 1711-630 road crossing (MHNF, unpublished data). This is noteworthy as the 1711-630 road crossing was an impassible barrier to upstream fish migration until it was replaced with a bottomless arch in 2004. Given current habitat conditions (see Habitat Condition discussion below) steelhead presence is suspected up to RM 10.5.

Electrofishing surveys indicate cutthroat trout and possibly rainbow trout reside in North Fork Mill Creek from the mouth to the headwater forks (MHNF, unpublished data, Figure 3-15). Field staff from the Forest noted there appeared to be "cutthroat-rainbow hybrids" in the headwater forks (MHNF, unpublished data). Genetic analysis of salmonids from Mill Creek indicated a mixed population of redband and cutthroat trout immediately below the confluence of the North and South Forks, predominantly redband trout. Progressing downstream, cutthroat trout presence dissipated giving way to a pure redband population. Rainbow trout identified as redband had a high frequency of the redband allele, thus Forest Service personnel assume they are the inland variety (Spruell et al. 1998, Gregg et al. 1995). The presence of cutthroat trout populations above the limits of anadromous fish use is a common pattern of species distribution in watersheds in

[1] The terms "known" and "suspected" are used to describe fish and other aquatic fauna distribution in this document. Known presence describes areas where a species has been documented. Areas of known presence could also be defined as occupied habitat. Suspected presence describes areas where a species has not been documented, but fisheries biologists believe they are present.

this area (Steve Pribyl, ODFW [retired], personal communication). It is the professional opinion of the Hood River and Barlow Ranger District zone fisheries biologist that salmonids in North Fork Mill Creek upstream from the Forest boundary are predominantly cutthroat trout (Gary Asbridge, USFS, personal communication). Further genetic analysis is warranted to determine the salmonid species observed by surveyors in the headwaters of North Fork Mill Creek. For this analysis, resident rainbow trout distribution is assumed to be identical to steelhead distribution.

West Fork Neal Creek

Salmonids known to be present in West Fork Neal Creek include resident coastal rainbow trout, Lower Columbia River ESU steelhead trout, cutthroat trout, and a naturalized population of brook trout (*Salvelinus fontinalis*). Steelhead are known to spawn within the first mile of West Fork Neal Creek (Holly Coccoli [retired], Hood River Watershed Group, personal communication), but adult steelhead have never been documented further upstream (Table 3-47). Their uppermost distribution ends at RM 2.5 due to natural gradient barriers, small stream size, and a lack of suitable spawning habitat (Steve Pribyl [retired], ODFW, personal communication). This distribution of steelhead spawning and rearing habitat is corroborated by StreamNet, which lists the upper limit as RM 2.52 (StreamNet, 2008). There are also five culverts that are upstream migration barriers between this point and National Forest system lands; the lowest located at approximately RM 5.5 (Figure 3-14) (Asbridge et al., 2001).

Forest Service personnel discovered what were believed to be cutthroat trout during electrofishing surveys in West Fork Neal Creek from RM 6.45 to the headwater forks (MHNF, unpublished data, Figure 3-15). Stream habitat surveyors also observed salmonids, likely cutthroat trout, throughout their survey from RM 2.3 to the headwaters at RM 8.8, and they appeared to be more abundant above a section of dry channel located between RM 5.9 and 6.4 (USFS, 1999). Fish studies to date have not determined whether trout found in the headwaters are cutthroat or rainbow trout. The fish observed in the headwaters morphologically appear to be cutthroat, but there could be rainbows in the population. For this analysis, fish in the headwaters are assumed to be cutthroat trout and rainbow trout distribution is assumed to be the same as steelhead.

Neal Creek

Lower Columbia River ESU steelhead trout in Neal Creek have been documented a half mile above the confluence with West Fork Neal Creek, where a culvert that was a probable barrier used to exist (Figure 3-14 and Table3-47). Based on a field visit on March 17, 2003, it is the professional judgment of Forest Service fish biologists that steelhead are unlikely to ascend the steep, cascading section of Neal Creek that begins at approximately RM 6.0 (the confluence with West Fork Neal Creek is at RM 5.1). This point appears to be at or near the upper limit of steelhead and rainbow trout distribution in Neal Creek. It is believed that steelhead spawn in Neal Creek no higher than one mile upstream of the West Fork Neal Creek mouth (Steve Pribyl [retired], ODFW, personal communication).

Oregon Department of Fish and Wildlife (ODFW) stream survey personnel noted “trout fry (steelhead?)” throughout their survey of Neal Creek from its confluence with West Fork Neal Creek at RM 5.1 to RM 8.8 (ODFW, 1993). These “trout fry” were probably cutthroat trout which are present to at least RM 8.8, where an impassable culvert exists (Steve Pribyl [retired], ODFW, personal communication, Figure 3-15). Genetic analysis of fish in the main-stem of Neal

Creek below the confluence with West Fork Neal Creek indicates coastal rainbow trout only (Kostow, 1994). ODFW personnel found both juvenile and adult "rainbow/steelhead" in Neal Creek at RM 1.5 and at RM 5.0, and found adult cutthroat trout at RM 5.0 as well (Olsen et al., 1995).

Alder Creek
Salmonids known to be present in Alder Creek are cutthroat trout (Figure 3-15). Forest Service personnel observed cutthroat trout while electrofishing and made ocular observation of salmonids during surveys in Alder Creek from RM 1.5 to RM 1.7 (MHNF, unpublished data). Stream habitat surveyors also observed cutthroat trout during their survey up to river mile 1.8 which is above the 1721 road culvert (USFS, 1998). The 1721 road was identified as a fish passage barrier during a 2000 survey resulting in a fragmented population of cutthroat in Alder Creek (Asbridge et al., 2001).

Table 3-47: Summary of pertinent information for steelhead trout (the only federally listed aquatic species in the vicinity) distribution and stream reaches relative to the North Fork Mill Creek analysis area.

	Neal Creek	West Fork Neal Creek	North Fork Mill Creek	Alder Creek[1]
Reach of stream within National Forest system lands	None	RM 6.45 – 8.8	RM 6.4 – 13.0	RM 0.0 – 2.7
Reach of stream within the analysis area	RM 6.8 – 8.8	RM 3.5 – 8.8	RM 6.4 – 13.0	RM 0.0 – 1.5
Upper limit of known steelhead presence	RM 5.6	RM 1.0	RM 9.75	NA
Upper limit of suspected steelhead presence	RM 6.0	RM 2.5	RM 10.5	NA
Upper limit of steelhead critical habitat	RM 5.8	RM 2.5	RM 9.0	NA
Distance (RM) from closest planned activity to suspected (uppermost) steelhead presence or critical habitat, whichever is further upstream	2.8 miles (culvert replacement on the 1710 road crossing)	3.0 miles (Lowest stream crossing on the 1700 road. Culvert is proposed for replacement and road is a haul route.)	0.0 miles (Underburning is proposed along the north side of the creek. Note the closest culvert replacement site is 1.5 miles upstream of suspected steelhead distribution.)	NA (Note that cutthroat trout are present from the mouth upstream to the culvert proposed for replacement.)

[1] Steelhead trout are not present in Alder Creek.

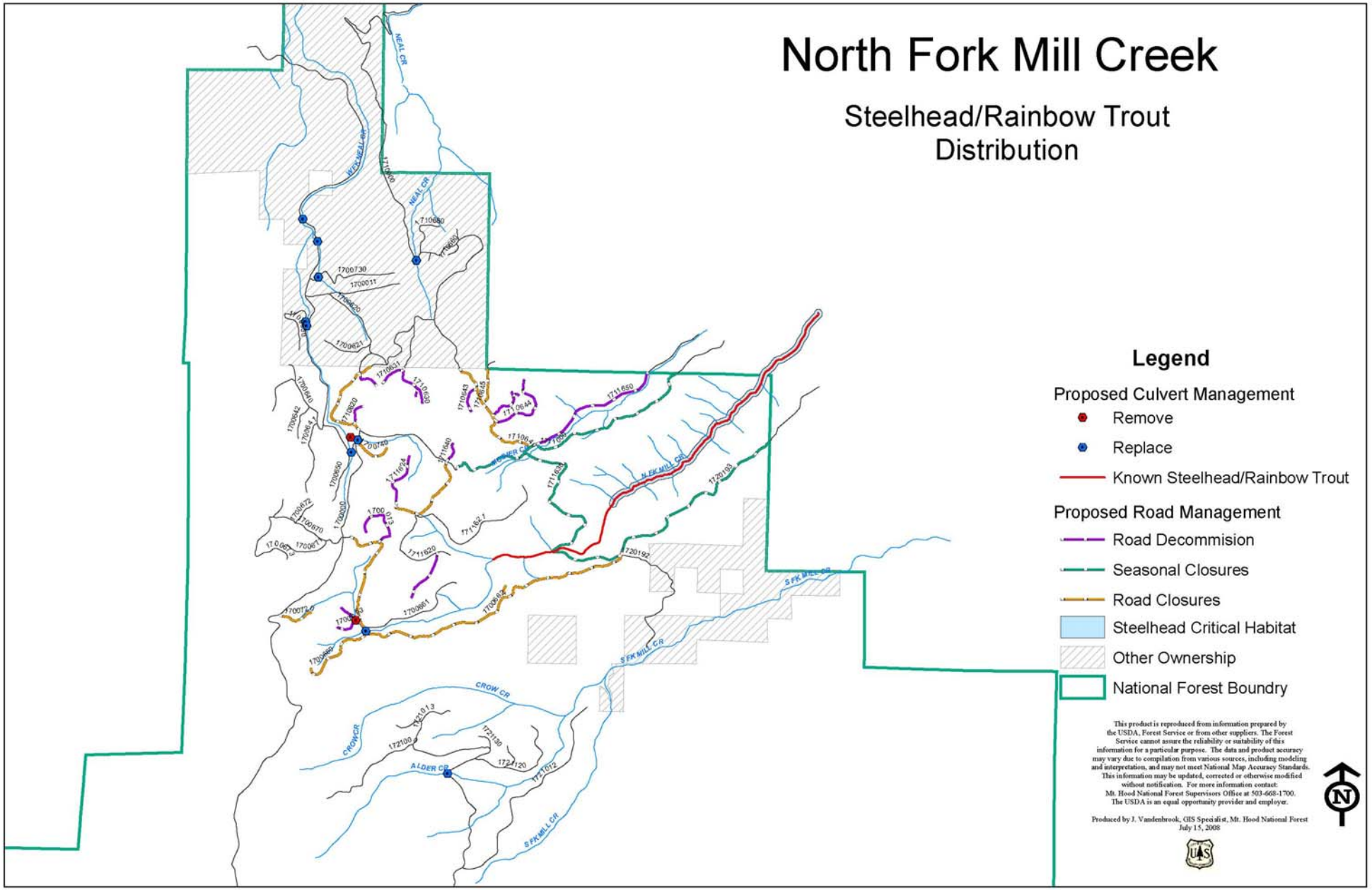

Figure 3-14: Steelhead/Rainbow Trout District in Planning Area

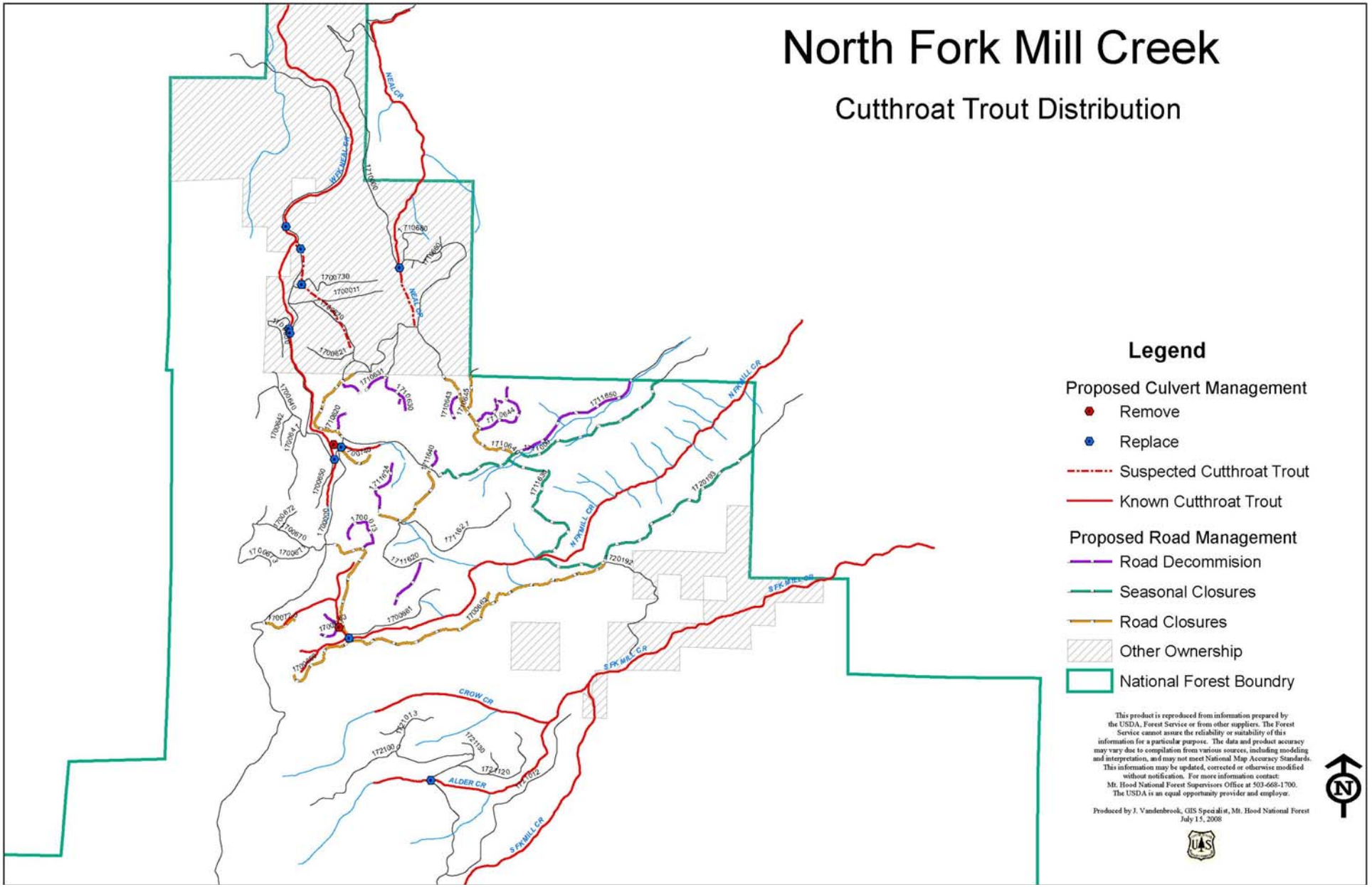

Figure 3-15: Cutthroat Trout Distribution in planning area

Aquatic Macroinvertebrates

Mollusks: The Columbia duskysnail is a Regional Forester's Special Status species and Northwest Forest Plan rare and uncommon aquatic mollusk. The Columbia duskysnail is found primarily in cold, well oxygenated perennial springs and spring outflows in shallow, slow-flowing areas. Most of the Columbia duskysnails found on the Forest have been in such habitat, although many have been found in small, non-glacial creeks as well. The substrate of known sites ranges from silt to cobble, and there seems to be a strong association with aquatic moss, especially Fontinalis. Often the snails are on the "fronds" of this moss. There doesn't appear to be an association with other aquatic macrophytes. Individuals have not been found in larger streams and rivers, or glacial streams of any size.

Distribution in the planning area appears to be limited. Columbia duskysnails have been found in West Fork Neal Creek near the headwaters during past surveys conducted by Forest personnel (MHNF, unpublished data). No other sites in West Fork Neal Creek were sampled. It is probable that the snails are found up and downstream in West Fork Neal Creek, but their overall distribution is unknown. Several sites were surveyed in the North Fork Mill Creek 7th field watershed, but no Columbia duskysnails were found. For the purposes of this analysis, Columbia duskysnails are considered present in West Fork Neal Creek, but not in Mosier or North Fork Mill Creeks. Presence in Alder Creek is assumed due to confirmed presence in South Fork Mill Creek nearby, although surveys have not been conducted (see below).

The Barren Juga and Purple-lipped Juga were recently added to the Regional Forester's Special Status species list and surveys were not conducted specifically for these two species. Both species prefer low elevation streams with stable gravel substrate and cold, oxygen rich water. The Barren Juga prefers small to medium size streams whereas the Purple-lipped Juga prefers larger streams. Given that, it is more likely that the Barren lipped Juga would be present in the planning area, but the presence of both species is possible.

The 2001 Survey and Manage Record of Decision (Standards and Guidelines, page 22) gives flexibility to survey or not survey for rare and uncommon species (Columbia duskysnail and Basalt Juga) – "The line officer should seek specialists' recommendations to help determine the need for a survey based on site-specific information. In making such determination, the line officer should consider the probability of the species being present on the project site, as well as the probability that the project would cause a significant negative effect on the species habitat or the persistence of the species at the site." (USFS and Bureau of Land Management (BLM), 2001).

Surveys for Regional Forester's Special Status and rare and uncommon aquatic mollusks were not conducted in all streams as part of this project, even though the Columbia duskysnail is known to occur in many streams on the District including those within the proposed project area. Because the Columbia duskysnail was found in South Fork Mill Creek, it is likely present in Alder Creek. Habitat conditions appear suitable for the Barren Juga in all streams within the planning area, whereas the Purple-lipped Juga would likely only be found in the lower reaches of North Fork Mill Creek, if at all. The Basalt Juga, a rare and uncommon species, has never been found during any survey on the Forest. Riparian reserve standards and guidelines and project design criteria/mitigation measures are sufficient to provide for the habitat needs of this species. Anticipated effects of implementing the action alternatives would not significantly affect habitat

or species persistence at each site, and thus the line officer (Responsible Official for this project) decided to not conduct surveys throughout the analysis area.

Scott's Apatanian Caddisfly: Little is known about the specific habitat requirements and distribution of this aquatic insect. In general, caddisflies prefer streams with cold water and gravel/cobble substrate. As such, most streams in the planning area would be suitable habitat for this species. Surveys were not conducted for this caddisfly, but their presence is assumed for the purposes of this analysis.

Threatened, Endangered, and Sensitive (TES) Aquatic Species Not Addressed in this Document

Bull Trout: There are no historic or current observations of Columbia River bull trout (*Salvelinus confluentus*), listed as threatened, in Neal Creek or West Fork Neal Creek (Buchanan et al., 1997). Bull trout have never been documented in Mosier Creek or North Fork Mill Creek (Jen Clark, Wasco County Soil and Water Conservation District, personal communication). Water temperatures are likely too high to support bull trout in any of these streams. Also, there is no designated bull trout critical habitat in any of these streams. As such, proposed activities in the North Fork Mill Creek planning area would have no effect on bull trout and they will not be discussed further.

Coho Salmon: Coho salmon (*O. kisutch*), listed as threatened, are known to occur in both Neal Creek and Mill Creek. However, in Neal Creek they have never been documented above the confluence with West Fork Neal Creek and are not believed to ascend past the confluence. Therefore, their presence is over 3.5 miles downstream of the proposed culvert replacement on the 1710 road, and well over 5.0 miles downstream of the closest proposed activity in the West Fork Neal Creek drainage. Similarly, coho salmon are known to occur in Mill Creek as well as short distances upstream in the North and South forks. Critical habitat for coho salmon has not been designated. Proposed activities in the North Fork Mill Creek planning area would have no effect on coho salmon because their upper limit of distribution is below the analysis area and they will not be discussed further.

Lower Columbia River Chinook salmon: Lower Columbia River ESU Chinook salmon do not reside in Neal Creek or West Fork Neal Creek. They do not ascend the Columbia River past the Hood River Basin. As such, they will not be discussed further.

Upper Willamette Chinook salmon: Upper Willamette River ESU Chinook salmon do not reside in the analysis area or downstream. As such, they will not be discussed further.

Designated Critical Habitat and Essential Fish Habitat

Critical habitat for several evolutionary significant units for steelhead trout and Chinook salmon was designated in September 2005 by the National Marine Fisheries Service (NMFS) (70 Federal Register 52630, September 2, 2005). Steelhead critical habitat has been designated in North Fork Mill Creek, Neal Creek, and West Fork Neal Creek. Steelhead critical habitat in Neal and West Fork Neal Creeks is essentially the same as suspected steelhead distribution (Table 3-47). In North Fork Mill Creek, however, designated steelhead critical habitat does not extend as far upstream as suspected steelhead presence (Table 3-47 and Figure 3-14). Chinook salmon

critical habitat was not designated in North Fork Mill Creek, Neal Creek, or West Fork Neal Creek.

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 USDA Forest Service. Essential Fish Habitat is coincident with Chinook salmon critical habitat where designated. However, since critical habitat for coho salmon has not been designated, and Chinook salmon critical habitat was not designated in the Mill and Neal Creek watersheds, the Forest Service has identified EFH as follows:

- Neal Creek – EFH extends from the mouth upstream to the confluence with West Fork Neal Creek.
- West Fork Neal Creek – No EFH present.
- Mill Creek – EFH extends from the mouth upstream the North and South Forks confluence.
- North Fork Mill Creek – No EFH present
- Alder Creek – No EFH present.
- Mosier Creek – No EFH present.

Habitat Conditions

The following discussion regarding stream physical habitat conditions is designed to give the reader a summary of fish habitat as it pertains to proposed activities, and their potential effects, in the North Fork Mill Creek planning area. This summary provides the baseline that potential effects from proposed activities can then be compared. Based on past experience, the available literature, and some monitoring information the primary habitat elements that could be affected by some or all proposed activities include: streambed substrate (especially fine sediment), turbidity2, pool quality (as measured by depth or volume), water temperature (as it relates to stream shade), recruitment potential of large woody debris (LWD) from surrounding riparian reserves, and fish passage. Other habitat elements, such as existing levels of in-channel LWD and pool quantity, would not be affected by any proposed activity thus they will not be discussed. Similarly, if only certain activities are proposed in or near a given creek, the potential effects may only impact certain habitat elements, thus only those elements will be discussed.

[2] Turbidity will be discussed in the effects section only. None of the streams in the planning are naturally turbid, except during high water events.

North Fork Mill Creek

North Fork Mill Creek originates in a wet meadow/spring complex in Gibson Prairie (T. 1S, R. 10E, Sec. 14). This wet meadow/spring complex (above the 1700-662 road) often dries out as the summer progresses. North Fork Mill Creek is undergoing severe channel downcutting in Gibson Prairie, due in part to the loss of deciduous riparian vegetation (in part from livestock grazing). The Mill Creek Watershed Analysis (USFS 2000a) noted degradation of Gibson Prairie due to cows keeping "riparian grasses short" and physically altering the streambanks. "The ephemeral streams within the meadow complex are actively downcutting which has resulted in a lowered water table, effectively draining the meadow." This was verified during the field visits during the summer of 2004 as part of the Long Prairie Grazing Allotment Environmental Analysis.

Deep pools were not abundant anywhere in North Fork Mill Creek (Table 3-48) (USFS, 2000b), but also would not be expected given the small size and power of the stream. Reach 2 (the headwaters in Gibson Prairie) has a large amount of sand/silt substrate (44%), whereas the lower steeper reach 1 had lesser amounts. The stream is generally well shaded although the uppermost reach in Gibson Prairie is more open due to the meadow nature as well as some effects from livestock grazing. Water temperatures in North Fork Mill Creek are well below Oregon Department of Environmental Quality standards (see the Watershed Resources report).

Table 3-48: Summary of habitat parameters in streams within the North Fork Mill Creek planning area (excluding Alder Creek) that could be affected by proposed activities outlined in the action alternatives.

Stream/Reach	Surveyor	Year Surveyed	Shade	Substrate <2 mm	Bank Erosion	Pools/Pools > 3 ft deep
North Fork Mill Creek						
RM 6.4-10.7	USFS	2000	71%	18%	8.5%	257/4
RM 10.7-12.4	USFS	2000	57%	44%	0.1%	39/0
Neal Creek						
RM 0.0-9.3	ODFW	1994	85%	17%	12%	120*
West Fork Neal Creek						
RM 0.0-2.3	ODFW	1994	93%	22%	13%	25*
RM 2.3-8.8	USFS	1999	73%	25%	7%	162/2

*ODFW does not count pools >3 ft deep.

There are two culvert upstream migration fish passage barriers in North Fork Mill Creek, both are in the headwaters in or near Gibson Prairie. One is located at the 1700-662 road crossing, and the other on the 1700-663 road crossing (both above RM 10.5).

Neal Creek

The Forest Service has not conducted a Level II stream survey on Neal Creek. ODFW conducted a habitat survey of Neal Creek from its mouth to RM 8.8. It is assumed that conditions documented in the 1993 ODFW survey are still relatively accurate, although the 1996 flood could have changed habitat conditions. The only project within the Neal Creek sub-watershed is the replacement of a fish passage barrier culvert on the 1710 road at RM 8.8. The only habitat elements that could be affected by the culvert replacement is substrate (fine sediment) and pool quality, thus these are the only elements that will be discussed.

Habitat in upper Neal Creek is dominated by cascades and rapids. Pool numbers were very low overall and there were no pools greater than three feet deep (Table 3-48). No pools of any depth were found in the reach from RM 6.9 -8.8. It is inferred from this data that pool quality, as measured by depth or volume, is low. However, given the steep gradient and dominant cascade/rapid habitat type this is likely within the normal range of condition. Neal Creek is dominated by cobble substrate (31% average), with relatively low amounts of fine sediment (17%, see Table 3-48).

West Fork Neal Creek

West Fork Neal Creek is the largest tributary to Neal Creek and its headwaters originate in a wet meadow/spring complex (T1S, R10E, Section 11). West Fork Neal Creek was surveyed from RM 2.3 – 8.8 by Forest Service personnel in 1999. Conditions today are likely similar to those described then because no large floods have occurred since 1999 and the creek itself is spring-fed and small – it lacks the power to move large volumes of sediment or LWD.

Pools totaled 162, but only two pools in the 6.5 mile survey reach were greater than three feet deep (Table 3-48). Given the small size and power of the stream however, large pools would not be expected. This reach had a large amount of sand/silt substrate (27% of the total), which exceeds LRMP standards. Trampled dirt banks were identified frequently from RM 6.45 to 8.8, which is the area of the stream within National Forest system lands. Percent bank instability overall was 7.0%, possibly contributing the fine sediment seen (USFS, 1999). The stream was generally well shaded, averaging 73% shade, but there were areas where the amount of shade was quite low. However, water temperatures in West Fork Neal Creek are well below Oregon Department of Environmental Quality standards (see the Watershed Resources report).

Habitat conditions in West Fork Neal Creek in the lower 2.3 miles were similar to those described above (see Table 3-48).

There are total of eight culvert fish passage barriers located on West Fork Neal Creek or its tributaries (Figure 1-5). Culvert barriers located on West Fork Neal Creek itself are as follows:

- 1700 road (RM 5.5)
- 1700-630 road (RM 6.7)
- 1700 road (RM 6.75)
- 1700 road (RM 8.27)

Culvert barriers on fish bearing tributaries to West Fork Neal Creek are as follows:

- Tributary “A” (T1N, R10E, Section 25)
  - 1700 road (RM 0.16)
  - 1700-730 road (RM 0.5)
- Tributary “B” (T1S, R10E, Section 2; headwaters near Long Prairie)
  - 1710-710 road (RM 0.06)
  - 1710 road (RM 0.1)

The first two culverts are located on the same tributary and the third and fourth culverts are located on another tributary.

Alder Creek
The only project proposed in the Alder Creek sub-watershed is a culvert replacement on the 1721 road, thus the only habitat elements discussed herein are sediment and pool quality. The Forest Service conducted a Level II stream survey on Alder Creek in 1998 from its mouth to river mile 3.2. It is assumed conditions documented in the 1998 USFS survey have not changed because no substantial human activity or natural events have occurred since the 1998 survey was conducted. There were no primary pools (pools ≥ 3 feet deep) in Alder Creek; however, pool numbers overall were low. Alder Creek has low to intermittent flow for the majority of the year and in general would not be expected to form deep pools in large numbers. Gravel was the dominant substrate. Fine substrate was observed in sections of dry channel where the water had slowed, dried, and deposited fines.

Analysis Methodology

This effects analysis utilizes research, relevant monitoring, field data, previous experience, and modeling to provide the context, amount and duration of potential effects for each alternative. Much of the analysis in regards to erosion potential, sedimentation potential, and water temperature is covered in detail in the Soil Productivity and/or Watershed Resources specialist's reports. As such, this effects analysis on aquatic fauna and habitat relies extensively on the Soil Productivity and Watershed Resources effects analyses because the primary effects to aquatic fauna are related to fine sediment and water temperature. For example, if hydrology and soils experts expect little to no sedimentation from a specific activity then that activity would have little to no effect on fish or aquatic macroinvertebrates from a sediment perspective. Other indicators incorporated in the effects analysis from a sediment perspective included the number of haul route road crossings over fish bearing streams, new trail crossings over streams, and miles of roads and trails adjacent to streams.

For LWD recruitment, potential this analysis related to existing riparian stand conditions compared to expected conditions following treatment. Canopy closure was used to compare the two conditions

Environmental Effects

No Action Alternative – Direct and Indirect Effects
Stream shading would remain at current levels and sediment delivery to stream would also remain at current levels, thus water temperatures and stream substrate conditions would remain unchanged (see Watershed Resources and Soil Productivity sections). Riparian stand conditions would also remain as is, at least in the near term. As in all forests, trees would grow, die, and fall in a natural manner thus LWD recruitment potential in riparian stands would change slowly over time. As a result of the above, there would be no effect to aquatic habitat and thus fish and aquatic macroinvertebrate populations in these areas. Because current fish barrier culverts would remain in place the current resident fish population fragmentation would remain.

As pointed out in the Watershed Resources and Soil Productivity sections, not treating vegetation and fuels in the planning area increases the risk of a higher burn severity wildfire, which in turn could lead to reduced site productivity, increased erosion, and more riparian vegetation burned. This could result in degraded stream habitat and water quality conditions in turn leading to

negative impacts to fish and/or snails such as impaired feeding, impaired respiration or suffocation, and increased stress. The magnitude of these effects, if they occurred, would depend on the fire location (proximity to occupied aquatic habitat) and intensity.

Proposed Action Alternative – Direct Effects
Direct effects associated with activities proposed in Alternative 1 relate to culvert removals and replacements, tree falling near fish bearing streams, and trail bridge construction as these are the only activities that could directly impact stream channels. All other proposed activities would occur too far from streams or other water bodies to directly harm or harass aquatic fauna or habitat.

Culvert removal/replacement: There are two proposed culvert removal sites and ten proposed replacement locations. At each location, the stream would be diverted prior to culvert removal and subsequent replacement (where proposed) as per design criteria/mitigation measures outlined in Chapter 2. As part of the diversion process a fish collection and removal procedure is also required. These actions have a high probability of impacting both fish and aquatic macroinvertebrates as described below.

Fish would be collected at each site with electrofishing gear. Electrofishing, when done properly, has minimal impact on individual fish, especially smaller fish as would be found in the creeks where the culverts are located. However, some injury or even mortality is possible and is assumed to occur, albeit at low levels. Effects of electrofishing on aquatic macroinvertebrates are not well understood, but for the purposes of this analysis, it is assumed that some injury or mortality may occur.

The diversion of creek water, causing the dewatering of the creek channel above, below, and through the culvert may also result in injury or mortality to fish or aquatic macroinvertebrates. If fish are not captured during the electrofishing process (a low probability, but possible), they may be stranded and die unless they are seen and captured by collection personnel. This situation is even more likely for aquatic insects and mollusks. For these small creatures, it is probable they would perish.

Finally, during the diversion and re-watering phases of the culvert work at each site there would be pulses of turbidity with some sediment movement downstream. These pulses would be short-term (a few hours) and are not expected to persist more than 1.5 to 2.0 miles downstream (see the Watershed Resources Section). Turbidity would be highest just below the site and then dissipate further downstream – very little suspended sediment would travel two miles downstream.

It is important to note that ESA listed fish species and Regional Forester's Special Status fish species do not reside at any culvert location (see Table 1), but cutthroat trout do. Regional Forester's Special Status mollusks and the one caddisfly may be present at one or more sites given known habitat preferences.

Riparian silviculture: There are design criteria/mitigation measures in place to maintain the existing canopy within 60 and 30 feet of perennial and intermittent streams, respectively. Tree falling may occur up to these buffer widths and the intent is to fall all trees away from the water body. However, it is possible that some trees may fall within these no treatment areas due to

wind shifts, predominant tree lean direction, or some other factor. If this occurs, the section of tree within the no treatment area would be left on site. If a tree were to fall in a perennial fish bearing stream, there is a slight chance that it could either kill or harm a fish (and/or aquatic macroinvertebrate) or disrupt its normal behavior for a short time. The risk for this is very low, but not zero.

None of the proposed thinning or other silvicultural treatment units (Figure 1-5) are located along stream segments that harbor ESA listed fish species and Regional Forester's Special Status fish species. The only units where a felled tree could land in or near a stream is in the headwaters of North Fork Mill Creek (fish bearing – cutthroat trout), along some unnamed tributaries to North Fork Mill Creek (non-fish bearing), and along Mosier Creek (non-fish bearing). Regional Forester's Special Status mollusks and the one caddisfly may be present at the North Fork Mill Creek sites given known habitat preferences, but not likely in Mosier Creek.

Trail bridge construction: There are two sites where trail bridges are required as the streams they cross are fish bearing (West Fork Neal Creek and North Fork Mill Creek). Although most trail bridges are constructed by hand or with a small, specialized excavator and the impacts are minimal, it is possible that trails personnel or equipment may have to enter the stream channel to facilitate construction. If this occurs fish or other aquatic fauna may be disturbed or killed. The risk of fish mortality is extremely remote as they normally detect presence and move out of the area.

As with the other projects listed above, no ESA listed or Regional Forester's Special Status fish species are present at either site, although cutthroat trout are present. Regional Forester's Special Status aquatic macroinvertebrates may be present.

Proposed Action Alternative – Indirect Effects

Indirect negative effects to fish, aquatic macroinvertebrates, and their habitat center on increases in water temperature, potential erosion and subsequent sedimentation, and potential reductions in LWD recruitment potential to streams and riparian areas. Each of these potential effects is discussed below.

Water Temperature

As described in the Watershed Resources Report, increases in water temperature could potentially result from vegetation treatments, recreational trail construction, road decommissioning, and culvert removal/replacement. Project designs, including appropriate design criteria/mitigation measures, coupled with the small impact area of some proposed work such as trail construction would ensure that existing canopy cover and thus shade is maintained. As such, no increase in water temperature is anticipated as a result of proposed activities and thus there would be no effect on aquatic fauna or habitat.

Sediment
Potential erosion and subsequent sedimentation into streams or other water bodies could come from a variety of proposed activities including vegetation treatment (including associated temporary roads and underburning), recreational trail construction and maintenance, road decommissioning, road maintenance, log hauling, road snowplowing, and culvert replacement/removal. Many of these activities and their anticipated effects were covered in the Soil Productivity and Watershed Resources Reports and the details will not be repeated here.

The risk of significant erosion and subsequent sedimentation into area streams was deemed quite low resulting from vegetation treatments, associated temporary road building and decommissioning, and underburning (prescribed fire). Cottonwood/aspen enhancements may result in a minor, short-term increase in sedimentation where proposed. These treatments are located in the headwaters of Mosier Creek and in the North Fork Mill Creek watershed (but not near any streams). Mosier Creek is not fish bearing in the action area.

Road maintenance on log haul routes and subsequent hauling has the potential to increase road related sediment into streams, primarily near stream crossings. Although road maintenance reduces sedimentation in the long-term, some road maintenance activities such as ditch cleaning could result in freshly disturbed soil that could be more prone to erosion after the first precipitation event. The amounts of sediment are normally quite small and short lived. Table 2-4 outlines proposed road maintenance on haul routes. The majority of these roads are located outside riparian reserves and most do not cross stream channels. The following table summarizes road crossings over perennial and intermittent stream channels.

Table 3-49: Haul route road crossings over stream channels within the North Fork Mill Creek Planning Area. These roads are also proposed for some form of maintenance depending on the location and road surfacing. The three crossings of the 1700000 road over West Fork Neal Creek are listed in downstream to upstream order.

Road Number	Stream Crossed	Perennial or Intermittent	Fish Bearing?	PETS** Fish Species Present?
1700000	WF Neal Creek	Perennial	Yes	No
1700000*	WF Neal Creek	Perennial	Yes	No
1700000*	WF Neal Creek	Perennial	Yes	No
1700660	NF Mill Creek	Perennial	Yes	No
1700663	NF Mill Creek	Perennial	Yes	No
1710000	WF Neal Creek	Perennial	Yes	No
1711000	Mosier Creek	Intermittent	No	No
1711630	Mosier Creek	Intermittent	No	No
1711630	NF Mill Creek	Perennial	Yes	Yes***

*The 1700 road is paved at these two crossings.
**PETS Fish Species are Proposed, Endangered, Threatened, or Sensitive species
***Steelhead (ESA listed as threatened) and redband trout (Regional Forester's Special Status Species.

Small amounts of sediment could be washed into streams at the locations listed in Table 3-49 by maintenance activities, particularly ditch cleaning. The sediment amounts would be small and short lived and would primarily occur after the first precipitation event. Log hauling itself could exacerbate erosion, especially in wet conditions, and produce dust. Hauling is proposed in the

normal operating season (May 15-October 31) which is normally the dry part of the year in this area. When hauling on dry roads the sediment produced is dust (depending on the speed of the truck) which has a negligible effect on water quality. There are design criteria/mitigation measures in place to address hauling during wet and snowy/frozen conditions. Along with road damage, the risk of sedimentation is the prime consideration whether to haul during these periods and that decision lies with the District Ranger.

If hauling does occur in winter it may be necessary to snowplow roads to provide access to the units. Any snowplowing that occurs would follow standard operating procedures outlined in the snowplow road use permit. These procedures include not plowing at a depth where bare soil is exposed when crossing streams, not pushing any snow into streams, and incorporating breaks in the snow berm alongside the road to provide drainage. Despite these measures it is possible for runoff during snowmelt to be channeled down the roadway directly into whatever stream lies in the valley bottom. This runoff could carry sediment, especially on native surface roads, but the amount is typically quite small.

Recreational trail building may result in some erosion and subsequent sedimentation into creeks at proposed trail crossings. The most likely site this would occur is the crossing proposed over West Fork Neal Creek (see the Soils Productivity and Watershed Resources sections) because of relatively steep slopes leading in and out of the drainage. The amount of sediment generated during and after construction is expected to be quite low. West Fork Neal Creek is fish bearing at this point (cutthroat trout), but no ESA listed or Regional Forester's Special Status species reside there or nearby downstream. The Columbia duskysnail is likely in the vicinity and the Purple-lipped and Barren Juga snails are suspected, as is Scott's Apatanian caddisfly.

Road decommissioning in and of itself would have little to no chance of contributing fine sediment to area streams. The ripping of the road surface would help restore water infiltration into the soil and greatly reduce surface runoff. However, where drainage culverts are removed there could be short-term inputs of sediment downstream from these sites. Where drainage culverts emptied out onto the forest floor (as opposed to a small intermittent stream channel) any sediment produced would be metered by topography, vegetation, and distance to any nearby water bodies. If a drainage culvert emptied into an intermittent channel then sediment could be routed downstream over time and eventually make its way into a perennial stream. Given the roads to be decommissioned (Figure 1-5) the greatest chance of sediment entering a waterway is in Mosier Creek which is an intermittent, non-fish bearing stream in the action area. The presence of Regional Forester's Special Status aquatic macroinvertebrates is unlikely here as well. There is a chance some sediment could enter the headwaters of North Fork Mill Creek when the 1700663 and 1700664 roads are decommissioned, but this would be a very low risk.

Culvert removal and replacements would have the greatest impact to area streams regarding increases in turbidity and sedimentation. There is no way to complete this type work without some increase in sediment downstream. Design criteria/mitigation measures incorporated into Alternative 1, such as working during low water, de-watering construction sites, and prompt re-vegetation would greatly minimize, but not eliminate increases in turbidity and sediment. As described above, turbidity and sedimentation increases would be most likely when the site is first de-watered and then re-watered. These pulses of sediment are expected to be relatively small and short-lived. According to information presented in the Watershed Resources section, this

sediment is not likely to travel downstream more than 2.0 miles due to the small amount of material and stream velocity breaks. The amount of fine sediment traveling that far downstream would be negligible. Therefore, although cutthroat trout and Regional Forester's Special Status aquatic macroinvertebrate could be affected in all creeks, ESA listed fish species and Regional Forester's Special Status redband trout individuals would not.

Table 3-50 summarizes the above discussion regarding proposed activities that could generate sediment in streams within the action area. The information is displayed in terms of relative risk of sedimentation, both at individual sites and downstream, because it is difficult to predict exact amounts of sediment generated. The risk assessment includes the beneficial effects of design criteria/mitigation measures meant to reduce impacts

Table 3-50: The relative sedimentation risk of various activities proposed in Alternative 1, as well the potential effects risk to fish and aquatic macroinvertebrates.

Proposed Activity	Relative Sedimentation Risk		Potential Effects Risk		
	Site Specific	Downstream	Macro-invertebrates	Cutthroat	ESA Listed Fish
Vegetation Treatment	Low	Very Low	Low	Low	None
Road Maintenance	Low	Very Low	Low	Low	None
Log Hauling	Low	Very Low	Low	Low	None
Snowplowing	Very Low	Very Low	Very Low	Very Low	None
Recreational Trails	Very Low	Very Low	Very Low	Very Low	None
Road Decommissioning	Low-Mod	Low	Low	Low	None
Culvert Removal or Replacement	Moderate	Low	Moderate	Moderate	None

Potential effects from sediment on aquatic fauna and habitat: The effects of turbidity and fine sediment on aquatic fauna and habitat vary depending on the amount, timing, existing habitat conditions, and species present. The proposed activities would produce small amounts of fine sediment as a whole and anticipated effects would be primarily site-specific in nature. The following discussion separates effects from turbidity increases and fine sediment.

Turbidity: Increases in turbidity could affect fish by reducing feeding, stimulating movement out of the area, respiratory impairment, increasing stress, and reduced tolerance to disease (Waters, 1995). In general, high levels of turbidity for long periods of time are required to cause significant effects. Feeding success could be reduced during prolonged episodes of high turbidity due to reduced sight distances and a reduced ability to see a capture prey. The amount of suspended sediment anticipated from all proposed activities would have little no effect on fish respiration given the small amount and short duration. Increased stress may be the most likely result of turbidity increases given the anticipated short-term duration of turbidity increases and relatively low amounts of suspended sediment. Overall, the impact on fish is expected to be slight and would occur in the near vicinity of the proposed projects. Turbidity would dissipate within two miles or less below culvert replacement/removal sites (the primary producer of

turbidity) so downstream effects would be immeasurable against background levels with no biological significance. Increased turbidity has little to no effect on habitat conditions.

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. Effects on mollusks are not well understood, but given that preferred habitat characteristics include clean water it is assumed that long periods of high turbidity would be detrimental. Since the pulses of turbidity would be short, the impact on aquatic invertebrates is likely minimal.

Sedimentation: 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). Large amounts of fine sediment deposition in pools could reduce the available habitat area and thus reduce the rearing space for juvenile and adult fish. The amount of sediment generated from the proposed activities, even culvert removal/replacements, would not be not be enough to measurably reduce pool habitat.

Fine sediment deposition in pool tails and riffles could reduce the quality of spawning habitat for fish and reduce food production (i.e. insects) in riffles where they are the most abundant. Again, given the anticipated amounts of sediment generated from all proposed projects the impact to spawning and food producing habitat would be minimal. Not all sediment would deposit in the same place as it would be spread over a relatively large reach of stream. In any given riffle or pool tail the amount deposited would be relatively low. The affect on spawning habitat would be minimal; food production could be slightly reduced in some areas.

The deposition of fine sediment could affect aquatic mollusks or insects by smothering them or covering their food supply. This is actually a greater risk than that for fish given their small size and relative immobility. It is anticipated that some aquatic macroinvertebrate mortality could occur at and below culvert removal/replacement sites, but not from other activities. This is due to the relatively higher amounts of sediment generated compared to other proposed activities.

Large Woody Debris Recruitment Potential

Proposed vegetation treatments could reduce the LWD recruitment potential to stream and riparian areas within the planning area. Thinning along streams within the planning area would be the activity most likely to reduce recruitment potential in the 5-15 years following treatment. The no treatment zone would be unaffected, but trees in the outer zones of the riparian reserves would be reduced in number and thus less would be available to fall into streams and riparian areas. Most thinning is proposed along Mosier Creek with a few stands in the headwaters of North Fork Mill Creek and some tributaries to North Fork Mill Creek (non-fish bearing). The effect to fish and fish habitat would be minimal in the short-term given the location of the thinning units. Of course in the long-term stand health should improve resulting in increased growth rates of remaining trees so that bigger trees would fall into area streams in the future. In addition, the target canopy closures are commensurate with expected canopy closures under a normal fire regime thus from a historical perspective the resultant stands would provide the amount of LWD recruitment expected given natural stand conditions.

Beneficial Effects
All of the proposed projects are designed to have long-term beneficial effect in the planning area. The greatest direct benefit to fish and other aquatic fauna would result from culvert replacement/removals. Restoring unimpeded upstream passage would restore the connectivity between currently fragmented cutthroat trout populations. The restored passage would not affect ESA listed or Regional Forester's Special Status fish species given their distribution. Improved riparian and upland forest health and fuels conditions would provide larger trees faster for in-stream and flooplain LWD recruitment as well as reduce the severity of future wildfires. Lower severity wildfires result in reduced erosion potential after fires, thus reducing potential sedimentation. Road maintenance and decommissioning would reduce erosion potential and subsequent sedimentation into area streams. Finally, concentrating recreation away from streams and bridging perennial streams where crossings are necessary would reduce streamside disturbance and potential sedimentation.

Proposed Action Alternative – Cumulative Effects
Cumulative direct effects could occur if cattle grazing coincided with trail bridge construction and/or culvert removal/replacements. At present the grazing permittee is resting the allotment, but in the future if cattle are present, they browse adjacent to, or in streams within the planning area. This could increase the overall direct disturbance to aquatic macroinvertebrates or fish. Many of the areas where cattle previously "camped out" in and along streams have or will be fenced, but other streamside areas would still be accessible.

There would be no cumulative effects associated with water temperature as there are no other anticipated projects that would increase water temperatures on any streams in the action area (see the Watershed Resources section). Additional sediment input from other proposed projects including Off-highway vehicles (OHV) use and livestock grazing in the Long Prairie grazing allotment could increase the amount of fine sediment in the North Fork Mill and West Fork Neal Creeks watersheds (see the Watershed Resources section). The amount and timing of this sedimentation depends on the implementation of these projects; if they are implemented within three years of this project then increased sedimentation may occur which could then increase the magnitude of effects at the site scale. This would have greater negative effects on cutthroat trout and Regional Forester's Special Status Species aquatic macroinvertebrates. Impacts to ESA listed fish, habitat, and Regional Forester's Special Status Species redband trout would be nonexistent given the distance from anticipated sediment sources.

There are no projects proposed in the foreseeable future that would cumulatively effect LWD recruitment potential in or below the planning area.

Alternative 2 – Direct, Indirect, and Cumulative Effects
Direct effects on aquatic fauna and habitat resulting from projects proposed in Alternative 2 would be the same as described for Alternative 1 except for riparian silviculture related tree falling. There would be no effect on any ESA listed or Regional Forester's Special Status species or habitat resulting from tree falling because none of the units are located near streams that contain these species or habitat. With the exception of underburning, the vegetation treatment units are either not near streams or along Mosier Creek.

Indirect effects to aquatic resources under Alternative 2 would be essentially the same as described for Alternative 1. In regards to water temperature, there was no increase in water temperature expected in Alternative 1 and the same rationale applies to this Alternative. The situation is the same for erosion and sedimentation potential. The only difference between the two alternatives is an overall reduction in the various vegetation treatments in Alternative 2 compared to Alternative 1 (see Tables 1-1 and 2-8). The sedimentation and potential effect risks for aquatic sites and species is low to none in Alternative 1 (Table 4). Risks would be even lower overall in Alternative 2 given that there are less than half the acres proposed for treatment as compared to Alternative 1. The risks and potential effects outlined in Alternative 1 for road maintenance, hauling, snowplowing, decommissioning, recreation trail building, and culvert removal/replacements would be the same in Alternative 2.

The long-term beneficial effects of vegetation treatments resulting in improved stand health, fuel loading levels, and LWD would be less in this alternative since fewer acres would be treated overall. Thinning treatment in the Mosier Creek drainage and underburning in the North Fork Mill Creek drainage would remain essentially the same, but forest conditions would not be improved in the headwaters of North Fork Mill Creek and West Fork Neal Creek. Long-term recruitment of LWD could be slowed in these headwater areas under Alternative 2.

Given that the direct and indirect effects on aquatic fauna and habitat are very similar between alternatives, and that there is no difference in the restoration related projects that have the most impact, the effects from a cumulative standpoint are the same for both alternatives.

Determination of Effect Including Essential Fish Habitat

No Action Alternative
The No Action Alternative would have no effect or impact on any ESA threatened aquatic species, designated critical habitat, Regional Forester's Special Status aquatic species, or essential fish habitat. Although the risk of a more severe fire is increased it is impossible to predict when or where that would occur, thus it is not a foreseeable action.

Alternatives 1 and 2
Projects proposed in Alternatives 1 and 2 would have no effect on ESA listed threatened steelhead trout individuals or designated critical habitat fine sediment would be trapped and stored in the stream channel between disturbed areas and occupied habitat. Given that rainbow trout (possibly the redband subspecies) distribution is similar to steelhead distribution there would be no impact to Regional Forester's Special Status redband trout.

Proposed projects may impact Regional Forester's Special Status aquatic macroinvertebrates (Columbia duskysnail, Purple-lipped Juga, Barren Juga, and Scott's Apatanian caddisfly) or their habitat but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species. Although at the site scale individuals may be harmed or killed (highest risk from culvert replacement/removals) and habitat could be degraded in the short-term, the distribution of the species would not be reduced and overall populations in area streams would remain viable due to presence of individuals both up and downstream.

Although not Federally listed or on the Regional Forester's Special Status list, cutthroat trout individuals could be harmed or killed associated with culvert removal/replacements and the risk of habitat degradation is low to moderate. These effects would occur primarily at the site scale and in terms of habitat the effects would be short-term.

Note that in the long-term the following projects would all benefit aquatic resources in and below the planning area:

- Vegetation/fuels treatments
- Road decommissioning
- Road maintenance
- Culvert removal and replacement

Wildlife Resource

A Wildlife Biological Evaluation was completed as part of this analysis. The entire Biological Evaluation is incorporated by reference and is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the evaluation are summarized below. Reference material is contained in the full biological evaluation.

Existing Conditions

Two species of wildlife classified as threatened, endangered or proposed may occur on or adjacent to the Hood River Ranger District of the Forest. There are twenty-two Forest Service, Region 6 sensitive species that may be found on the Hood River District.

The status of threatened, endangered, and proposed species; Forest Service Region 6 sensitive species; and Forest management indicator species that may occur in the project area are listed in Table 3-51.

Table 3-51: Status of threatened, endangered, and proposed species; Forest Service Region 6 sensitive species in the project area.

WILDLIFE SURVEY RESULTS			
Species	**Habitat**	**Surveys**	**Presence**
Federally Threatened, Endangered or Proposed			
Northern spotted owl *(Strix occidentalis caurina)*	Y[1]	Y[2]	Y[1]
Canada lynx *(Lynx canadensis)*	N[1]	Y[1]	N[1]
R6 Sensitive Species			
Bald eagle *(Haliatus leucocephalus)*	N[1]	-	-
Great gray owl *(Strix nebulosa)*	N[1]	-	-
Oregon Slender salamander *(Batrachoseps wrighti)*	Y[1]	-	-
Larch Mountain salamander *(Plethodon larselii)*	N[1]	-	-
Cope's giant salamander *(Dicomptodon copei)*	N	-	-
Cascade torrent salamander *(Rhyocotriton cascadae)*	N	-	-
Oregon spotted frog *(Rana pretiosa)*	N	-	-
Painted turtle *(Chrysemys picta)*	N	-	-
Northwestern pond turtle *(Clemmys marmorata marmorata)*	N	-	-
Baird's shrew *(Sorex bairdii permiliensis)*	N	-	-
Pacific fringe-tailed bat *(Myotis thysanodes vespertinus)*	N	-	-
Wolverine *(Gulo gulo luteus)*	Y[1]	-	-
Pacific fisher *(Martes pennanti)*	Y[1]	-	-
Horned grebe *(Podiceps auritus)*	N	-	-
Bufflehead *(Bucephala albeola)*	N	-	-
Harlequin duck *(Histrionicus histrionicus)*	N	-	-
Peregrine falcon *(Falco peregrinus anatum)*	N	-	-
Gray flycatcher *(Empidonax wrightii)*	N	-	-
Dalles sideband *(Monadenia fidelis minor)*	Y[1]	-	-
Crater Lake tightcoil *(Pristiloma arcticum crateris)*	Y[1]	-	-
Evening fieldslug *(Deroceras hesperium)*	Y[1]	-	-

WILDLIFE SURVEY RESULTS			
Species	**Habitat**	**Surveys**	**Presence**
Puget Oregeonium *(Cryptomastix devia)*	Y[1]	-	-
Columbia Gorge Oregeonium *(Cryptomastix hendersoni)*	Y[1]	-	-
Management Indicator Species			
Mule Deer (*Odocoileus hemionus*) and Elk (*Cervus elaphus nelsoni*)	Y[1]	-	-
Pileated Woodpecker *(Dryocopus pileatus)*	Y[1]	-	-
Pine Marten *(Martes americana)*	Y[1]	-	-
Wild Turkey *(Meleagris gallopavo)*	Y[1]	-	-
Western Gray Squirrel *(Sciurus griseus griseus)*	Y[1]	-	-
Snag and Down Log Associated Species	Y[1]	-	-
Neotropical Migratory Birds	Y[1]	-	-

1. See narrative.
2. The last surveys were conducted in 1993. In accordance with the Northwest Forest Plan, additional surveys are not needed in this area.

Threatened, endangered and proposed species

Northern spotted owl

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. 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).

Spotted owls are mostly nocturnal, but they may forage opportunistically during the day. Composition of prey in the spotted owl's diet varies regionally, seasonally, annually, and locally, which is likely in response to prey availability (Forsman et al. 2001). Northern flying squirrels and woodrats are usually the predominant prey species. Other prey species include red tree vole, red backed voles, mice, rabbits and hares, birds, and insects.

Surveys conducted on the District since l979 have revealed a number of documented sightings. All nesting, roosting, and foraging (NRF) habitat on the Hood River Ranger District is considered 'unsurveyed' suitable habitat.

The Recovery Plan for the Northern Spotted Owl has developed a habitat management strategy for fire-dominated east-side Provinces that is intended to maintain spotted owl habitat in an environment of frequent natural disturbances. No Managed Owl Conservation Areas are identified in these Provinces, given the assumption that the severe natural disturbance regime precludes long-term persistence of any static habitat management areas. Rather, a landscape

approach that promotes spotted owl recovery within the broader goal of ecological sustainability is recommended (U.S. Fish and Wildlife Service, 2008). Active management to reduce wildfire and insect outbreak risks will be required to offset risks of habitat loss. Recovery Action 7 directs agencies to manage lands in east-side Provinces outside of the high-quality habitat patches to restore ecological processes and functions, and to reduce the potential for significant losses by stand-replacing fires, insects, and disease.

The project area contains 1462 acres of NRF habitat and 2097 acres of dispersal habitat and there are 3 spotted owl home ranges that overlap treatment units. The Surveyors Ridge Late Successional Reserve (LSR) runs along the western boundary of the project area and does not fall within any treatment units. Approximately one mile of existing trail is within the eastern edge of the LSR boundary. There is no designated critical habitat in the project area.

The *Status and Trends in Demography of Northern Spotted Owls* (Anthony et. al. 2006) states that the spotted owl numbers have fallen by roughly half over the past decade in parts of Washington, and the 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 NSO 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.

Canada lynx

Lynx rely heavily on a single prey species, the snowshoe hare (Lepus americanus), although they do take other small mammals, birds and carrion, particularly when hares are rare. High snowshoe hare populations are generally associated with dense, young, lodgepole pine and subalpine fir stands (Koehler and Aubry 1994). Winter snow track surveys (1993-1996) and hair sample surveys (1999-2001) where conducted on the Forest with no detections of lynx.

The Forest received direction[3] in 2000 from the Lynx Steering Committee and the Lynx Biology Team addressing lynx habitat mapping in Regions 1,2,4,6, and 9. This direction identified subalpine fir plant associations as the primary vegetation component from which lynx habitat and lynx analysis units (LAU) would be delineated. The Forest ran this analysis based on plant association groups and identified approximately 1270 acres of subalpine fir plant associations primarily on the eastside of the Forest.

The Lynx Conservation Assessment Strategy identified a need for at least 10 square miles (6400 acres) of primary vegetation to warrant delineation of a LAU. A minimum number of contiguous LAUs are necessary to provide the amount and distribution of habitat required to manage for

[3] Refer to memoranda "Lynx Habitat Mapping" (September 19, 2000) and "Lynx Habitat Mapping Direction" (August 22, 2000).

viable lynx populations. Based on our analysis above, the Forest does not have the minimum criteria to develop a LAU, and therefore, it is unlikely that lynx are resident on the Forest, although they may be present as transient or dispersing animals.

R6 Sensitive Species

Bald Eagle
Bald eagles require large bodies of water such as lakes, marshes, and rivers, which provide fish as a food source and tall trees for nesting and roosting. Bald eagles feed primarily on fish, but also eat small animals (ducks, muskrats, rabbits, snakes) and occasionally carrion (Watson et al. 1991). There are no bald eagle nest sites within or near the project area. The closest known nest site is near the Columbia River to the north of the project area and the 2 known nests on the Forest are 18 (Rock Creek) and 30 (Timothy Lake) miles to the south.

Great Gray Owl
Great gray owls occur in mid- to high elevation conifer forests and prefer dense forests interspersed with open meadows, clearings, or bogs. This owl usually nests in mature and older forest stands using existing raptor nests or tops of broken trees and snags for a nest platform (Hayward and Verner 1994). They forage mainly during dusk and dawn from a perch at the forest edge near grassy meadows and openings where they feed on voles and pocket gophers. Surveys for great gray owls on the Forest were completed in 1997 and 1998 and no owls were located. There is no suitable habitat within the project area.

Oregon Slender Salamander
Oregon slender salamander habitat is described as evergreen forests, older second-growth, and old growth Douglas fir with large numbers of large logs and stumps. It is also characterized as a species mostly associated with the westside of the Cascade Mountains of Oregon (Corkran and Thoms 1996). This species requires down wood and tree canopy closure (50-100 percent) to maintain the microsite. The proposed project area has current tolerance levels of 30-80% for snags and down wood material (DecAid wood advisory model). This equates to 2-6 percent cover of down wood for the project area and 6.7 to 25 snags/acre greater than 10.0 in dbh (Eastside Mixed Conifer Forest, Small/Medium Trees Vegetation Condition).

Larch Mountain Salamander
Larch Mountain salamander habitat includes shaded talus areas, usually with a litter or duff covering, with interstitial spaces suitable for this species to descend into as the summer heats and dries the surface (Nussbaum 1983). Surveys north of the Columbia River have found this species within conifer habitat where litter, duff, and moisture conditions are sufficient. The surveyors indicated that even in those conditions, the substrate beneath the litter or duff tended to be an open, porous rocky material with talus-like characteristics. These conditions do not occur in any of the areas proposed for treatment within the planning area. Soil conditions are relatively tight with virtually no interstitial spaces.

Wolverine
The wolverine needs large tracts of undeveloped and uninhabited areas and are considered highly sensitive to human presence. Habitat for wolverine may consist of all forest and non-forest types.

It appears that the limiting factor for wolverine is the presence of an abundant, large mammalian prey base, and the exclusion of human presence (Hatler 1989).

Wolverine tracks have been observed near the Highway 35 corridor. No denning habitat exists within or adjacent to the project area, although the general area could be considered potential foraging or travel habitat by wolverine.

Pacific Fisher

Fishers use forests with a high percentage of canopy closure, abundant large woody debris, large snags, cavity trees, and understory vegetation. Fisher habitat includes a high degree of diversity; multi-aged stands interspersed with small openings that contain wetland or riparian habitats which help support a diverse prey base (Powell 1981). Although fishers are associated with late-successional conifer forests, they also use younger stands, especially as foraging habitat (Lewis and Stinson 1998). Fishers are primarily carnivorous. The most common prey species are porcupines, snowshoe hares, tree squirrels, mice and voles (Powell 1993). Suitable habitat exists in patches within and adjacent to the proposed project area.

There are three known specimens of fisher from Oregon; two from Lane County and one from Douglas County. Fishers have been re-introduced in southern Oregon and a small population has been established in that part of the state. The presence of fishers on the Forest has not been confirmed. Winter snow track surveys, camera bait stations, and smoke track plates have been utilized in the past decade to determine carnivore presence. No fishers were found using these survey techniques. Fishers are documented on the Deschutes National Forest to the south and are suspected on the Columbia River Gorge National Scenic area to the north. Because this species can make long distance dispersal movements of many miles, they have the potential to occur on the Forest.

Dalles Sideband, Crater Lake Tightcoil, Evening Fieldslug, Puget Oregonian, Columbia Gorge Oregonian

These species require down wood and tree canopy closure (60-100 percent) to maintain the microsite (Burke et al. 1999). The proposed project area has current tolerance levels of 30-80% for snags and down wood material (DecAid wood advisory model). This equates to 2-6 percent cover of down wood for the project area and 6.7 to 25 snags/acre greater than 10.0 in dbh (Eastside Mixed Conifer Forest, Small/Medium Trees Vegetation Condition). The project area was surveyed during the spring of 2001 and 2008. All sites needing protection would be buffered to maintain these sites.

Management Indicator Species

Deer and Elk

Deer and elk are indicative of edge associated species that require forested habitat adjacent to openings. The project area is classified as summer (western half of project area) and winter range (eastern half of project area) for black-tail deer and Rocky Mountain elk, and is inhabited by both during the summer and winter periods. The planning area contains forested cover of varying degrees with openings and early seral stands that provide forage.

Total road density for the project area is currently 3.36 miles per square mile. The total open road density is 2.24 miles per square mile. This is less than the 2.5 miles of open road density in the Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) Standards and Guidelines for this allocation. Inventoried winter range is currently 1.91 miles of open road per square mile which is less than the 2.0 miles of open road density in the Forest Plan Standards and Guidelines. The current open road density in B10 deer and elk winter range is 1.11 miles of roads per square mile which is less than the 1.5 miles of open road density in the Forest Plan Standards and Guidelines.

Pileated Woodpecker

Pileated woodpeckers are an indicator species for those animals associated with larger diameter snags within mature forest/closed canopy stands. This species nests in cavitites and feeds on carpenter ants, beetle larvae, other insects, fruits and nuts. The project area currently includes trees larger than 20 inches dbh which are suitable for pileated woodpeckers to nest in.

Pine Marten

Pine marten represent the status of those species associated with medium to large diameter down logs within mature old growth forests. Martens are closely associated with lodgepole pine, Douglas fir, spruce, and mixed hardwood forests (Verts and Carraway 1998). They tend to be found in structurally complex, mature forests, and can occur at all elevations where such habitat exists. They den in hollow trees, crevices, or vacant ground burrows (Bull 1997). Suitable habitat for this species is within the planning area. Pine marten have not been documented within the planning area, but based on their range and habitat suitability, are expected to occur there.

Wild Turkey

Two subspecies (Merriam's and Rio Grande) of wild turkeys are found on the Forest. Both subspecies are generally associated with the pine/oak vegetation classification. Turkeys feed on acorns, conifer seed, insects and grass/forbs. Turkey nest sites are closely associated with mixed conifer stands. Roost trees are large diameter (> 20 inch dbh) ponderosa pine and douglas fir.

Western Gray Squirrel

The Western gray squirrel is closely associated with pine/oak vegetation. Nests are generally of two kinds: large twig and leaf nests constructed with a roof for winter use and rearing of young; and looser leaf nests contructed as temporary nests, summer nests or alternative nests (Foster 1992). Western gray squirrels feed on hypogeous fungi, conifer seeds, and acorns. Western gray squirrels can be found on the Forest from the Columbia River Gorge south to the Warm Springs Reservation and are expected to occur within the planning area.

Snag and Down Log Associated Species

Snags (standing dead trees) and down logs are essential components in forests. Many wildlife species depend on them for survival. The Forest Plan (FW-215, 216, 217) recommends a 40% biological potential (0.9 snags/acre) for cavity nesting species across the landscape and a 60% biological potential (1.35 snags /acre) in new timber harvest units (Thomas, 1979).

Forest Plans standards and guidelines for management of snags and down wood in the Pacific Northwest were based on wildlife species models and tools that were developed in the 1970s and 1980s (Thomas et al. 1979, Neitro et al. 1985, Marcot 1992, Raphael 1983). New information

about the ecology, dynamics, and management of decayed wood has been published since then, and the state of the knowledge continues to change. Rose et al. (2001) report that results of monitoring indicate that the biological potential models are a flawed technique (page 602).

Until the Forest Plan is revised, the Forest is directed to rely on the best available science. While the Forest would still meet or exceed the Forest Plan standards, the concept of historic range of variability (HRV) is being used to maintain populations of snag dependent species. By managing habitat within HRV it is assumed that adequate habitat would be provided because species survived in those levels of habitat in the past in order to be present today. Thus, if the Forest Service manages current habitats within the range of historic variability, the Forest Service is likely to ensure population viability for those species that remain (Landres et al. 1999). DecAID is a compilation of the best available science on management of dead wood, including reference conditions for HRV.

The Mill Creek watershed was analyzed using DecAid to determine snag and down wood levels needed to help meet wildlife management objectives (such as the Mt. Hood LRMP and the Northwest Forest Plan). This tool is not a wildlife population simulator nor is it an analysis of wildlife population viability. Refer to the website listed in the Literature Citations for more detail and for definition of terms.

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 sub-watersheds, watersheds, sub-basins, 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.

For the Mill Creek watershed, black-backed woodpeckers and pileated woodpeckers warrant determining objectives and using DecAid to evaluate in relation to the HRV. Both woodpeckers require large amounts of snags and down wood near their nest sites and pileated woodpeckers are a management indicator species for the Forest. Table 3-52 shows the 30, 50, and 80 percent tolerance levels[4] for black-backed wood peckers and pileated wood peckers (From Table EMC_S/L.sp-22 in DecAid).

[4] *Tolerance interval*: The range of values that represent a specific proportion or percentage of some sample or population (such as a 30%, 50%, or 80% tolerance interval), at a given level of confidence such as 95% or 90% confidence.
Tolerance level (limit): The specific value at the edge of a tolerance interval. For example, if a 30% tolerance level of snag dbh used by wildlife species in a specific vegetation condition is, say, 40 cm, this means that 30% of all individuals of the wildlife populations used less than or equal to that size snag. An 80% tolerance level would correspond to 80% of the individuals using that corresponding size snag. A 100% tolerance level means all of the individuals would use that size snag (100% tolerance intervals correspond to the maximum observed values, such as the largest dbh snag observed to be used by a wildlife species).

Table 3-52: Tolerance levells (t.l.) for Black-backed wood peckers (BBWO) and pileated wood peckers (PIWO) from DecAid Analysis.

Snag size: > 10 inches						
Species	**30% t.l. Snags/ acre)**	**30% t.l. Sample size**	**50% t.l. Snags/ acre)**	**50% t.l. Sample size**	**80% t.l. Snags/ acre**	**80% t.l. Sample size**
BBWO	2.5	14	13.6	14	29.2	14
PIWO	14.9	32	30.1	137	49.3	32
Snag size: > 20 inches						
BBWO	0.0	14	1.4	14	5.7	14
PIWO	3.5	32	7.8	166	18.4	32

DecAID uses vegetation inventory data from unharvested stands to approximate "natural" or "historical" levels of dead wood. However, there is a caveat in DecAID to using this approach in eastside dry forests: "On the eastside in particular, current levels of dead wood may be elevated above historical conditions due to fire exclusion and increased mortality, and may be depleted below historical levels in local areas burned by intense fire or subjected to repeated salvage and firewood cutting (Mellen et al. 2006)."

The Forest Service is using the data as a reference condition because:

- They are still some of the best data available to assess HRV of dead wood, even in eastside dry forests.
- They are the only available data showing distribution and variation in snag and down wood amounts across the landscape.
- The data from unharvested stands are in the range of other published data on HRV of dead wood even in the drier vegetation types (Agee 2002, Korol et al. 2002 as per http://www.fs.fed.us/r6/nr/wildlife/decaid/hrv-dead-wood-comparison.shtml).

According to distribution histograms in DecAID (EMC_ECB_S.inv-14&15), approximately 4 percent of the landscape would be expected to provide snag densities for nest sites for pileated woodpeckers at the 80 percent tolerance level and approximately 11 percent of the landscape would be expected to provide snag densities for nest sites for black-backed woodpeckers at the 80 percent tolerance level. These species select nesting sites with high density clumps of snags which have always been rare on the landscape.

The overall objective for the project is to reduce hazardous fuels to improve forest health conditions for this area which makes meeting the snag and down wood tolerance level objectives for these species a lower priority. Wildland Urban Interfaces are not the best places on the landscape to manage for high density snag habitat because of the increased fire risk.

The majority of the project area falls into the "Eastside Mixed Conifer Forest, East Cascades/Blue Mountains, Small/Medium Trees Vegetation Condition" as described DecAID. This zone contains 6.7 to 25 snags/acre >10.0 in dbh and 2-6 percent cover for down wood.

In the Mill Creeks watershed, snag and down woody debris density and conditions were taken from the 1995 Current Vegetation Survey (CVS). In order to have an adequate sampling intensity, the Middle Columbia-Hood subbasin was used as the 'representative area' (264,769

acres with 85 CVS plots), of which the Mill Creek Watershed forms a portion. Vegetation stratification was by ecological zone (Eastside Douglas-fir, Grand fir/Ponderosa Pine, Pacific Silver fir/ Mountain hemlock); seral stage (early, middle, late); and history (managed or unmanaged). Portions of the project falls within each of the above ecological zones.

CVS data indicates that there is an average of 29.1 snags per acre and 5.7 percent cover for down wood in the unmanaged stands in the watershed. The Mill Creek watershed currently meets the 80% tolerance level (29.2 snags per acre) for black-backed woodpeckers and the 50% tolerance level (30.1) for pileated woodpeckers.

Neotropical Migratory Birds
The project area currently contains approximately 20 % early seral habitat, 50 % mid-seral habitat, and 30 % late seral habitats and supports the species associated with these seral stages.

Environmental Effects

The environmental effects to threatened, endangered, and sensitive wildlife species is summarized in Table 3-53. Each species is discussed separately in the following sections.

Table 3-53: Effects Determinations for Threatened, Endangered, and Sensitive Species.

Species	No Action	Alternative 1 – Proposed Action	Alternative 2
Threatened and Endangered Species			
Northern Spotted Owl	LAA	LAA	LAA
Canada Lynx	No Effect	No Effect	No Effect
R6 Sensitive Species			
Bald Eagle	No Impact	No Impact	No Impact
Great Gray Owl	No Impact	No Impact	No Impact
Oregon Slender Salamander	No Impact	MII	No Impact
Larch Mountain Salamander	No Impact	No Impact	No Impact
Wolverine	No Impact	MII	MII
Pacific Fisher	MII	MII	MII
Dalles Sideband	No Impact	MII	No Impact
Crater Lake Tightcoil	No Impact	MII	No Impact
Evening Fieldslug	No Impact	MII	No Impact
Puget Oregonian	No Impact	MII	No Impact
Columbia Gorge Oregonian	No Impact	MII	No Impact

LAA—May Effect, Likely To Adversely Affect
MII – May Impact Individuals, but are not likely to impact populations, nor contribute to a potential loss of viability of the species

Threatened, endangered and proposed species

Northern Spotted Owl
Direct and Indirect Effects of the No Action Alternative
The long-term effects of the No Action alternative to spotted owls would include an increase in root-rot pockets and diseased trees and the potential for an increase in stand replacing fires within the planning area. This increase in disease and fire potential would raise the likelihood of

losing mature forest habitat which the owls depend on for nesting and foraging. Therefore, the No Action alternative may effect and is likely to adversely affect northern spotted owls.

Direct and Indirect Effects of Alternative 1 – Proposed Action
The tree removal activites on 54 acres which downgrade suitable habitat may affect and are likely to adversely affect spotted owls. The tree removal activites and the resulting disturbance on 28 acres which degrade suitable habitat may affect and are not likely to adversely affect spotted owls. Tree removal activites and the resulting disturbance on 928 acres which remove (275 acres) or degrade (653 acres) dispersal habitat may affect and are not likely to adversely affect spotted owls. Treatment on 54 acres of suitable habitat is 3.7 percent of the 1462 acres of suitable habitat in the project area and treatment on 275 acres of dispersal habitat is approximately 13 percent of the dispersal habitat within the project area.

Although the short-term effects to spotted owls may be negative, the long-term effects would be positive. The improvement of stand health and the reduction in fuels would reduce the potential for disease caused mortality and stand replacing fires. Under this alternative, there is a greater chance of maintaining, through time, some of the key mature forest stands and/or key components of mature forests, such as large diameter trees, snags and logs, which would contribute to achieving the goals for habitat improvement of east-side Provinces under the Recovery Plan for the spotted owls.

The underburning of 610 acres would have a long-term positive effect on mature forest associated species. Underburning activities would reduce fuels and aid in the regeneration of the understory. These acres have a smaller diameter material throughout the area and burning would reduce the fire potential and initiate new growth. This new growth, and development of multi canopy layers would be beneficial for mature forest associated species.

Direct and Indirect Effects of Alternative 2
Tree removal activities and the resulting disturbance on 244 acres which remove (25 acres) or degrade (219 acres) dispersal habitat may affect and are not likely to adversely affect spotted owls. Treatment on 244 acres of dispersal habitat is approximately 12 percent of the dispersal habitat within the project area. Nesting habitat would not be impacted.

Under this alternative, the improvement of stand health and the reduction in fuels would reduce the potential for disease caused mortality and stand replacing fires on the acres treated. The long-term effects to the remaining untreated acres would include an increase in root-rot pockets and diseased trees and the potential for an increase in stand replacing fires. This increase in disease and fire potential would also increase the likelihood of losing mature forest habitat which the owls depend on for nesting and foraging. Therefore, Alternative 2 may effect and is likely to adversely affect northern spotted owls.

The underburning of 610 acres would have a long-term positive effect on mature forest associated species. Underburning activities would reduce fuels and aid in the regeneration of the understory. These acres have a smaller diameter material throughout the area and burning would reduce the fire potential and initiate new growth. This new growth, and development of multi canopy layers would be beneficial for mature forest associated species.

Cumulative Effects of Alternative 1 and Alternative 2
The analysis area is bordered on the south by The Dalles Watershed, on the west by the Surveyers Ridge LSR, on the north by SDS lands and other private lands, and on the east by other private lands. The Dalles Watershed Fuel Break falls within this area and would degrade 326 acres of NRF habitat, remove 455 acres of NRF habitat, and degrade 81 acres of dispersal habitat. Based on GIS analysis, the SDS lands to the north of the planning area, the Surveyers Ridge LSR, and The Dalles Watershed have adequate dispersal routes for spotted owls.

Cumulatively, the short-term effects of the North Fork Mill project and The Dalles Watershed Fuel Break projects impact spotted owl habitat negatively. All projects downgrade, remove or degrade habitat. Alternative 2 would have less short-term impacts because this Alternative treats fewer acres of spotted owl habitat. The long-term cumulative effects of these projects would reduce future habitat loss. The purpose of the Dalles Watershed Fuel Break project is to protect the watershed from catastrophic wildfire. This would also protect the spotted owl habitat within the watershed. Therefore, the overall cumulative impacts to spotted owls would be neutral.

The effects to spotted owls for this project were consulted on with the U.S. Fish and Wildlife Service through formal consultation on FY 2007-2008 activities within the Willamette province that have the potential to adversly affect spotted owls due to habitat modification and disturbance (FWS reference: 1-7-06-F-0179). The conclusion by the US Fish and Wildlife Service is that these projects are not likely to jeopardize the continued exixtence of the spotted owl or result in the destruction or adverse modification of spotted owl critical habitat.

Canada Lynx
Lynx are not considered a resident on the Forest and it is anticipated that lynx use in the project area would be restricted to transient individuals, therefore, implementation of the proposed project would have no effect on lynx or their habitat because the proposed project does not alter habitat conditions for travel, foraging or denning. Long-term landscape connectivity has not been compromised. Travel habitat would be widely distributed throughout the landscape. None of the units fall within the subalpine fir plant association which is considered primary habitat for lynx.

Sensitive Species

Bald Eagle
There would be no direct, indirect, or cumulative effects to bald eagle. No suitable habitat exists for bald eagles in the project area, therefore this project would have no impact on bald eagles.

Great Gray Owl
There would be no direct, indirect, or cumulative effects to great gray owls since no habitat would be impacted, therefore, there would be no impact to this species.

Oregon Slender Salamander
Direct and Indirect Effects of the No Action Alternative
There would be no impact to Oregon slender salamander with the No Action alternative because no activities would take place in salamander habitat and no habitat would be altered or removed.

Direct and Indirect Effects of Alternative 1 – Proposed Action
The Proposed Action may impact individuals, but is not likely to impact populations, nor contribute to a potential loss of viability of this species. This project would impact habitat for salamanders by reducing snags and down wood. All known micro sites would be protected. In addition, the Northwest Forest Plan Record of Decision (ROD) recommends 120 linear feet of down logs per acre greater than 16 inches in diameter within the matrix management areas in eastern Oregon. Although this project would eliminate some habitat within the project area, a minimum of 120 linear feet of down woody material and 4 snags/acre would be retained and the populations of salamanders would continue to persist within the project area.

Direct and Indirect Effects of Alternative 2
There would be no impact to Oregon slender salamander with this alternative because no activities would take place in salamander habitat and no habitat would be altered or removed.

Cumulative Effects of Alternative 1 and Alternative 2
The cumulative effects area of consideration is the North Fork Mill Creek project area. This species has a very small home range of less than 100 meters. There would be no measurable change in cumulative effects because of the small home range for this species, the protection of known sites, and the retention of down wood and snags.

Larch Mountain Salamander
There would be no direct, indirect, or cumulative effects to Larch Mountain salamander since no habitat would be impacted, therefore, there would be no impact to this species.

Wolverine
Direct and Indirect Effects of the No Action Alternative
Human disturbance would continue from recreational and administrative uses. There would be no habitat impacted and no change in the use patterns of wolverines with this alternative. This alternative would have no impact on wolverines.

Direct and Indirect Effects of Alternative 1 – Proposed Action
Disturbance caused by sound and human presence may impact individuals, but is not likely to impact populations, nor contribute to a potential loss of viability of this species. The construction or improvement of 17 miles of trail would increase human use which may increase disturbance to wolverines. This alternative reduces some human disturbance by proposing road closures and addressing the long-term need for roads in the watershed . This alternative would reduce open road densities from 2.24 to 1.72 in the project area, and from 1.11 to 0.0 in B-10 winter range. Foraging opportunities would continue in the stands adjacent to the proposed units and no denning habitat would be impacted by this project.

Direct and Indirect Effects of Alternative 2
Disturbance caused by sound and human presence during treatment activities may impact individuals, but is not likely to impact populations, nor contribute to a potential loss of viability of this species. The construction or improvement of 13.5 miles of trail would increase human use which may increase disturbance to wolverines. This alternative address human disturbance by proposing road closures and addressing the long-term need for roads in the watershed. This alternative would reduce road open densities from 2.24 to 1.72 in the project area, and from 1.11

to 0.0 in B-10 winter range. Foraging opportunities would continue in the stands adjacent to the proposed units and no denning habitat would be impacted by this project.

Cumulative Effects of Alternative 1 and Alternative 2
The cumulative effects area of consideration is the Mill Creek Watershed. Wolverine use of the habitat in the analysis area is limited by the presence of humans who are using roads and recreating throughout the watershed. The action alternatives address human disturbance by proposing road closures in the watershed. By closing roads that are currently open to public use, disturbance caused by human presence would be reduced and therefore, these alternatives would cumulatively have a beneficial effect to wolverine.

Fisher
Direct and Indirect Effects of the No Action Alternative
The long-term effects of the No Action alternative to fishers would include an increase in root-rot pockets and diseased trees and the potential for an increase in stand replacing fires within the planning area. This increase in disease and fire potential would increase the likelihood of losing mature forest habitat. This alternative may impact individuals but is not likely to impact populations, nor contribute to a potential loss of viability of this species.

Direct and Indirect Effects of Alternative 1 – Proposed Action
Treatment activities that reduce canopy cover, large woody debris, large snags, and cavity trees may impact individuals, but are not likely to impact populations, nor contribute to a potential loss of viability of this species. Foraging and denning opportunities would continue within the project area and within the stands adjacent to the proposed units. The riparian areas would continue to provide foraging habitat.

Although the short-term effects to fishers may be negative, the long-term effects would be positive. The improvement of stand health and the reduction in fuels would reduce the potential for disease caused mortality and stand replacing fires. Under this alternative, there is a greater chance of maintaining, through time, some of the key mature forest stands and/or key components of mature forests, such as large diamater trees, snags and logs.

The underburning of 610 acres would have a long-term positive effect on mature forest associated species. Underburning activities would reduce fuels and aid in the regeneration of the understory. These acres have a smaller diameter material throughout the area and burning would reduce the fire potential and initiate new growth. This new growth, and development of multi-canopy layers would be beneficial for mature forest associated species.

Direct and Indirect Effects of Alternative 2
Because this alternative does not treat stands in suitable fisher habitat, there would be no short-term impacts. The long-term effects of this alternative to fishers would include an increase in root-rot pockets and diseased trees and the potential for an increase in stand replacing fires within untreated units. This increase in disease and fire potential would increase the likelihood of losing mature forest habitat. This alternative may impact individuals but is not likely to impact populations, nor contribute to a potential loss of viability of this species.

The underburning of 610 acres would have a long-term positive effect on mature forest associated species. Underburning activities would reduce fuels and aid in the regeneration of the understory. These acres have a smaller diameter material throughout the area and burning would reduce the fire potential and initiate new growth. This new growth, and development of multi-canopy layers would be beneficial for mature forest associated species.

Cumulative Effects of Alternative 1 and Alternative 2
The cumulative effects area of consideration is the Mill Creek Watershed. Cumulatively, the short-term effects of the North Fork Mill project and The Dalles Watershed Fuel Break projects impact fisher habitat negatively by reducing canopy cover, large woody debris, large snags, and cavity trees. Alternative 2 would have less short-term impacts because this Alternative treats fewer acres of fisher habitat. The long-term cumulative effects of these projects would reduce future habitat loss. The purpose of the Dalles Watershed Fuel Break project is to protect the watershed from catastrophic wildfire. This would also protect fisher habitat within the watershed. Therefore, the overall cumulative impacts to fisher would be neutral.

Dalles Sideband, Crater Lake Tightcoil, Evening Fieldslug, Puget Oregonian, Columbia Gorge Oregonian

Direct and Indirect Effects of the No Action Alternative
There would be no impact to these species with the No Action alternative because no activities would take place in suitable habitat and no habitat would be altered or removed.

Direct and Indirect Effects of Alternative 1 – Proposed Action
The Proposed Action may impact individuals, but is not likely to impact populations, nor contribute to a potential loss of viability of these species. This project would impact habitat for mollusks by reducing snags and down wood. All known micro-sites would be protected. In addition, the Northwest Forest Plan ROD recommends 120 linear feet of down logs per acre greater than 16 inches in diameter within the matrix management areas in eastern Oregon. Although this project would eliminate some habitat within the project area, a minimum of 120 linear feet of down woody material and 4 snags/acre would be retained and the populations of salamanders would continue to persist within the project area.

Direct, Indirect, and Cumulative Effects of Alternative 2
There would be no impact to these species with this alternative because no activities would take place in suitable habitat and no habitat would be altered or removed.

Cumulative Effects of Alternative 1 and Alternative 2
The cumulative effects area of consideration is the North Fork Mill Creek project area. These species have a very small home range of less than 100 meters. There would be no measurable change in cumulative effects because of the small home ranges, the protection of known sites, and the retention of down wood and snags.

Management Indicator Species

Deer and Elk

Direct and Indirect Effects of the No Action Alternative

Disturbance from human presence and activities within the planning area would remain at the current levels. Stand structural development that would occur within the planning area would be neutral for deer and elk. No forage habitat would be created for deer and elk through the No Action alternative.

Direct and Indirect Effects of Alternative 1 – Proposed Action

Variable density thinning would benifit deer and elk by creating a mosaic of forage habitat intermixed with some hiding cover. Thermal cover would be reduced on all acres proposed for timber harvest although treatment units would maintain 1 to 5 acre patches for hiding and thermal cover. Forage habitat for deer and elk would be developed in areas where heavy thinning is required. The long-term impacts to deer and elk would be neutral. Within the next 40 years, the forage habitat created by the Proposed Action would no longer be in a forage condition. In the long-term, the habitat would likely be a combination of hiding and thermal cover, returning the area to a situation similar to the current condition.

The Mt. Hood Forest Plan Standard and Guide FW-208 recommends 2.5 mile of open roads per square mile on summer range and 1.5 miles of open roads per square mile on B10 winter range. Open road densities in the project area would not exceed the Forest Plan Standards and Guidelines for summer range (1.72 miles per square mile) and B10 winter range (no open roads), reducing human interactions with wintering deer and elk .

Direct and Indirect Effects of Alternative 2

Thermal cover would be reduced on all acres proposed for timber harvest although treatment units would maintain 1 to 5 acre patches for hiding and thermal cover. Forage habitat for deer and elk would be developed on 25 acres where heavy thinning is required. The long-term impacts to deer and elk would be neutral. Within the next 40 years, the forage habitat created by the Alternative 2 would no longer be in a forage condition. In the long-term, the habitat would likely be a combination of hiding and thermal cover, returning the area to a situation similar to the current condition.

The Mt. Hood Forest Plan Standard and Guide FW-208 recommends 2.5 mile per square mile of road on summer range and 1.5 miles per square mile on B10 winter range. Open road densities in the project area would exceed the Forest Plan Standards and Guidelines for summer range (1.72 miles per square mile) and winter range (no open roads), reducing human interactions with wintering deer and elk.

Cumulative Effects of Alternative 1 and Alternative 2

The analysis area is bordered on the south by The Dalles Watershed, on the west by the Surveyers Ridge LSR, on the north by SDS lands and other private lands, and on on the east by the private lands. The Dalles Watershed Fuel Break project area and the North Fork Mill Creek project area combined currently have 44% forage and 56% cover. These projects would have 48% forage and 52% cover post timber removal. The optimum cover forage ratio is 60% forage and 40% cover (Thomas, 1979). Cumulatively, there would be a small change in cover forage

ratios with forage increasing by 4% and cover decreasing by 4% in the North and South Fork Mill Creek areas.

The Mt. Hood Forest Plan Standard and Guide FW-208 recommends 2.5 miles of open roads per square mile of road on summer range and 1.5 miles of open roads per square miles on B10 winter range. The roads within the Dalles Watershed are not open to the public and the area meets or exceeds the Standards and Guidelines for open road densities. The North Fork Mill Creek project area would reduce open road densities and would meet or exceed the Standards and Guidelines for open road densities which would reduce human interactions with wintering deer and elk.

Pine Martin and Pileated Woodpecker

Direct and Indirect Effects of the No Action Alternative

The long-term effects of the No Action alternative to these species would include an increase in root-rot pockets and diseased trees and the potential for an increase in stand replacing fires within the planning area. This increase in disease and fire potential would increase the number of snags, and would also increase the likelihood of losing mature forest habitat which these species depend on for reproduction and foraging.

Direct and Indirect Effects of Alternative 1 – Proposed Action

Tree removal would reduce snags, down wood and canopy closure for these species. Currently, the proposed project area is between 30 and 80 percent snag and down wood levels as outlined in the DecAID Advisor. The 30 percent levels are generally associated with previously harvested areas and the pine/oak habitat. The 80 percent levels are generally located in previously unharvested areas. The proposed project would retain snags and down wood at the 30 to 50 percent level in the planning area. The project does not impact any designated pine marten or pileated woodpecker habitat areas (B5) designated in the Mt. Hood Forest Plan.

Although the short-term effects to mature forest associated species may be negative, the long-term effect would be positive. The long-term improvement of stand health and the reduction in fuel loading would improve stand health and reduce the potential for stand replacing fires. Under this alternative, there is a greater chance of maintaining, through time, some of the key mature forest stands and/or key components of mature forests, such as large diamater trees, snags and logs.

The underburning of 610 acres would have a long-term positive effect on mature forest associated species. Underburning activities would reduce fuels and aid in the regeneration of the understory. These acres have a smaller diameter material throughout the area and burning would reduce the fire potential and initiate new growth. This new growth, and development of multi canopy layers should be beneficial for mature forest associated species.

Direct and Indirect Effects of Alternative 2

Currently, the proposed project area is between 30 and 80 percent snag and down wood levels as outlined in the DecAID Advisor. The 30 percent levels are generally associated with previously harvested areas and the pine/oak habitat. The 80 percent levels are generally located in previously unharvested areas. The proposed project would retain snags and down wood at the 30

to 80 percent level in the planning area. The project does not impact any designated pine marten or pileated woodpecker habitat areas (B5) designated in the Mt. Hood Forest Plan.

Under this alternative, the improvement of stand health and the reduction in fuels would reduce the potential for disease caused mortality and stand replacing fires on the acres treated. The long-term effects to the remaining untreated acres would include an increase in root-rot pockets and diseased trees and the potential for an increase in stand replacing fires. This increase in disease and fire potential would also increase the likelihood of losing mature forest.

The underburning of 610 acres would have a long-term positive effect on mature forest associated species. Underburning activities would reduce fuels and aid in the regeneration of the understory. These acres have a smaller diameter material throughout the area and burning would reduce the fire potential and initiate new growth. This new growth, and development of multi canopy layers would be beneficial for mature forest associated species.

Cumulative Effects of Alternative 1 and Alternative 2
The analysis area is bordered on the south by The Dalles Watershed, on the west by the Surveyers Ridge LSR, on the north by SDS lands and other private lands, and on on the east by the private lands.

The Dalles Watershed Fuel Break would reduce snags to below the 30% level. The Surveyer's Ridge LSR would provide snags and down logs at the 80% level. Cumulatively, there would be no major impact on these species as adequate snags and down wood would be retained within the cumulative effects area. The area within the Surveyor's Ridge LSR would have 240 linear feet of down logs/acre (three tree lenth logs/acre, Surveyor's Ridge LSR Plan) and 2.25 snags/acre (Surveyor's Ridge LSR Plan, 100% biological potential).

Wild Turkey and Western Gray Squirrel
Direct and Indirect Effects of the No Action Alternative
There would be no impact to these species with the No Action alternative because no activities would take place in suitable habitat and no habitat would be altered or removed.

Direct and Indirect Effects of Alternative 1 – Proposed Action
Adequate forage would be available in the stands adjacent to and within the project area and does not appear to be a limiting factor for wild turkeys and gray squirrels within the watershed. There would be a reduction in the number of potential roost and nest trees within the project area, however, the majority of large ponderosa pine and Douglas fir would be maintained. These large trees would still supply roost sites and forage for turkeys and squirrels. Turkey nest sites would be minimally impacted by this project as nests are generally found on slopes greater than 30 percent. The majority of this project area is located on slopes less than 30 percent. Gray squirrel nest sites would be negatively impacted by this project as tree canopies need to overlap for travel connectivity.

Direct and Indirect Effects of Alternative 2
There would be no impact to these species with this alternative because no activities would take place in suitable habitat and no habitat would be altered or removed.

Cumulative Effects for Alternatives 1 and 2
The cumulative effects area of consideration is the North Fork Mill Creek Project boundary. Gray squirrels have a relatively small home range of 0.25 miles or less. Wild turkeys have a larger home range approximately 1 mile during the spring nesting season. Cumulatively, there would be a minor impact on these species. Wild turkeys and squirrels would still forage in the project area. Turkey nest sites would be minimally impacted as the majority of the habitat within the project is less than 30 percent slope. Gray squirrel nest sites would be negatively impacted in treatment areas where canopy cover is reduced.

Snag and Down Log Associated Species
Direct and Indirect Effects of the No Action Alternative
There would be an increase in snags and down logs under this alternative. Root-rot pockets would provide large amounts of down wood and insect kill and fire would provide an increase in snags. The long-term effects of the No Action alternative to these species would include the increase in root-rot pockets and diseased trees and the potential for an increase in stand replacing fires within the planning area. This increase in disease and fire potential would raise the likelihood of losing mature forest habitat which is also a component of most snag and down log associated species.

Direct and Indirect Effects of Alternative 1 – Proposed Action
Tree removal would reduce snags, down wood and canopy closure for snag and down log associated species. Currently, the proposed project area is between 30 and 80 percent snag and down wood levels as outlined in DecAID. The 30 percent levels are generally associated with previously harvested areas and the pine/oak habitat. The 80 percent levels are generally located in unharvested portions of the project area and the Surveyers Ridge LSR.

CVS data indicates that there is an average of 29.1 snags per acre and 5.7 percent cover for down wood in the unmanaged stands in the watershed. The Mill Creek watershed currently meets the 80% tolerance level (29.2 snags per acre) for black-backed woodpeckers and the 50% tolerance level (30.1) for pileated woodpeckers. Based on the Northwest Forest Plan Record of Decision (ROD) standards and guidelines, the 100% population potential for white-headed woodpeckers is 0.60 snags per acre. Because the snag objective for the treatment area is 4 snags per acre, the 100% potential for this species would be exceeded for this project. Since pygmy nuthatches use habitat very similar to those of white-headed woodpeckers, provisions of snags for white-headed woodpeckers are also assumed to provide for the needs of pygmy nuthatches. It is assumed that standards and guidelines for snags and green-tree replacements for woodpeckers as provided by existing National Forest Land and Resource Management Plans would also provide habitat for flamulated owls. Therefore, the above snag retention provides sufficient habitat for this species.

The Northwest Forest Plan ROD recommends 120 linear feet of down logs per acre greater than 16 inches in diameter within the matrix management areas in Eastern Oregon. This project would eliminate some habitat within the project area, however a minimum of 120 linear feet of down wood would be retained.

Removal of trees would reduce the ability of the project area to recruit large numbers of snags and downed wood in the forseeable future. However, the project area would still provide foraging habitat for snag associated species even if managing for high density clumps of snags

for nest sites is not compatible with the overall objective for the project. The current prescription calls for 4 snags per acre. Girdling and other forms of mortality would increase the number of snags in the project area to levels that would be expected to meet or exceed the 30% tolerance level for the HRV (6.7 snags/acre >10 inches dbh of which 2.6 snags/acre would be >20 inches dbh). Over the long-term, after thinning, the project area would produce larger trees which would later contribute larger snags and down wood to the watershed. The remainder of the watershed would continue to recruit snags and downed wood equal to or greater than historic levels due to decades of fire suppression which has created root-rot pockets that would provide large amounts of down wood and insect kill that would provide an increase in the number of snags. The remainder of the watershed would still meet the 80% tolerance level for black-backed woodpeckers and the 50% tolerance level for pileated woodpeckers.

Direct and Indirect Effects of Alternative 2
The effects of this alternative are similar to those discussed for Alternative 1. Alternative 2 would treat fewer acres and leave more snags and down wood in the project area. By treating fewer acres, the project area would retain the ability recruit a larger number of snags and down wood in the future. Under this alternative, the project area would be expected to meet or exceed the 30% tolerance level for the HRV (6.7 snags/acre >10 inches dbh of which 2.6 snags/acre would be >20 inches dbh). The remainder of the watershed would continue to recruit snags and downed wood equal to or greater than historic levels due to decades of fire suppression which has created root-rot pockets that would provide large amounts of down wood and insect kill that would provide an increase in the number of snags. The remainder of the watershed would still meet the 80% tolerance level for black-backed woodpeckers and the 50% tolerance level for pileated woodpeckers.

Cumulative Effects for Alternatives 1 and 2
The analysis area is bordered on the south by The Dalles Watershed, on the west by the Surveyers Ridge LSR, on the north by SDS lands and other private lands, and on on the east by private lands.

The Dalles Watershed Fuel Break would reduce snags to below the 30% level. The Surveyer's Ridge LSR would provide snags and down logs at the 80% level. Cumulatively, there would be no major impact on these species as adequate snags and down wood would be retained within the cumulative effects area. The area within the Surveyor's Ridge LSR would have 240 linear feet of down logs/acre (three tree lenth logs/acre, Surveyor's Ridge LSR Plan) and 2.25 snags/acre (Surveyor's Ridge LSR Plan, 100% biological potential).

Neotropical Migratory Birds
Direct and Indirect Effects of the No Action Alternative
There would be no change in habitat for species associated with mid-seral habitats. Those species associated with late seral habitats would see a long-term negative effect due to an increase in root-rot pockets and diseased trees and the potential for an increase in disease caused mortality and stand replacing fires within the planning area. This increase in disease and fire potential would raise the likelihood of losing mature forest habitat for late seral species and may increase the amount of habitat for early seral species.

Direct and Indirect Effects of Alternative 1 – Proposed Action
Tree removal would create an additional 275 acres of early seral habitat for those bird species. This would benefit these species as more habitat would be available to them.

Species dependent upon mid-seral stands would have a reduction in 221 acres from the existing condition. This would reduce the available habitat in the planning area for these species, however approximately 1230 acres of mid-seral habitat would still remain within the planning area.

Bird species dependent upon late-seral habitat, would have a reduction of 54 acres of habitat. This would reduce the available habitat in the planning area for these species, however approximately 820 acres of late seral habitat would still remain within the planning area. Although the short-term effects to mature forest associated species may be negative, the long-term effect would be positive. The long-term improvement of stand health and the reduction in fuel loading would reduce the potential for disease caused mortality and stand replacing fires. Under this alternative, there is a greater chance of maintaining, over time, late seral habitat.

Under the Proposed Action, bird species dependent upon riparian habitat would not see a change in their habitats because the riparian vegetation is being maintained or protected within the project area.

Direct and Indirect Effects of Alternative 2
Tree removal would create an additional 25 acres of early seral habitat for those bird species. This would benefit these species as more habitat would be available to them.

Species dependent upon mid-seral stands would have a reduction in 25 acres from the existing condition. This would reduce the available habitat in the planning area for these species, however approximately 1425 acres of mid-seral habitat would still remain within the planning area.

Because this alternative does not treat stands in late-seral habitat, there would be no short-term impacts to late-seral habitat. The long-term effects of this alternative to late-seral dependent migratory birds would include an increase in root-rot pockets and diseased trees and the potential for an increase in stand replacing fires within untreated units. This increase in disease and fire potential would increase the likelihood of losing late-seral forest. Under this alternative, there is a greater chance of a reduction, over time, in late seral habitat.

Under this alternative, bird species dependent upon riparian habitat would not see a change in their habitats because the riparian vegetation is being maintained or protected within the project area.

Cumulative Effects of Alternative 1
The analysis area is bordered on the south by The Dalles Watershed, on the west by the Surveyers Ridge LSR, on the north by SDS lands and the other private lands, and on the east by private lands.

Cumulatively, there would be an increase in early seral habitat and a reduction in late seral habitat. Mid seral habitat would decrease slightly and riparian areas would remain relatively unchanged. Late seral habitat in the analysis area would remain above the 15 percent threshold as outlined in the Northwest Forest Plan.

Cumulative Effects of Alternative 2
The analysis area is bordered on the south by The Dalles Watershed, on the west by the Surveyers Ridge LSR, on the north by SDS lands and the other private lands, and on the east by private lands.

Cumulatively, there would be an very small increase in early seral habitat and a slight reduction in mid seral habitat. Late seral habitat and riparian areas would remain relatively unchanged.

Botanical Species

A Botanical Biological Evaluation was completed as part of this analysis. The entire Biological Evaluation is incorporated by reference and is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the evaluation are summarized below. Reference material is contained in the full biological evaluation.

Existing Conditions

There are 75 special status botanical species within range of the Mt. Hood National Forest. Prefield review indicates that suitable habitat may be present in the proposed project area for 38 of the 75 species - 14 vascular species, 4 bryophyte species, 4 lichen species, and 16 fungi species.

Arabis sparsiflora v. atrorubens (Nutt. mss.), Sicklepod rockcress

Extensive surveys for this species have been conducted in the Mill Creek watershed since 1989. Sites have not been reported off-Forest in the vicinity of Mill Creek Watershed. On the Mt. Hood National Forest, Sicklepod rockcress is widely distributed on the Hood River Ranger District along Surveyors Ridge Trail from Shellrock to the top of Bald Butte and along Mill Creek Ridge. There are also several reported sites on the Barlow Ranger District. Periodic informal monitoring between 1992 and 2007 indicate that Sicklepod rockcress populations in the Mill Creek watershed are not declining in numbers or size. On the Mt. Hood National Forest, Sicklepod rockcress appears to be a pioneer species (i.e., early seral) associated with pine/oak/grassland habitats in fire prone areas that remain in an early seral stage.

Botrychium minganense Victorin, Mingan moonwort

Extensive surveys for this species have been conducted in the Mill Creek watershed since 1989. Sites have not been reported off-Forest land in the vicinity of Mill Creek Watershed. There are approximately 15 populations of Mingan moonwort on the Mt. Hood National Forest. The majority of known sites have been found on the eastside of the Forest on the Hood River Ranger District in alluvial floodplains, seeps and springs, and along flat riparian areas with cedar and/or hardwood overstory and skunk cabbage understory (primarily early mid-late successional forests). Mingan moonwort is likely to be present in similar suitable habitat downstream from known sites in the watershed as spores are dispersed by water, wind, and migrating wildlife.

Fungi Species: *Cordyceps capitata, Cortinarius barlowensis, Gomphus kaufmannii, Gyromitra californica, Leucogaster citrinus, Mycena monticola, Otidea smithii, Phaeocollybia attenuata, Phaeocollybia californica, Phaeocollybia olivacea, Phaeocollybia oregonensis, Phaeocollybia picea, Phaeocollybia pseudofestiva, Phaeocollybia scatesiae, Ramaria amaloidea, Ramaria gelatiniaurantia, Sowerbyella rhenana.*

Formal surveys for special status fungi are not currently required (2001 Northwest Forest Plan, Record of Decision, Standard & Guideline-9) and have not been conducted in the planning area. Informal surveys (incidental to surveys for other botanical surveys) have been conducted for various fungi throughout the Mill Creek watershed, but no species were found. The majority of known sites have been found on the westside of the Mt. Hood National Forest. In the vicinity of the planning area, the suitable habitat is present around North Fork

Mill Creek and in the Surveyors Ridge Late- Successional Reserve at the west edge of the planning area.

Methodology and Analysis

A controlled predetermined survey methodology was used, where all recognized habitats were initially sampled. The survey focused on specific habitat types that appeared to be suitable for one or more special status botanical species. Surveys generally focus on habitats such as seeps, springs, streams, floodplains, swales, rock outcrops, meadows, grasslands, pine/oak woodlands, and late successional forests (80 years and older). The micro-habitats that are of particular interest include; boles and branches of conifer trees from ground-level to approximately 15 feet, boles and braches of hardwood trees and shrubs from ground-level to approximately 15 feet snags rootwad in high humidity micro sites large class III, IV and V down wood cut ends of felled trees, and mossy boulders.

If surveys cannot be conducted during the appropriate season for definitive identification of a species, the presence of suitable habitat may be expected if:

1) Prefield review concludes that there are known sites of special status species in the project area and/or vicinity, or

2) Cursory pre-field and field survey finds presence of plant communities and/or micro-habitats associated with special status species botanical species.

Prefield review of the project area was conducted in 2007. District botany records indicate that surveys have been conducted throughout the planning area during May through October of 2000-2006. Special status species *Botrychium minganense* (moonwort) was found at 7 locations in and near the North Fork Mill Planning area (see Long Prairie Allotment Biological Evaluation report #2005.02). Region 6 Sensitive species *Arabis sparsiflora v. atrorubens* (sicklepod rockcress) and *Lomatium watsonii* (Watson's desert parsley) were found on Surveyor's Ridge and Mill Creek Ridge. No other Sensitive Plant Species were found.

Field Surveys
Field surveys for Special status species have been conducted by Forest Service botanists in the project area over the years since 1992, most recently during 2005, 2006, and 2007. Surveys focused on the verification of suitable habitats that were identified during prefield review, and on habitats for species known to be present in the project area particularly in grassy openings along Mill Creek Ridge and Surveyors Ridge and alluvial floodplains along North Fork Mill Creek and its tributaries.

Surveys also included search for botanical species formerly listed as Survey and Manage under the Northwest Forest Plan (since 1996) and also for some species that are known to be uncommon or rare in Oregon (according to the Oregon Natural Heritage Program), but which are not currently listed by the Regional Forester as R6 Sensitive.

Survey Results
1. Unit 92 – *Arabis sparsiflora v. atrorubens* (Sickle-pod rockcress), R6 Sensitive: Sickle-pod rockcress occupies approximately ½ acre of grassland/shrub habitat at the northern edge of

underburn unit 92. There are approximately 50 plants scattered around the edges of rabbit brush and pine forest. The grassland habitat is dominated by non-native grasses. The site was originally documented in 1990. Informal monitoring has been conducted periodically since 1990 and the population appears to be stable although there is some evidence of past off-road vehicle traffic through the habitat area.

2. Unit 95 - *Botrychium minganense* (Moonwort), R6 Sensitive and Rare & Uncommon: Moonwort occupies a seep area directly adjacent to the boundary of underburn unit 95. There are approximately 30 plants in a 1 acre seep. The population was originally documented in 2000, it has not been revisited since 2006 when the population appeared to be stable.

3. Unit 25 - *Botrychium minganense* (Moonwort), R6 Sensitive and Rare & Uncommon: Moonwort occupies approximately 2 acres along a cedar wetland the northeast edge of sapling thinning unit 25. Approximately 70 plants were documented in 2001, it has not been revisited since 2006 when the population appeared to be stable.

Fungi Surveys Not Conducted – Not Required

There are 19 special status (i.e., R6 Sensitive and Rare & Uncommon) fungi species that are within range of the Mt. Hood National Forest. Pre-disturbance surveys are only required for *Bridgeoporus nobilissimus* (if suitable habitat might be affected by project activity). Surveys are not required for the other 18 fungi species currently under direction of the Northwest Forest Plan because surveys are "not practical" (2001 Northwest Forest Plan, Record of Decision, Standard & Guidline-9). Informal surveys (incidental to surveys for other botanical surveys) have been conducted for various fungi throughout the Mill Creek watershed but no species were found. If species had been found they would be protected if required according to management direction.

Environmental Effects

No Action – Direct, Indirect and Cumulative Effects

Arabis sparsiflora v. atrorubens (Nutt. mss.), Sicklepod rockcress and *Botrychium minganense* Victorin, Mingan moonwort and fungi: *Cortinarius barlowensis, Cudonia monticola, Gomphus kaufmannii, Gyromitra californica, Leucogaster citrinus, Mycena monticola, Phaeocollybia attenuata, Phaeocollybia californica, Phaeocollybia oregonensis, Phaeocollybia piceae, Phaeocollybia pseudofestiva, Phaeocollybia scatesiae, Ramaria amyloidea, Ramaria gelatiniaurantia, Sowerbyella rhenana*

Assumptions - Under the No Action alternative it could be expected that: 1) Forest, riparian, and grassland habitats in the planning area would continue to evolve in response to various environmental conditions; 2) vegetation debris and forest fuels would likely continue to accumulate in unmanaged areas or where natural fires are suppressed, and 3) the severity risk of wildfire might increase as a result.

There is insufficient information available at this time to definitively measure direct, indirect, or cumulative effects that the "No Action" alternative might have on Special status botanical species *Arabis sparsiflora v. atrorubens* and *Botrychium minganense* or rare and uncommon fungi. It could be expected that the extent of effects, if they occurred as a result of the No Action alternative, would likely depend on the proximity of the fire to occupied habitat, the

intensity of the fire, and how both species and their habitats respond directly and indirectly to fire.

Arabis sparsiflora v. atrorubens (Nutt. mss.), Sicklepod rockcress

Under the No Action alternative recreational use of existing trails through *Arabis sparsiflora v. atrorubens* habitat on Surveyors Ridge would continue. Existing trails along Surveyors Ridge also function as dispersal corridors for noxious weeds that spread out into grassy openings and compete with Sicklepod rockcress and native plant communities for water and nutrients. Monitoring would be needed to accurately assess the direct, indirect, and cumulative effects that recreation and other trail related factors might have on Sicklepod rockcress and its habitat along Surveyors Ridge trails.

Alternative 1: Proposed Action – Direct, Indirect and Cumulative Effects

Arabis sparsiflora v. atrorubens (Nutt. mss.), Sicklepod rockcress and *Botrychium minganense* Victorin, Mingan moonwort and rare and uncommon fungi: *Cortinarius barlowensis, Cudonia monticola, Gomphus kaufmannii, Gyromitra californica, Leucogaster citrinus, Mycena monticola, Phaeocollybia attenuata, Phaeocollybia californica, Phaeocollybia oregonensis, Phaeocollybia piceae, Phaeocollybia pseudofestiva, Phaeocollybia scatesiae, Ramaria amyloidea, Ramaria gelatiniaurantia, Sowerbyella rhenana*

Direct or indirect effects to *Arabis sparsiflora v. atrorubens* and its habitat near unit 92 and *Botrychium minganense* near units 25 and 95 are not expected to occur as a result of activities proposed under the Proposed Action alternative. The sites would be protected by buffers included in the project design.

Other known populations of *Arabis sparsiflora v. atrorubens* and *Botrychium minganense* in the planning area are not in the vicinity of proposed project activities and would not be impacted directly or indirectly, therefore cumulative effects to both species are not expected as a result of project activities associated with the action alternative.

If rare and uncommon fungi individuals are present in the project area they could be impacted by soil disturbance associated with project activities. The removal of some trees could potentially impact fungi individuals, if they are present, that require host trees. The reduction of stand density that would result from the proposed action may affect suitable habitat for rare and uncommon fungi but would not likely have a cumulative effect on the viability of species because key elements of suitable habitat would remain in reserves in and outside of the planning area.

Alternative 2 – Direct, Indirect and Cumulative Effects

Arabis sparsiflora v. atrorubens (Nutt. mss.), Sicklepod rockcress and *Botrychium minganense* Victorin, Mingan moonwort and rare and uncommon fungi: *Cortinarius barlowensis, Cudonia monticola, Gomphus kaufmannii, Gyromitra californica, Leucogaster citrinus, Mycena monticola, Phaeocollybia attenuata, Phaeocollybia californica, Phaeocollybia oregonensis, Phaeocollybia piceae, Phaeocollybia pseudofestiva, Phaeocollybia scatesiae, Ramaria amyloidea, Ramaria gelatiniaurantia, Sowerbyella rhenana*

Direct or indirect effects to *Arabis sparsiflora v. atrorubens* and its habitat near unit 92 are not expected to occur as a result of activities proposed under this alternative. The site would be protected by buffers included in the project design.

Other known populations of *Arabis sparsiflora v. atrorubens* in the planning area are not in the vicinity of proposed project activities and would not be impacted directly or indirectly, therefore cumulative effects are not expected as a result of project activities associated with the action alternative.

If rare and uncommon fungi individuals are present in the project area they could be impacted by soil disturbance associated with project activities. The removal of some trees could potentially impact fungi individuals, if they are present, that require host trees. The reduction of stand density that would result from the proposed action may affect suitable habitat for rare and uncommon fungi but would not likely have a cumulative effect on the viability of species because key elements of suitable habitat would remain in reserves in and outside of the planning area.

Effects Determination

Table 3-54: Summary of Effects for Botanical Species

SPECIES	**Step 1. Prefield Review:** Potential suitable habitat identified?	**Step 2. Field Surveys:** Surveys conducted? If no, explain rationale.	**Survey Results:** Species found?	**Step 3. Effects:** No Action	**Step 3. Effects:** Proposed Action	**Step 3. Effects:** Alternative 2
Ophioglossum pusillum	No	No habitat	N/A	NI	NI	NI
Phlox hendersonii	No	No habitat	N/A	NI	NI	NI
Potentilla villosa	No	No habitat	N/A	NI	NI	NI
Ranunculus reconditus	Yes	Yes	No	NI	NI	NI
Romanzoffia thompsonii	No	No habitat	N/A	NI	NI	NI
Scheuchzeria palustris v.*americana*	No	No habitat	N/A	NI	NI	NI
Sisyrinchium sarmentosum	Yes	Yes	No	NI	NI	NI
Suksdorfia violacea	Yes	Yes	No	NI	NI	NI
Sullivantia oregana	No	No habitat	N/A	NI	NI	NI
Taushia stricklandii	No	No habitat	N/A	NI	NI	NI
Wolffia borealis	No	No habitat	N/A	NI	NI	NI
Wolffia columbiana	No	No habitat	N/A	NI	NI	NI
BRYOPHYTES						
Rhizomnium nudum (moss)	Yes	Yes	No	NI	NI	NI
Schistostega pennata (moss)	Yes	Yes	No	NI	NI	NI
Scouleria marginata (moss)	Yes	Yes	No	NI	NI	NI
Tetraphis geniculata (moss)	Yes	Yes	No	NI	NI	NI
LICHENS						
Chaenotheca subroscida	No	No habitat	N/A	NI	NI	NI
Dermatocarpon luridum	No	No habitat	N/A	NI	NI	NI
Fuscopannaria rubiginosa	No	No habitat	N/A	NI	NI	NI
Hypogymnia duplicata	No	No habitat	N/A	NI	NI	NI
Leptogium burnetiae v. *hirsutum*	Yes	Yes	No	NI	NI	NI

SPECIES	**Step 1. Prefield Review:** Potential suitable habitat identified?	**Step 2. Field Surveys:** Surveys conducted? If no, explain rationale.	**Survey Results:** Species found?	**Step 3. Effects:** No Action	**Step 3. Effects:** Proposed Action	**Step 3. Effects:** Alternative 2
Leptogium cyanescens	Yes	Yes	No	NI	NI	NI
Lobaria linita v. tenuoir	No	No habitat	N/A	NI	NI	NI
Nephroma occultum	Yes	Yes	No	NI	NI	NI
Peltigera neckeri	No	No habitat	N/A	NI	NI	NI
Peltigera pacifica	No	No habitat	N/A	NI	NI	NI
Pilophorus nigricaulis	Yes	Yes	No	NI	NI	NI
Pseudocyphellaria rainierensis	No	No habitat	N/A	NI	NI	NI
Ramalina pollinaria	No	No habitat	N/A	NI	NI	NI
Tholurna dissimilis	No	No habitat	N/A	NI	NI	NI
Usnea longissima	No	No habitat	N/A	NI	NI	NI
FUNGI						
Bridgeoporus nobilissimus	Yes	Yes. According to Protocol.	No	NI	NI	NI
Cordyceps capitata	No	Not required	No	NI	NI	NI
Cortinarius barlowensis	Yes	Not required	No	NI	MIIH	MIIH
Cudonia monticola	Yes	Not required	No	NI	MIIH	MIIH
Gomphus kaufmannii	Yes	Not required	No	NI	MIIH	MIIH
Gyromitra californica	Yes	Not required	No	NI	MIIH	MIIH
Leucogaster citrinus	Yes	Not required	No	NI	MIIH	MIIH
Mycena monticola	Yes	Not required	No	NI	MIIH	MIIH
Otidea smithii	No	Not required	No	NI	NI	NI
Phaeocollybia attenuata	Yes	Not required	No	NI	MIIH	MIIH
Phaeocollybia californica	Yes	Not required	No	NI	MIIH	MIIH
Phaeocollybia olivacea	No	No habitat	No	NI	NI	NI
Phaeocollybia oregonensis	Yes	Not required	No	NI	MIIH	MIIH
Phaeocollybia piceae	Yes	Not required	No	NI	MIIH	MIIH
Phaeocollybia pseudofestiva	Yes	Not required	No	NI	MIIH	MIIH
Phaeocollybia scatesiae	Yes	Not required	No	NI	MIIH	MIIH

SPECIES	**Step 1. Prefield Review:** Potential suitable habitat identified?	**Step 2. Field Surveys:** Surveys conducted? If no, explain rationale.	**Survey Results:** Species found?	**Step 3. Effects:** No Action	**Step 3. Effects:** Proposed Action	**Step 3. Effects:** Alternative 2
Ramaria amaloidea	Yes	Not required	No	NI	MIIH	MIIH
Ramaria gelatiniaurantia	Yes	Not required	No	NI	MIIH	MIIH

NI = No Impact. Not Likely to Impact Individuals or Habitat or Lead to a Loss of Viability and a Trend Toward Federal Listing.
MIIH = May Impact Individuals or Habitat but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species at the site, on the Mt. Hood National Forest, or throughout the range of the species.
MIIV = May Impact Individuals or habitat and contribute to a trend towards Federal listing or cause a loss of viability on the Mount Hood National Forest and/or throughout the range of the species.
BI = Project would have a Beneficial Impact on species and habitat.

Rationale for Determination of Effects

Fungi – Potential Suitable Habitat / Surveys Not Conducted
There are 19 special status (R6 Sensitive and Rare and Uncommon) fungi species that are within range of the Mt. Hood National Forest. Pre-disturbance surveys are only required for *Bridgeopurus nobilissimus* (if suitable habitat might be affected by project activity). Surveys are not required for the other 18 fungi species currently under direction of the Northwest Forest Plan because surveys are "not practical" (2001 Northwest Forest Plan, Record of Decision, Standard & Guideline -9).

Surveys for special status fungi, except *B. nobilissimus*, are not considered practical because the presence of fruiting bodies (e.g. mushrooms and truffles) varies year to year which would require multi-year surveys to detect presence in suitable habitat. Surveys for *B. nobilissimus* are practical because the species produces perennial fruiting bodies on stumps, snags, and live trees.

The following rationale is specific to 16 fungi species that were identified as having suitable habitat in the proposed project area (see Table 1). If suitable habitat is suspected for listed fungi it is assumed that the species are likely present.

MIIH = May Impact Individuals or Habitat but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species at the site, on the Mt. Hood National Forest, or throughout the range of the species. The MIIH effects determination was made for the following species primarily due to the potential for localized impact to individuals caused by the removal of host trees, vegetation, and/or substrate.

1. *Cortinarius barlowensisi*
2. *Cudonia monticola*

3. *Gomphus kaufmannii*
4. *Gyromitra californica*
5. *Leucogaster citrinus*
6. *Mycena monticola*
7. *Phaeocollybia attenuata*
8. *Phaeocollybia californica*
9. *Phaeocollybia oregonensis*
10. *Phaeocollybia piceae*
11. *Phaeocollybia pseudofestiva*
12. *Phaeocollybia scatesiae*
13. *Ramaria amyloidea*
14. *Ramaria gelatiniaurantia*
15. *Sowerbyella rhenana*

1. *Cortinarius barlowensis* is known from 16 sites in the western Cascades, Coast Range, and Olympic Mountains of Washington and Oregon. There are two known sites from the Mt. Hood National Forest on the Zigzag District. Habitat is soil under conifers. If *Cortinarius barlowensis* grows within the project area, it could be impacted by the removal of some host trees, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

2. *Cudonia monticola* is endemic to the Pacific Northwest and grows under conifers in the spring and summer. This earth tongue fungus is scattered to gregarious or grows in dense clusters in humus, soil, and on rotting wood. If this species grows within the project area, it might be locally impacted by disturbance to the soil during project activity, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

3. *Gomphus kaufmannii* is endemic to western North America and is found in California, Oregon, and Washington states. It is located either along the Pacific coast or in the Cascade-Sierran Range. There are 6 known sites for this mushroom on the Mt. Hood National Forest. Host trees for this species include true firs and pines. The species also forms symbiotic associations with the fine root systems of plants, growing out into the soil matrix. If this species grows within the project area, it might be impacted by the removal of some host trees, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

4. *Gyromitra californica* is distributed from British Columbia to northern California and east to Colorado, Montana and Nevada. It is known in Washington, Oregon and northern California from 35 sites. Three sites are known from the Mt. Hood National Forest on Clackamas, Zigzag and Hood River Districts. This species is found on well-rotted stumps and logs of conifers or in soil with rotted wood. If *Gyromitra californica* grows within the project area, it might be impacted by the localized disturbance, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed

habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

5. *Leucogaster citrinus* is endemic to the Pacific Northwest, known from western Washington, western Oregon and northern California and known from 45 sites. There are five sites from the Mt. Hood National Forest, Zigzag District. This truffle species is associated with the roots of conifers. If this species grows within the project area, it might be impacted by the removal of some host trees, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

6. *Mycena monticola* is endemic to the Pacific Northwest and is known from a number of sites in the Northwest Forest Plan area, scattered in the western and eastern Cascade Range, the Klamath Mountains, and the Olympic Mountains. On the Mt. Hood National Forest, one site has been documented (Bear Springs Campground, Barlow Ranger District). *M. monticola* is restricted to conifer forests above 1,000 meters in elevation, particularly those with *Pinus* species and usually found in gregarious, caespitose clusters in duff (Castellano et al. 1999). Key elements of suitable habitat would still exist in the project areas, and similar habitat located in reserves adjacent to the project areas would presumably continue to provide undisturbed habitat for this species, if it is present. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

7. *Phaeocollybia attenuata* is endemic to the Pacific Northwest from western Washington and western Oregon to northern California where it is known from 131 sites. There is one site known from the Mt. Hood National Forest on Zigzag District. This species is on soil under conifers. Although some host trees might be removed for relocation of the corral, potentially impacting individuals, others would remain continuing to provide the host trees for this species. Key elements of suitable habitat would still exist inside the planning area and similar habitat located in reserves adjacent to the area would presumably continue to provide undisturbed habitat for this species, if it is present in the area. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

8. *Phaeocollybia californica* is endemic to the Pacific Northwest, known from 34 sites in western Washington, western Oregon and northern California. No sites are known to occur on the Mt. Hood National Forest, however, there is a site on the adjacent Columbia River Gorge National Scenic Area. This species is terrestrial and associated with the roots of Douglas-fir, western hemlock and Pacific silver fir. If this species grows within the project area, it might be impacted by the removal of some host trees, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

9. *Phaeocollybia oregonensis* is endemic to the Pacific Northwest, know from 10 sites in the Oregon Coast Range and western Cascades. On Mt. Hood National Forest there are two sites from Zigzag District. This species is terrestrial and associated with the roots of Douglas-fir, western hemlock and Pacific silver fir. The project would not remove all host trees for *P.*

oregonensis. If this species grows within the project area, it might be impacted by the removal of some host trees, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

10. *Phaeocollybia piceae* is endemic to the Pacific Northwest, known from 49 sites in western Washington, western Oregon and northern California. There are no known sites on the Mt. Hood National Forest. This species is terrestrial and associated with the roots of Douglas-fir, western hemlock and Pacific silver fir. The project would not remove all host trees for *P. piceae.* If this species grows within the project area, it might be impacted by the removal of some host trees, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

11. *Phaeocollybia pseudofestiva* is endemic to the Pacific Northwest, known from British Columbia south through western Washington, western Oregon to California. There are 36 known sites in Washington, Oregon and California, four of which are on the Mt. Hood National Forest, Zigzag District. The species grows on soil under conifers. If this species grows within the project area, it might be locally impacted by disturbance to the soil during project activity, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

12. *Phaeocollybia scatesiae* is endemic to the Pacific Northwest with 17 sites documented in the Northwest Forest Plan area, three on the Mt. Hood National Forest (Zigzag Ranger District). This species is associated with the roots of *Abies* species, *Picea sitchensis*, and *Vaccinium* species, from sea level to 1,250 meters in elevation (Castellano et al. 1999). Soil compaction could have a localized negative impact on individuals. Key elements of suitable habitat would still exist inside the project areas, and similar habitat located in reserves adjacent to the project areas would presumably continue to provide undisturbed habitat for this species, if it is present. Alternatives 1 and 2 May Impact Individuals but is not likely to lead to a trend toward federal listing.

13. *Ramaria amyloidea* is endemic to the Pacific Northwest from western Washington to northern California. It is currently known from 16 sites. No sites are known from the Mt. Hood National Forest. Habitat for the species is soil in sites associated with true fir, Douglas-fir and western hemlock. If this species grows within the project area, it might be locally impacted by disturbance to the soil during project activity, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

14. *Ramaria gelatiniaurantia* is endemic to the Pacific Northwest, known from 24 sites from western Washington to northern California. Two sites are located on the Mt. Hood National

Forest, Clackamas River District. Habitat for the species is soil in sites associated with true fir, Douglas-fir and western hemlock. If this species grows within the project area, it might be locally impacted by disturbance to the soil during project activity, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

15. *Sowerbyella rhenana* occurs in Europe, Japan and Northwest North America. In the Pacific Northwest, it is known from 55 sites in western Washington, western Oregon and northern California, including two sites from the Mt. Hood National Forest on Clackamas River and Zigzag Districts. Habitat for the species is soil under conifers. If this species grows within the project area, it might be locally impacted by disturbance to the soil during project activity, but key elements of suitable habitat would still exist in and around the project area and presumably continue to provide undisturbed habitat for this species. Alternatives 1 and 2 May Impact Individuals and habitat but is not likely to lead to a trend toward federal listing.

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). The nine objectives are listed on page B-11 of the ROD. Portions of the effects analysis in this document have focused 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 to ascertain whether the project is consistent with the objectives. Table 3-55 displays the individual indicators and the effect the action 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).

The following summarizes the Individual Indicator Table:

- 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 either Alternative 1 or 2 would be seen at the 7th field sub-watershed scale. Alternative 1 proposes to treat 9% more Riparian Reserves than Alternative 2 so benefits to Riparian Reserves would more likely be seen at the 6th field level as well in Alternative 1.

- The proposed project would remove or replace undersized culverts and 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 7th field sub-watershed scale and to a limited degree at the 6th field scale.

- Indicators other than those described in the bullet above would be maintained as outlined in the effects analysis above.

Table 3-55: Individual Indicators for Aquatic Conservation Strategy

	Effects of the Actions								
	No Action			Alternative 1			Alternative 2		
Indicators	Restore[1]	Maintain[2]	Degrade[3]	Restore	Maintain	Degrade	Restore	Maintain	Degrade
Water Quality: Temperature		X			X			X	
Sediment		X		X (short-term degrade)			X (short-term degrade)		
Chemical Contamination		X			X				
Habitat Access: Physical Barriers		X		X			X		
Habitat Elements: Substrate		X			X			X	
Large Woody Debris		X			X			X	
Pool Frequency		X			X			X	
Pool Quality		X			X			X	
Off-channel Habitat		X			X			X	
Refugia		X			X			X	
Channel Conditions and Dynamics: Width/Depth Ratio		X			X			X	
Streambank Condition		X			X			X	
Floodplain Connectivity		X		X			X		
Flow/Hydrology: Peak/Base Flows		X			X			X	
Drainage Network Increase		X		X			X		
Watershed Conditions: Riparian Reserves		X		X			X		

1 "Restore" means the action(s) would result in acceleration of the recovery rate of that indicator.
2 Maintain" means that the function of an indicator does not change by implementing the action(s) or recovery would continue at its current rate.
3 "Degrade" means changing the function of an indicator for the worse.

Table 3-56 displays specific Aquatic Conservation Strategy objectives and the indicators from the previous table that comprise each objective. All of the indicators that are checked for a particular objective should be evaluated together to determine whether the action maintains or enhances the specific Aquatic Conservation Strategy objective.

Table 3-56: Aquatic Conservation Strategy Objectives

	Aquatic Conservation Strategy Objectives								
Indicators	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**
Temperature		X		X				X	X
Sediment				X	X	X		X	X
Chemical Contamination				X				X	X
Physical Barriers	X	X						X	X
Substrate			X		X	X			X
Large Woody Debris			X					X	X
Pool Frequency			X						X
Pool Quality			X						X
Off-Channel Habitat	X	X	X						X
Refugia	X	X						X	X
Width/Depth Ratio			X					X	X
Streambank Condition			X			X		X	X
Floodplain Connectivity	X	X	X				X	X	X
Peak/base Flows					X	X	X		
Drainage Network Increase					X	X	X		
Riparian Reserves	X	X	X	X	X	X		X	X

The following is a summary the Aquatic Conservation Strategy objectives (ROD B-10) and how the action alternatives would influence them:

1. **Maintain The Distribution, Diversity And Complexity Of Watershed And Landscape-Scale Features:** This project would meet this objective because of the protection that the Riparian Reserves provide. Specific prescriptions for vegetation treatments in Riparian Reserves have been developed for this project and those prescriptions are intended to maintain or enhance the development of a diverse, healthy riparian area while protecting it

with a variety of mitigation measures and design criteria. No new road crossings of perennial streams or wetlands are proposed and several existing crossings would be upgraded or removed, which would decrease the current level of aquatic habitat fragmentation. Some temporary crossings of ephemeral channels may be constructed and removed immediately after project completion. Three new trail crossings are proposed but the crossings would be constructed to minimize aquatic habitat fragmentation by utilizing bridges and properly sized culverts where appropriate. These crossings would not result in any long-term aquatic habitat fragmentation.

2. **Maintain Spatial And Temporal Connectivity Within And Between Watersheds:** The project would increase the spatial and temporal connectivity within and between watersheds due to culvert replacement, culvert removal and road decommissioning. New major stream crossings associated with the trail construction would be bridges which would maintain spatial and temporal connectivity.

3. **Maintain the Physical Integrity of the Aquatic System, Including Streambanks, Side channels (Refugia), and Channel Bottom Configurations:** This project would meet this objective through mitigation measures, design criteria and the protection provided by Riparian Reserves. Mitigation measures and design criteria aimed at reducing soil compaction and erosion, establishment of undisturbed vegetative buffers next to perennial and intermittent streams, prescriptions for Riparian Reserves that are intended to maintain or enhance the development of a diverse, healthy riparian area and the lack of any new crossings on perennial streams would greatly reduce risks of sedimentation, increased peak flow, and resulting bank erosion and channel bed scour.

4. **Maintain Water Quality Necessary To Support Healthy Ecosystems:** This project would meet this objective through mitigation measures, design criteria and protection provided by Riparian Reserves which would maintain stream temperature. Mitigation measures and design criteria aimed at reducing erosion would maintain the reduce sediment levels in the long-term. These measures are discussed in detail in the Soil Productivity, Water Quality, and Fisheries sections in Chapter 3.

5. **Maintain Sediment Regimes:** This project would enhance this objective in the long run through culvert replacement, culvert removal and road decommissioning. Mitigation measures and design criteria such as establishment of undisturbed vegetative buffers next to perennial and intermittent streams, keeping new temporary roads and landings out of Riparian Reserves, removing or breaching snow berms to avoid accumulation or channelization of erosive melt water on roads after snowplowing and protection provided by Riparian Reserves would minimize sediment introduction in the short-term.

6. **Maintain In-Stream Flows That Are Closer To Natural Regimes:** This project would meet this objective through mitigation measures, design criteria and protection provided by Riparian Reserves. As described in the watershed section of this report, this project would maintain the Watershed Impact Area well below the 35% Management Plan Standard and Guide which shouldn't result in any peak flow increase. In addition, road decommissioning would "disconnect" the road system from streams which should move runoff toward a more natural rate.

7. **Maintain The Timing, Variability, And Duration Of Floodplain Inundation:** This project would meet this objective through mitigation measures, design criteria and protection provided by Riparian Reserves. Mitigation measures and design criteria such as establishment of undisturbed vegetative buffers next to perennial and intermittent streams, keeping new temporary roads and landings out of Riparian Reserves and maintaining the Watershed Impact Area well below the 35% Management Plan Standard and Guide would protect the integrity of the floodplains while minimizing the potential for increased peak flows. In addition, road decommissioning would "disconnect" the road system from streams which should move runoff toward a more natural rate. Floodplains are extremely limited in this area due to the steep nature of the landscape.

8. **Maintain The Species Composition And Structural Diversity Of Plant Communities In Riparian Areas And Wetlands:** This project would meet this objective through protection provided by Riparian Reserves. Treatments within the Riparian Reserves are aimed at producing a more natural vegetative composition and density that has been lost through many decades of fire suppression.

9. **Maintain And Restore Habitat To Support Well-Distributed Populations Of Native Plant And Riparian Dependent Species:** The project would meet this objective with mitigation measures, protection provided by Riparian Reserves and vegetative treatments that are designed to simulate a more natural disturbance regime within the area.

Invasive Plant Species

A more detailed invasive plant report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below. Reference material is contained in the full specialists report.

Existing Conditions

Invasive non-native plants occur throughout the planning area; most notable are noxious weeds and some grass species. These plant species can inhabit and negatively alter native plant communities and ecosystems.

Direction for management of invasive plants in national forest and grasslands of the Pacific Northwest is included in a 2005 Environmental Impact Statement (EIS) that focused primarily on preventing and managing invasive plants. Prevention measures that have been used along roads on the Hood River Ranger District include the release of biological control insects that selectively feed on targeted noxious weeds, and manual/mechanical methods of treatment such as hand pulling and/or mowing noxious weeds where feasible. Under the 2008 Record of Decision for Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon high priority roads in the project area would be treated to control noxious weeds either manually, mechanically, and/or with approved herbicides. There may also be isolated noxious weeds sites along spur roads that would also be treated (see treatment map in project record, located at Hood River Ranger District, Mt. Hood/Parkdale, Oregon).

The invasive plant species below that are of concern and are legally recognized as noxious weeds, meaning laws have been developed by the State of Oregon to restrict their spread and effect on the environment. Noxious weeds are defined by the Oregon State Weed Board "as exotic, non-indigenous, species that are injurious to public health, agriculture, recreation, wildlife or any public or private property". The following noxious weeds below are identified by the Oregon Department of Agriculture (ODA) and are known to occur within or a short distance (1 mile or less) from this planning area.

Table 3-57: Noxious Weeds in Planning Area

Rating	Common Name	Scientific Name
B	Diffuse knapweed	*Centaurea diffusa*
B,T	Spotted knapweed	*Centaurea maculosa*
B	Canada thistle	*Circium arvense*
B	Yellow toadflax	*Linaria vulgaris*
B	St. Johnswort (Klamath weed)	*Hypericum perforatum*

***NOXIOUS WEED CONTROL RATING SYSTEM**

Noxious weeds, for the purpose of this system, shall be designated "A", "B", and/or "T", according to the ODA Noxious Weed Rating System.

1. **"A" Designated weed** – a weed of known economic importance which occurs in the state in small enough infestations to make eradication /containment possible; or is not known to occur, but its' presence in neighboring states make future occurrence in Oregon seem imminent. Recommended action: Infestations are subject to intensive control when and where found.

2. **"B" designated weed** - a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties. Where implementation of a fully integrated statewide management plan is infeasible, biological control shall be the main control approach.
3. **"T" designated weed** – a priority noxious weed designated by the State Weed Board as a target weed species on which the Department will implement a statewide management plan.

Noxious Weeds

Canada thistle, St. Johnswort, and diffuse and spotted knapweed could be found along most of the major roads in the planning area, such as the 17, 1711 and 17-660 roads. These species also occur on disturbed areas such as past timber harvested units (landings/slash piles), skid trails, roadside prisms, OHV trails, trailheads, and dispersed campsites. Diffuse knapweed is also located in the Kiyi Quarry pit on the 1710 road. Forested areas with little disturbance and at least 70% canopy closure are generally weed free from these two species.

Yellow toadflax occurs in one small population along the 17-660 road by the 013 spur intersection. The Canada thistle occurs in some of the older timber harvested areas (Bronco TS, 1972-73, & Pigeon TS, 1985-86).

At the current time there are no treatment activities occurring by the Forest Service, except for some occasional hand-pulling by the Hood River County Weed specialist. Under the Mt. Hood National Forest Site-Specific Invasive Plant Treatment EIS the following sites would be treated along roads 1700 (treatment sites #66-044 and #66-074), 1700-013 (treatment site #66-055), 1700-662 (treatment sites #66-081 and #66-033).

Invasive Grasses

Non-native grass species were widely introduced in commercial seed mixes used by the Forest Service for erosion control and wildlife/livestock forage uses. These seed mixes were used for a long time as a means of site restoration efforts after timber harvesting. The efforts were identified specifically to revegetate landings, slash piles, and skid trails. These areas now sometimes exhibit a monoculture of these species in certain areas. Conversion of these areas back to a more native vegetation type mix will take a long time and will be quite costly. This practice of using non-native seed mixes has not been implemented since 1993, when the Forest Service issued policy regarding the use of native plants (FSM #2470/2600, 1-7-1993).

The following is a list of those non-native grass species known to occur within or near (1 mile or less) of this planning area, according to Susan Nugent, Hood River Ranger District Botanist. Orchard grass (*Dactylis glomerata*), Soft brome (*Bromus mollis*), Tall fescue (*Festuca arundinacea*), Perennial ryegrass (*Lolium perenne*), Timothy grass (*Phleum pratense*), Meadow foxtail (*Alopecurus pratensis*), Intermediate Wheatgrass (*Agropyron intermedium*), and Kentucky bluegrass (*Poa pratensis*). There are some non-native "early seral invader" type grass species that are also opportunistic and have established in this planning area because of past soil disturbance from timber sales and recreation. The creation of bare ground from these types of activities is where these species could gain a foot hold. These species are, Cheatgrass (*Bromus tectorum*), Barren brome (*Bromus sterilus*), Bulbous bluegrass (*Poa bulbosa*), and Voodoo grass (*Ventenata dubia*).

Environmental Effects

No Alternative – Direct, Indirect, and Cumulative Effects
The projects proposed in the North Fork Mill Creek planning area would not be implemented. There would be no new weed populations established or spread in the planning area as a result of project activities. The rate of spread would be expected to continue at the current level, but would be controlled by designated treatment in high priority areas (see Mitigations below). There would not be an increase in the cost of monitoring and treating weeds under the current noxious weed treatment program as high priority areas would still be designated for treatment regardless of proposed planning area activities. Since there would be no change in the existing condition, no cumulative effects would result from not taking action.

There would be no new ground disturbances within the planning area other than what is already occurring. The projects proposed in the North Fork Mill Creek planning area would not be implemented therefore would not increase in the cost of monitoring and treating weeds under the current noxious weed treatment program. There would be no new weed populations established or spread in the forested landscape from these activities. The rate of spread would be expected to continue at the same level.

Alternatives 1 and 2 – Direct and Indirect Effects
The proposed alternatives are intended to improve forest health conditions (removing root rot pockets, removing diseased trees) and reduce hazardous fuels (removal of surface fuels, removal of ladder fuels, and opening of the canopy). The mechanical fuels reduction treatment methods would consist of tree thinning from below, machine piling, hand thinning, pruning by hand, machine mastication, and manual brush removal. The proposed alternatives would also include a prescribed fire matrix that would identify stands/areas where prescribed fire could be utilized to help move that vegetation type to a more natural fire regime, thus more able to withstand small more frequent fires. Also, the proposed alternatives include proposed trail, road and culvert projects. Livestock grazing in the Long Prairie Allotment, current recreation and special use permits that are not associated with proposed activities under North Fork Mill Creek would continue under both alternatives. Lastly, the proposed alternatives identify design criteria or mitigation measures that would be implemented as part of this project.

The proposed action would potentially increase the spread of non-native grass species that are known to occur within 1 mile of this planning area. These non-natives are opportunistic and the creation of bare ground would provide for this. Access to the planning area would be decreased through the road closures/decommissioning and increased through trail construction/maintenance. Overall, the general public would still have access to this planning area, so this vector for seed dispersal would still exist.

The proposed alternatives could potentially increase the need for treatment and potentially the increased use of herbicides. The Region 6 Invasive Plant EIS (2005) and the Mt. Hood National Forest Site-Specific Invasive Plant Treatment EIS (2008) identify standards and guidelines pertaining to the application of herbicides used anywhere on the Mt. Hood National Forest. Both alternatives would also likely increase the cost for the Hood River Ranger District to implement their current weed management program, since the activities would add additional acres needing monitoring and treatment to the district's existing program.

General Project Associated Activity
The activity of cutting trees, temporary road building, and landing construction would cause a reduction in canopy and stems, which would provide favorable light conditions for invasive species establishment. Harvest activities (yarding material), deep ripping, and grapple piling, could expose and compact soils which would provide a seedbed for invasive species establishment. Once piles are burned, soil conditions are favorable again for these species to become established.

Prescribed Fire
Underburn projects in grassy areas could be expected to cause invasive non-native grass species and knapweed to gain competitive edge over native plants after prescribed fire (James et al., 1991, and Zimbdahl, 1999).

Alternatives 1 and 2 – Cumulative Effects
This analysis focuses on potential cumulative effects of the introduction and spread of invasive plants and noxious weeds by project activities past, present, and proposed in the Mill Creek Watershed and surrounding area.

Assumptions include: 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 could be controlled. Mitigation and an active treatment program (including approved use of herbicides) could control the rate of spread, but are not likely to eliminate invasive plants or noxious weeds from the watershed.

Past and current ground disturbing activities such as timber harvesting, road construction and maintenance, trail construction and maintenance, dispersed recreation, wildlife (deer/elk), livestock grazing in the Long Prairie Allotment, past forage seeding practices for livestock and wildlife, Forest Service contractors, and fire suppression activities have all contributed to the establishment and spread of invasive species/noxious weeds in this planning area. The recreational and economic land uses (hunting, hiking, off-highway vehicle use, mushroom harvesting, and firewood gathering) are also known vectors of weed seed dispersal. All these activities are likely to continue into the reasonably foreseeable future in this area.

Activities within the next five years in this general area include road maintenance, trail maintenance, The Dalles Watershed Fuelbreak, prescribed fire treatments, livestock grazing, and the Mt. Hood National Forest Invasive Treatment Program. Logging activities could potentially occur on private land that borders the North Fork Mill planning area. All of these projects could potentially cause noxious weeds or invasive species to become established or spread.

Ground disturbing activities listed above that are not directly proposed under the North Fork Mill Restoration EA have been previously analyzed for direct, indirect, and cumulative environmental effects. One of the most recent projects analyzed for the potential effects of noxious weeds was the 2005 Long Prairie Allotment EA (Noxious Weed specialist report, D. Fissel).

Grazing in the Long Prairie Allotment over the years has been a concern regarding the introduction and spread of invasive plants and noxious weeds, and has contributed to cumulative impacts on the diversity of native plant communities in and around the area. There is evidence

that cows tend to congregate in riparian areas. Cumulative effects, therefore, are primarily associated with grazing in sensitive riparian areas where soil is easily disturbed allowing weed seeds to germinate and spread along riparian corridors in and outside of the watershed. The allotment has not been grazed since 2005 and is currently in a "rest" period while fences are repaired.

The proposed project in conjunction with any of the primary vectors described above, including the Long Prairie Allotment, would likely increase the introduction and spread of invasive plants and noxious weeds and may have a potentially negative impact on the diversity of native plant communities in and around the watershed.

Prescribed Fire
Underburn projects in grassland areas along Mill Creek Ridge could be expected to cause invasive non-native grass species and knapweed to gain competitive edge over native plants after prescribed fire (James et al., 1991, and Zimbdahl, 1999). There is a possibility that if the prescribed fire areas along Mill Creek Ridge are not treated annually and reseeded with native grasses, some level of decrease in diversity of native plants and pollinators and associated wildlife could result due to the increased encroachment of noxious weeds and invasive non-native species.

Noxious Weed Risk Assessment
The North Fork Mill Creek projects have a MODERATE to HIGH risk of introducing or spreading known populations of noxious weeds. Weed control measures are identified under the mitigations section of this document.

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).

The proposed project would have a Moderate Risk of spreading or introducing noxious weeds. The process for risk ranking is detailed below.

_X_ HIGH
Has to be a combination of the following three factors:
1. Known weeds in/and or adjacent (~ 100 feet) to the project area, in large quantities (High density/acre).
2. Any four or more of vectors # 1 - 8 in the immediate project area.
3. Project operation activities not able to avoid weed populations.

__ MODERATE
Has to be a combination of the following three factors:
1. Known weeds in/and or adjacent (~ 100 feet) to the project area, in moderate quantities (Moderate density/acre).
2. No more than three of vectors # 1 - 8 present in the immediate project area.
3. Project operation activities are not able to avoid weed populations.

__ **LOW**

Has to be one or the other or both factors:

1. No more than two of vectors # 1 - 8 present in the immediate project area.
2. No Known weeds in/and or adjacent (~ 100 feet) to the project area without vectors

*Vectors (if contained in the project proposal) ranked in order of weed introduction risk:

1. Heavy equipment (implied ground disturbance)
2. Importing soil, cinders, or gravel
3. OHV/ATV's (mountain bikers, motorcycles, 4-wheelers etc.)
4. Grazing livestock (long-term disturbance)
5. Pack animals (short-term disturbance)
6. Plant restoration (active restoration, soil scarification, seeding, etc.)
7. Recreationists/General Public (hikers, hunters, camping, mushroom/firewood gathering) Forest Service/contractor project vehicles

Range Management

A more detailed range management report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below. Reference material is contained in the full specialists report.

Existing Conditions

This planning area encompasses the entire Long Prairie Allotment, which in itself totals 5,760 acres. The current permitted numbers of livestock on this allotment are 52 cow/calf pairs or 185 Animal Unit Months (AUM's). The permitted grazing season for this allotment is from June 15 to September 30. There is one ten year term permit issued on this allotment. In 1993 two sections of National Forest System lands (T1S, R10E, SEC.36 & T1S, R11E, SEC. 31) were exchanged out of federal ownership to private land. The new landowner has given the permittees permission to continue grazing their livestock, in order to maintain objectives of keeping the herbaceous and shrubby vegetation low, for less competition with tree seedling survival.

Historical records at the Barlow Ranger District do indicate that documented livestock grazing (cattle and sheep) has occurred in this area from 1906 to the present. Records do indicate that livestock grazing occurred in this area before the inception of the US Forest Service in 1906, but those records are sketchy at best.

An Environmental Analysis (EA) was completed for the Long Prairie Allotment in September, 2005. This document outlined a plan that would construct 3 miles of new fencing to the north of the North Fork of Mill Creek. This new fence would essentially keep livestock north of the North Fork of Mill Creek, thus eliminating the need to maintain an existing allotment boundary fence along the 1700-662 road. To date just over one mile of this fence has been constructed (Fall 2007) starting from the southern portion of Gibson Prairie Meadow northeast to the intersection of 1711-620 and 1711-623. The fence was constructed along the 1711-620 road.

The decision from this document identifies a "two-pasture, deferred, rotation" grazing system. Under this system, the permittee's first turn out their livestock into one of the identified pastures for that season, after "range readiness" (firm soils, & maturing vegetation) has been achieved. The livestock will utilize this area for approximately one to two months, or until utilization levels are reached, which ever comes first. The permittee's will then move their livestock into the other identified pasture for use that season. The animals will stay there until September 30, the end of the grazing season. This system accomplishes deferring utilization of forage in the second designated pasture, until plant development is allowed to progress to a mature phenological stage. The plan is to switch this order of use, the following year. This system requires that each pasture will receive deffered use every other year. This system will allow that each pasture will be utilized early in the season one year, and then later in the season for the next year. The allotment currently has six "short-term" monitoring sites established, that measure utilization levels (the removal of the current years vegetative growth). This data is collected at every site, once before the animals are turned out, and then once at the end of the season.

The majority of permanent range occurs in the meadows and riparian areas of this allotment. In the timbered portions of this allotment the transitory range (clear-cuts, shelterwoods etc.)

provides forage on a relatively short-term basis (20 to 50 years). This is forage produced in openings created by timber harvest activities, and seeded with a grass species mix of Orchardgrass (Dactylis glomerata), Timothy grass (Phleum pratense), Intermediate Wheatgrass (Agropryon intermedium) and Brome grass (bromus spp.). This forage production is significant for the first 8-20 years following harvest, but drops off as the tree canopy shades out the herbaceous vegetation. There are some harvested areas that have almost permanently become grasslands due to the difficulty silviculture has had growing trees on them, so these areas have remained productive as far as herbaceous forage is concerned.

Specific details of allotment management such as pasture movement schedules, range readiness recommendations, utilization limits, range improvement maintenance responsibilities and locations etc., are discussed in the Long Prairie Allotment Management Plan, available at the Barlow Ranger District. Range improvements within the allotment are a combination of drift and boundary fences, stock watering ponds, spring developments, guzzlers, corrals and cattleguards.

Under current direction from the Forest Service Washington Office, range managers are striving for vegetation management. The Forest Service has the opportunity in this planning area to utilize livestock as a tool to control undesirable vegetation, such as competing vegetation in young plantations, or possibly use livestock as a tool to achieve a desired future condition for vegetation in other specific areas.

Environmental Effects

No Alternative
Under the No Action Alternative the existing condition as far as livestock carrying capacity (herbaceous forage) and permitted livestock would be expected to continue on for the next 10 to 20 years, unless a stand replacing type fire or an increase in timber harvesting were to occur in this area of the allotment. The result from that type of an action (fire or harvest) would potentially result in a temporary increase in the short-term (5 to 20 years) of herbaceous forage type species which is a positive from a range forage production stand point. The amount of AUM's (animal unit months) or numbers of livestock would not be increased from this type of an action since the Long Prairie EA identified the need for riparian fencing to be constructed first with an increase in the vegetative condition to occur before any increase in numbers. The potential for a fire to destroy range improvement structures though would be a negative, which would create a need for a financial re-investment to reconstruct those structures lost.

Alternative 1: Proposed Action – Direct and Indirect Effects
The potential herbaceous forage created from the mechanical vegetation treatments would be minimal, and would be expected to last from 5 to 20 years, depending on specific site growing conditions. This is not expected to significantly change and/or alter any of the existing foraging patterns currently used by livestock, since these areas are mostly upland and forested locations. These treated areas would help somewhat relieve grazing pressure on some of the riparian areas, created since livestock usually spend little time in the uplands unless management prescribes something like "salting" to encourage more use. The treatments would not occur in any riparian reserves, without implementing a protection buffer, thus no increase in utilization levels within the few riparian areas is expected (LRMP FW-293) from any potential herbaceous forage created. Since these harvest prescriptions call for thinning existing live mature trees and the trees

planned for leaving are grown and mature (> 6 feet tall), there would be no threat from livestock occasionally browsing on the trees left behind.

The proposed action also identifies the use of prescribed fire (underburning) which would be expected to initially increase the herbaceous forage quality and to a small degree quantity in the short-term. In the long-term these indicators would be expected to level off.

The proposed action also identifies 24.2 miles of roads to close (year-round) and/or decommission. Decommissioning or closing of roads would limit access for both livestock grazing permittees and Forest Service personnel for permit compliance and range improvement maintenance, construction and inspections. This would increase the cost of permit administration and monitoring for not only the livestock permittee but also the Forest Service. The roads prescribed for seasonal closures (7.64 miles) would not have an effect to the existing grazing management program from what is already happening.

The proposed action also identifies the new construction of recreation trails. These trails are planned for hikers, mountain bikers and horse-back riders. The proposed location for sections of these trails would go directly through existing and/ or planned range pasture fences. The need to coordinate the construction of these trails for installation of gates, or walk-through's as they cross these fences is critical. For effective and successful range management, control of permitted livestock is dependent on the ability to keep the animals in a pasture for a prescribed length of time to meet resource objectives. Maintaining the integrity of these fences without any gaps, or holes in them meets that intent. The Long Prairie Allotment Environmental Assessment signed in September of 2005 identified existing range improvements and those planned for new construction that would be needed in order to meet resource objectives identified in that plan.

Alternative 2 – Direct and Indirect Effects

The direct and indirect effects would be expected to be the same except for the amount of potential herbaceous forage created from the prescribed thinning vegetation treatments. This amount would be minimal and would depend on site specific growing conditions, which would be expected to last anywhere from 5 to 20 years. The other proposed activities would have the same effects also.

Cumulative Effects for Alternatives 1 and 2

The cumulative effects for both the Alternative 1 – Proposed Action and Alternative 2 would be expected to be the same. The analysis area for cumulative effects is the Long Prairie Allotment.

Assumptions made: Long Prairie would continue as an active allotment; timber harvest activities and road closures are likely to continue into the reasonably foreseeable future within the allotment; forage in some areas would increase for 5 to 20 years following timber harvest from past planning efforts and then decrease as the tree canopy closes in. The increase in forage capacity would also increase for potentially 5 to 20 years from any fire activity should it occur within the allotment.

Recreation and Visual Quality

A more detailed recreation and visual quality report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below. Reference material is contained in the full specialists report.

Existing Conditions

Land Use Allocations and Forest Plan Consistency
The proposed project is located on lands defined as C1, Timber Emphasis in the Mt Hood Forest Plan for the most part. About one third of the eastern portion of the project area is on lands identified a B10, Deer and Elk Winter Range. Gibson Prairie Horse Camp is designated as A10 Developed Recreation. Table 1 lists the Standards and Guidelines from the Forest Plan pertinent to the action alternatives.

The lands in this planning area are classified as C1 and B10 in the Mt Hood Forest Plan. Dispersed recreation opportunities are to be provided and encouraged. The use of trails, off road vehicle use, berry picking, skiing, driving for pleasure and hunting are examples of activities that could occur. Timber management activities could temporarily interrupt recreation activities, but must protect structures and facilities. Developed recreation may also occur in facilities constructed for that purpose. In the eastern third of the project area human use would be restricted from December 1 to April 1 to reduce interaction with wintering deer and elk, based on the design criteria/mitigation measures developed for this project.

All of the above activities occur to some extent in the planning area. A fluctuating snow level and lack of a plowed sno-park precludes extensive ski and snowmobile activity, but the C1 area is open for both. No official closure to over snow use is in place for the B10 land allocation even though standard B10-001 states winter use shall be discouraged. People are not directed to the area as a winter use location, and little use is known to occur presently. Hunting and berry picking are popular activities. The open nature of the vegetation and fairly gentle slopes both lend themselves to unstructured recreation activities more so than most ground on the Hood River District which are largely either too steep or heavily vegetated. Four-wheel drive enthusiasts use the western portion of the area (primarily in the C1 allocation zones) during low to moderate snow conditions because winter recreation closures for wheeled vehicles do not exist and the area is in close proximity to the Hood River Valley. If the human use creates a conflict with the deer and elk winter range, the District Ranger has the ability to close the area as directed by the Forest Plan through a Forest Closure Order.

Table 1: Consistency with Forest Plan Standards and Guidelines

Standards & Guidelines	Relevant Element of the Alternatives	Do the Alternatives Meet Standard as currently designed?	If no, what measures can be taken to meet standard	Would this measure reduce the effectiveness of the proposal?	Data Used for Analysis
FW-556 states that VQO's should be achieved within one year of any project activity	Activity debris, temporary roads, landings, skid trails in near foreground need to be mitigated within one year of close of activity	Yes		No	Skid trail and Temporary road system plan. Proposed schedule for slash disposal
FW-584, 586, describe VQO of middle ground (1320 feet to 5 miles) for views from Surveyors Ridge and North Section Line Trail	Proposed treatment areas are in middle ground from these trails. Contrasting and diversified tree species should remain after treatment, and resultant stands should blend with surrounding landscape.	Yes		No	Examination of similar treatments in other areas. Visit to trails to check on visibility of proposed treatment areas.
For B10 allocations; Management activities shall achieve a Modification VQO as viewed from roads open during the summer.	Management units need to blend with the surrounding landscape. See description of Modification below.	Yes		No	Similar treatments accomplished on the Ranger District.

Standards & Guidelines	Relevant Element of the Alternatives	Do the Alternatives Meet Standard as currently designed?	If no, what measures can be taken to meet standard	Would this measure reduce the effectiveness of the proposal?	Data Used for Analysis
For C1 allocations; Management activities shall achieve a VQO of Modification as viewed from open roads; local roads and temporary roads are exceptions.	Management units need to blend with the surrounding landscape. See description of Modification below.	Yes		No	Similar treatments accomplished on the Ranger District.
For Gibson Prairie Horse Camp; A10-009 states that management activities shall achieve a VQO of Partial retention as viewed from within the A10 boundary (i.e. the campground).	See mitigation measures/design criteria for vegetation management below in this document.	Yes, with mitigation measures/design criteria prescribed		No	Management activities in similar rustic campgrounds.
For B10 allocations, (eastern 1/3 of project area); B10-002 states that human access should be restricted between December 1 and April 1 to reduce interaction with wintering deer and elk.	Trails are proposed for construction in this portion of the area; however, they are usually snow covered during the restricted time period. A seasonal closure needs to be incorporated for that portion of the trail system.	Yes, with closure as the mitigation measures/design criteria prescribe		No	Forest Plan and historical snowfall and retention experience

Standards & Guidelines	Relevant Element of the Alternatives	Do the Alternatives Meet Standard as currently designed?	If no, what measures can be taken to meet standard	Would this measure reduce the effectiveness of the proposal?	Data Used for Analysis
For C1 allocations; C1-001 states that dispersed recreation opportunities shall be provided, including hiking and trail use. C1-002 states these activities may be altered or temporarily precluded in localized areas to facilitate timber management. C1-003 and 004 states that "Special Places" shall be identified and management prescriptions developed.	Trails are proposed for construction. Gibson Prairie horse Camp is identified as a special place and a trail system is being built to compliment the camp. Aspen groves have been identified as a special place and they are being managed to promote health and longevity.	Yes		No	Gibson Prairie identified as a special place by horse groups. Aspen stands identified as a special place by individuals who like to visit them and because they are rare in occurrence.
C1-040 states that a trail system should be developed and designed to disperse use, and provide a range of difficulty levels.	Construction of a trail system to accommodate hikers, bikers and equestrians is proposed.	Yes		No	Trail system is proposed for development and was planned with the input of user groups in the collaboration process.

Standards & Guidelines	Relevant Element of the Alternatives	Do the Alternatives Meet Standard as currently designed?	If no, what measures can be taken to meet standard	Would this measure reduce the effectiveness of the proposal?	Data Used for Analysis
C1-141 and 142 states that Off-highway vehicle (OHV) use should be encouraged and be restricted within specific areas with conflicting resource objectives.	OHV use is being considered under a separate planning effort in the OHV Transportation Management Plan EIS	Not included in action alternatives, but the alternatives do not preclude opportunities for OHV trails		No	OHV EIS proposed action for Gibson Prairie area

- ***Modification:*** Under the modification visual quality objective **management activities may visually dominate the original characteristic landscape**. However, activities of vegetative and land form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type.

Visual Quality
The area shows evidence of past harvest activities, both clear cuts and partial cuts. Current stand conditions contain many dead and dying trees, understory of fire intolerant trees and brush, and many fallen dead trees. Areas of wind throw are also prevalent in stands affected by root rot. The Visual Quality Objective (VQO) for the planning area is Modification, as described above.

Camps
The area is popular with equestrians, and the Back Country Horsemen (BCH) and Oregon Equestrian Trails (OET) groups have rebuilt and expanded the facilities at Gibson Prairie Horse Camp. A new outhouse and corrals are among the improvements. There are few trails that emanate from the camp. Dispersed camping also occurs along roads within the project area, mostly during hunting season.

Trails
The only developed trails available for equestrians are the Surveyors Ridge Trail and the North Section Line Trail. Equestrians also use gravel and native surface roads and old skid trails. Local equestrian groups have desired to work with the Forest Service to construct more trails. Planning and construction funds have not been available until the collaborative stewardship process began. The same two trails are open to mountain bikes. The Surveyors Ridge Trail receives High use by mountain bikes and is avoided by some equestrians. There is a demand for more mountain biking opportunities, especially opportunities with gentle grades. OHV use occurs on the North Section Line Trail and on unpaved roads.

Off-highway Vehicles (OHV)
The C1 land allocations are open to dispersed OHV use as defined in the Forest Plan, however in 2003, 2004 and 2005 numerous user-created unauthorized trails were constructed in the planning area and used primarily by motorcycle riders. These trails linked to extensive unauthorized user created trails to the north on private timber ground and Hood River County Forest land, and extended south to The Dalles Watershed boundary. The Forest Service closed the trails a number of times with down logs, root wads, rock, etc., but the users reopened then repeatedly. The rolling terrain and sparse tree cover make construction easy and eradication of trails difficult. The users created trails crossed wet meadows, paralleled streams, went straight up hills, and were a source of erosion. In the summer of 2005, a total closure on off-road motorized travel in the planning area was put in place and the unauthorized trail system was closed and rehabilitated with the use of machinery and a large crew. The closure has remained in place since 2005 and was very effective until the fall of 2007 when some unauthorized trail construction began again. The unpaved road system has remained open to OHV use and receives moderate use, mainly during hunting season.

Recreation pressure will continue to increase as the population of Hood River and the Portland Metro area increases. In particular, there will most likely be continued pressure from motorized users coming from private timberlands just north of the project area. OHV ownership increased from 2.9 million vehicles in 1993 to 8 million vehicles in 2003 and is continuing to rise (Cordell, Betz, Green Owens, June 2005). The report found that over 22% of people over 16 years of age participate in OHV recreation. A extensive system of user created trails have been built in the last decade on several square miles of lands owned by SDS Lumber and other private owners, as well as those managed by the County of Hood River adjacent to the north of the permit area. The

illegal trails built on the National Forest were linked to these trails. SDS has closed its lands to off road motorized travel, but does not have the resources to patrol to control use. Hood River County is engaged in a Trails Master Planning effort at this time and intends to restrict use to designated trails. The Forest Service, SDS Lumber Co., and Longview Fibre Co. have had preliminary discussions about a coordinated motorized trail system in the area where their lands adjoin. At this time, the Forest Service portion only includes the Surveyors Ridge Trail north of the power lines, which is currently open to motorized use.

Environmental Effects

No Action – Direct and Indirect Effects

Visual Quality
Visual quality would be affected by timber stands continuing to decline and more trees dying. Fire susceptible trees and brush would also increase. If a large stand replacing fire were to occur, visual quality would be greatly altered beyond the scope of the desired future condition as outlined in the Forest Plan.

Camps
Gibson Prairie would continue to be used, as well as dispersed camps along roads.

Trails
Existing trails would continue to be used and become more crowded.

OHV
Use would continue on the North Section Line Trail and unpaved roads. The outcome of the OHV Travel Management Plan EIS is uncertain, but may build more trails, or prohibit use entirely.

Alternative 1: Proposed Action – Direct and Indirect Effects

Visual Quality
Visual quality would be affected by the vegetation treatments and road closure/culvert removal activities, but remain within Forest Plan standards due to the design criteria/mitigation measures.

Camps
Gibson Prairie Horse Camp would be greatly enhanced by the addition of trails. Road closure and decommissioning proposed by the action would eliminate some opportunities for dispersed camping.

Trails
Trail opportunities would be greatly enhanced by building new trails open to bikes and horses. A horse only loop would provide a rare opportunity for beginning riders and/or horses.

OHV
The proposed action would not affect the future of OHV opportunities; the OHV Travel Management Plan EIS will determine them. However thinning of stands, burning of stands, and removal of down material would make cross-country travel by OHV much easier.

Alternative 2 – Direct and Indirect Effects

Visual Quality
Visual quality would be affected, but remain within Forest Plan standards. There would be less impact from vegetation management than the proposed action because fewer acres would be thinned.

Camps
Gibson Prairie Horse Camp would be greatly enhanced by the addition of trails. By closing roads numerous opportunities for dispersed camping would be lost. This alternative would not treat hazard trees in and near the horse camp because those treatment units are dropped, and that would have to be done with limited funding available, possible resulting in closures of campground until work is completed.

Trails
Trail opportunities would be greatly enhanced by building new trails open to bikes and horses. A horse only loop would provide a rare opportunity for beginning riders and/or horses. Alternative 2 proposes less stand treatments. This would allow trail construction to proceed on a faster timeline because the vegetation treatment would be completed sooner, however the construction would be more costly and maintenance costs would increase due to larger amounts of dead and dying trees on the routes to be cleared during construction, and during on-going maintenance.

OHV
The proposed action would not affect the future of OHV opportunities; the OHV Travel Management Plan EIS will determine them. However thinning of stands, burning of stands, and removal of down material would make cross-country travel by OHV much easier. This alternative would treat less stands and open less opportunities for cross country travel.

Cumulative Effects for Alternatives 1 and 2

Visual Quality
There are no cumulative effects for visual quality since there are no direct or indirect effects.

Camps
It is possible, but not likely that the vegetation management activities in The Dalles Watershed Fuel Break might occur at the same time as the proposed action and result in multiple camp closures. There are ample rustic camp facilities to accommodate use unless Gibson and Knebal springs are closed at the same time, which would limit the opportunities for campers with horses. Other horse camps exist on the Hood River and Barlow Districts, but not in close proximity.

Trails
There are cumulative effects to existing trails because they would not be closed during any proposed activities.

OHV
Comments from the public received in the OHV Plan have requested a motorized trail be built in the northern part of the project area to link to the multi-ownership system described above. If this idea were incorporated in to an alternative for the OHV system it would have an effect on any

trails built through the action alternatives. The addition of motorize use could degrade the experience of other trail users by increased noise and could result in motorized incursions on to horse and mountain bike trails.

Heritage Resources

A more detailed heritage resources report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below. Reference material is contained in the full specialists report.

Existing Conditions

Heritage resource surveys were conducted on a planning area scale in preparation for numerous projects around the North Fork of Mill Creek and the Mill Creek Buttes areas. These previous surveys encompassed the current proposed project. Survey methodologies were conducted in compliance with the 1994 Programmatic Agreement (PA) between Region 6 of the Forest Service, the State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation (ACHP), and also meet current survey standards in compliance with the 2004 PA. The previously surveyed projects were eventually delayed in order to pursue collaborative efforts for treatment within the area, including this current proposed project. High probability areas and previously documented sites were revisited for this project in compliance with the 2004 PA. All survey methodology and findings were documented in Heritage Resource Report 2008/060606/0012.

According to the 1995 Ethnographic Study of the Mt. Hood National Forest, there are no designated traditional use areas within the proposed project area. Fieldwork by the Inter-Disciplinary Team has revealed that huckleberries exist in only occasional small, isolated patches throughout the area and do not offer any significant potential for enhancement. There are no other known traditional native plant communities within the proposed project area.

Archaeological sites within the proposed project area include four precontact lithic isolates (666NA0021, 666NA0090, 666IS0209 and 666IS0212), two precontact lithic scatters (666NA0205 and 666NA0210), a historic telephone line (666EA0156), three multi-component sites with both historic and precontact remains (666MC0211, 666MC0213 and 666MC0214), two carved aspen tree sites (666NA0154 and 666EA0243,), two peeled cedar tree sites (666NA0164 and 666NA0206), and one historic lookout (666EA0057). Lithic isolate 666NA0020 lies just outside of thinning unit 4 and outside of the project area.

Lithic isolate finds 666IS0209 and 666IS0212 consist of fewer than ten artifacts and are considered to be generally insignificant finds ineligible for inclusion on the National Register of Historic Places.

Precontact lithic scatter 666NA0021 consists of a single flake recovered from a logging road. Intensive inspection of the area in 1990 proved negative for additional cultural material; however, the recorder recommended reclassifying the isolate as a potential lithic scatter due to the setting. An intensive inspection of the area in 2005 also proved negative for additional cultural material.

Precontact lithic isolate 666IS0051 consists of a single chert projectile point midsection, a flake, and a core recovered from a barren opening. Although ground visibility was excellent, intensive inspection of the area and a road passing through the vicinity proved negative for additional

cultural material.

Precontact lithic scatter 666NA0090 consists of a projectile point fragment and two flakes observed in a Forest Development Road. Information about the find is vague, imprecise, and incomplete. Intensive inspection of the general area in 2005 proved negative for additional cultural material.

Precontact lithic scatter 666NA0205 consists of six chert artifacts recovered on 0.9 acres. The site was initially documented in 1999. No cultural affiliation could be determined.

Precontact lithic scatter 666NA0210 was initially documented in 1999 as a small site of unknown dimensions within an area that may have been logged previously. The cultural affiliation of the site remains undetermined, but the site area was probably used for hunting, gathering and tool making.

Historic telephone line site 666EA0156 consists of four fragments of 9.0 gauge wire ranging in length from six feet to 30 feet long situated in an old clear cut. A fragment of a white split-tree insulator embossed with the name brand "THOMAS" was also reported at the site. A later revisit to the site in 2005 was negative for cultural material.

Multi-component site 666MC0211 consists of a sparse scatter of lithic flakes and a fragment of ground stone. No diagnostic artifacts have been found at the site; however, the area appears likely for a seasonal hunting and food processing camp. The historic component of the site consists of cookstove fragments, automobile parts and logging cables possibly dating from 1880 to 1942.

Multi-component site 666MC0213 consists of one lithic flake and considerable historic debris. No other precontact artifacts have been found at the site, and its cultural affiliation remains undetermined. The historic component of the site consists of glass and ceramic fragments, numerous tin can fragments, milled lumber, and an old rim-fir bullet casing. Possible foundation stones appear displaced from previous logging. A cabin is shown in this general location on a 1912 Oregon National Forest Map.

Multi-component site 666NA0214 consists of a possible spokeshave and two fragments of angular waste. Four additional flakes were observed at the site. Although the cultural affiliation for the site remains undetermined, the area was probably used as a seasonal camp. The historic component of the site consists of ceramic and glass fragments, including amethyst glass and Chinese ceramics.

Carved aspen tree site 666NA0154 consists of six aspen trees of various sizes with designs carved into the bark. There are no dates included with the carvings. Most of the designs or symbols appear to be abstract representations, although three of the carvings may represent projectile points. The carvings have been attributed to Native American origin.

Carved aspen tree site 666EA0243 consists of 11 aspen trees of various sizes with designs, names, two symbol, initials and three possible dates carved into the bark. A few of the trees have multiple carvings. The possible dates may include 1908, 1912 and 1945.

Peeled cedar tree site 666NA0164 consists of four peeled cedar trees situated just to the north of a log landing area. All four trees are situated within 5.0 meters (approximately 16 feet) of each other. The peel scars include two Type II scars and two Type IV scars.

Peeled cedar tree site 666NA0206 consists of a single peeled cedar tree situated within 200 meters (approximately 650 feet) of peeled cedar tree site 666NA0164 documented in 1999. However, the description, access and location for the tree are identical to the description for 666NA0164. Subsequent attempts to locate the site have been unsuccessful.

Forest Development Road 1711-630 (666EA0249) was probably constructed before the establishment of the Oregon National Forest in 1908; however, the road appears only as a trail on forest maps prior to 1939.

Forest Development Road 1711 (666EA0253) appears on the 1883 GLO plat map for T1S, R11E, suggesting that the road was constructed prior to the establishment of the Oregon National Forest in 1908. The road continues to be shown on subsequent maps.

No signs of a historic trail shown on early forest maps could be located, despite intensive inspection of the area. The trail was apparently obliterated by the past construction of Forest Development Roads 1711-620.

No signs of a historic trail shown on the 1934 Mt. Hood National Forest Map traveling north from Mill Creek Ridge, across the North Fork of Mill Creek could be located, despite intensive inspection of the area. The trail traversed very steep ground, and may have been abandoned in favor of more accessible routes across the ravine. The trail is not shown on any later maps.

Environmental Effects

Methodology for Effects Analysis

Direction for surveys for protecting, documenting effects, and consulting on heritage resources comes from various laws, regulations and policies. The most important are summarized below.

- The National Historic Preservation Act (NHPA) of 1966, as amended
  This Act requires Federal agencies to consult with American Indian Tribes, state and local groups before nonrenewable cultural resources, such as archaeological and historic structures, are damaged or destroyed. Section 106 of this act requires federal agencies to review the effects project proposals may have on the cultural resources in the analysis area.

- 36 CFR Part 800 – Protection of Historic Properties

  800.1 Purposes. (a) *Purposes of the section 106 process.* Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the Council a reasonable opportunity to comment on such undertakings. The procedures in this part define how Federal agencies meet these statutory responsibilities. The section 106 process seeks to accommodate historic preservation through consultation among the agency official and other parties with an interest in the effects of the

undertaking on historic properties, commencing at the early stages of project planning. The goal of consultation is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties.

800.5 Assessment of Adverse Effects. (1) Criteria of adverse effect. An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.

When applying the criteria of effect and adverse effect, there are three possible findings:

- **No Effect:** There is no effect of any kind, neither harmful nor beneficial, on the historic properties.
- **No Adverse Effect:** There could be an effect, but the effect would not be harmful to those characteristics that qualify the property for inclusion in the National Register.
- **Adverse Effect:** There could be an effect, and that effect could harm characteristics that qualify the property for inclusion in the National Register.

No Action Alternative – Direct and Indirect Effects
Current management would remain unchanged under this alternative. There would be no effect to heritage resources under the No Action Alternative, other than the natural process that are already occurring.

Alternative 1: Proposed Action – Direct and Indirect Effects
Under this alternative, approximately 48 acres would be treated for the enhancement of aspen and/or cottonwood trees, about 26 acres would thin saplings, about 2125 acres would be commercially thinned, and about 671 acres would be underburned. Many of the acres proposed for commercial thinning would also be underburned. Long-term maintenance would occur with continued brush removal and underburning. Approximately 7.78 miles of road would be closed seasonally, while 7.64 miles of road would be permanently closed. About 8.78 miles of road are proposed for obliteration. Twelve culverts would be removed or replaced.

Potential impacts to heritage resources could result from activities associated mostly with the use of heavy machinery during the proposed commercial harvest operations, machine piling activities, installation of road closure structures, or road obliteration. Combustible heritage resources could be impacted by the proposed underburning.

Heritage Resource Report 2008/060606/0012 documented the survey methodology, findings and recommendations for archaeological resources associated with this proposed project. This report concluded with findings of **no effect** for expected impacts to archaeological resources.

Lithic isolates consist of fewer than ten artifacts and are considered to be generally insignificant finds ineligible for inclusion on the National Register of Historic Places. All significant information about the isolates has been obtained through documentation; the isolates offer no further research potential. No further archaeological work is required, and no protective measures are required or recommended for lithic isolate finds 666IS0209 and 666IS0212. Lithic isolate 666NA0020 lies outside of thinning unit 4 (outside of the project area) and would not be affected by the project.

Precontact lithic isolate 666NA0021 was initially documented as an isolate, and subsequent inspections of the general area in 1990 and 2005 proved negative for additional cultural material.

However, the isolate was reclassified as a site in 1990 because of its setting on a small bench above a wet meadow. Although the precise location of the isolate is approximate, two shovel probes in the general area also proved negative for cultural material. All significant information about the isolate has been obtained through documentation; the isolates offer no further research potential. No further archaeological work is required, and no protective measures are required or recommended for lithic isolate 666NA0021.

Precontact lithic isolate 666NA0090 was documented as a projectile point fragment and two crypto-crystalline flakes observed in a Forest Development Road during its construction in the late 1980's. The road is proposed for use as a trail. However, the site information was not formally documented, but a note was added to district files about the isolate in 1993. No sketch map was included with the notation, and the location of the isolate was not specific. Intensive inspection of the area in 2005 proved negative for cultural material. All significant information about the isolate has been obtained through documentation; the isolates offer no further research potential. No further archaeological work is required, and no protective measures are required or recommended for lithic isolate 666NA0090.

Precontact lithic isolate 666IS0051 lies within an area proposed for prescribed burning. Low temperature burns are generally considered to have no effect on lithic isolates. Existing firelines and roads would be used for fire control with no new fireline construction in the vicinity of the isolate. The proposed project would have **no effect** on the isolate. The proposed burning would have **no effect** to the lithic isolate 661IS0051.

Precontact lithic scatter 666NA0205 consists of lithic artifacts. The site is situated within areas proposed for aspen/cottonwood enhancement and thinning. A 30-meter (approximately 100-foot) buffer zone would flagged around the site for the exclusion of heavy machinery prior to project implementation. Any trees harvested in the vicinity of the site would be felled directionally away from the buffer zone. The proposed project would have **no effect** on lithic scatter site 666NA0205.

Precontact lithic scatter 666NA0210 consists of lithic artifacts. The site is situated within an area proposed for thinning and adjacent to a road scheduled for decommissioning. A 30-meter

(approximately 100-foot) buffer zone would be flagged around the site prior to project implementation for the exclusion of heavy machinery. Any trees harvested in the vicinity of the site would be felled directionally away from the buffer zone. No road obliteration activities would occur within the site boundaries. The proposed project would have **no effect** on lithic scatter site 666NA0210.

Historic telephone line site 666EA0156 consists of one ceramic insulator and four fragments of 9.0 gauge wire. The site is situated adjacent to an existing road proposed for use as a trail. Use of the existing road as a trial would have **no effect** on site 666EA0156.

Multi-component site 666MC0211 consists of a sparse scatter of lithic flakes and a fragment of ground stone. The site is situated within an area proposed for thinning and adjacent to a road scheduled for decommissioning. A 30-meter (approximately 100-foot) buffer zone would be flagged around the site prior to project implementation for the exclusion of heavy machinery. Any trees harvested in the vicinity of the site would be felled directionally away from the buffer zone. No road obliteration activities would occur within the site boundaries. The proposed project would have **no effect** on site 666MC0211.

Multi-component site 666MC0213 consists of one lithic flake and considerable historic debris. The site is located in an area proposed for aspen/cottonwood enhancement. A 30-meter (approximately 100-foot) buffer zone would be flagged around the site prior to project implementation for the exclusion of heavy machinery. Any trees harvested in the vicinity of the site would be felled directionally away from the buffer zone. The proposed project would have **no effect** on site 666MC0213.

Multi-component site 666NA0214 consists of a possible spokeshave, two fragments of angular waste, four flakes, ceramic fragments and glass fragments. The site is situated within an area proposed for thinning. A 30-meter (approximately 100-foot) buffer zone would be flagged around the site prior to project implementation for the exclusion of heavy machinery. Any trees harvested in the vicinity of the site would be felled directionally away from the buffer zone. The proposed project would have **no effect** on site 666MC0214.

Carved aspen tree site 666NA0154 consists of six aspen trees of various sizes with designs carved into the bark. The site is situated within an area proposed for aspen/cottonwood enhancement consisting of tree felling and prescribed burning. Each tree would be flagged for avoidance and would not be harvested. Any trees harvested in the vicinity of the site would be felled directionally away from the trees. All combustible materials would be scraped away from the base of each carved tree, and reflective material may be employed to protect the trees from prescribed burning. The proposed project would have **no effect** on carved aspen tree site 666NA0154.

Carved aspen tree site 666EA0243 consists of 11 aspen trees with historic carvings. The site is situated within an area proposed for aspen/cottonwood enhancement consisting of tree felling and prescribed burning. Each tree would be flagged for avoidance and would not be harvested. Any trees harvested in the vicinity of the site would be felled directionally away from the trees. All combustible materials would be scraped away from the base of each carved tree, and

reflective material may be employed to protect the trees from prescribed burning. The proposed project would have **no effect** on carved aspen site 666EA0243.

Peeled cedar tree site 666NA0164 consists of four culturally-modified cedar trees. The site is situated within an area proposed for thinning. Each tree would be flagged for avoidance and would not be harvested. Any trees harvested in the vicinity of the site would be felled directionally away from the trees. The proposed project would have **no effect** on peeled cedar tree site 666NA0164.

Peeled cedar tree site 666NA0206 consists of a single culturally-modified cedar tree. The site is situated within an area proposed for thinning. The tree would be flagged for avoidance and would not be harvested. Any trees harvested in the vicinity of the site would be felled directionally away from the tree. The proposed project would have **no effect** on peeled cedar tree site 666NA0206.

The historic lookout site 661EA0057 consists of combustible remains situated within an open area proposed for prescribed burning. The bundle of timbers within the open area would be sprayed with water or foam and protected during burning operations. A hand or wet line would be constructed around the remains to exclude them from burning operations. Existing roads and fireline would be used with no new fireline construction in the vicinity of the site. With these stipulations, the proposed project would have **no effect** on the historic lookout site 661EA0057.

Forest Development Road 1711-630 (6660249) is thought to date back to the late 1800's, although Forest documentation shows the road dates to ca.1939. The road is scheduled for a seasonal closure. The road has been continually maintained for at least 70 years. The maintenance typically consisted of widening, blading, shaping, ditching, and graveling. The road no longer retains any historic fabric or character, and is not considered a historic resource. The seasonal closure of Forest Development Road 1711-630 would have **no effect** on heritage resources.

Forest Development Road 1711 (6660253) appears on early forest maps and its construction may date back to 1883. The road is scheduled for seasonal closure. The road has been used for past timber harvest and has been intermittently maintained for at least 120 years. The past maintenance has apparently consisted of widening, blading, shaping, and some ditching. The road no longer retains any historic fabric or character, and is not considered a historic resource. The seasonal closure of Forest Development Road 1711 would have **no effect** on heritage resources.

A historic trail shown on archival maps could not be located, despite intensive investigation. The trail was apparently obliterated during the construction of Forest Development Roads 1711-620. No protective measures are required or recommended for heritage resources that cannot be located. The proposed project would have **no effect** on the historic trail.

A historic trail shown on the 1934 Mt. Hood National Forest Map traveling from Mill Creek Ridge north across the North Fork of Mill Creek could not be located, despite intensive investigation. The trail traversed very steep ground and may have only been utilized for a short time before it was abandoned in favor of easily accessible trails. No protective measures are

required or recommended for heritage resources that cannot be located. The proposed project would have **no effect** on the historic trail.

All road obliteration would consist of ripping the roadbed for each road proposed for obliteration to the visual extent (site distance) from the nearest road intersection. No ripping would occur within any site boundaries. Road obliteration would have **no effect** on heritage resources.

All proposed road closure structures are located outside of any documented site boundaries. No ground disturbing activity is proposed for road closure other than the installation of the closure structures. The proposed road closures would have **no effect** on heritage resources.

There are no known heritage resources within any of the trails proposed for construction in association with this project. A complete heritage resource survey would be conducted after trail locations have been flagged and prior to any trail construction. Any heritage resource sites discovered during the survey for the proposed trails would be avoided with a 30-meter (approximately 100-foot) buffer zone.

All temporary road construction would occur outside of any site boundaries. The proposed temporary roads would have **no effect** on heritage resources.

All culvert removals or replacements would occur within previously disturbed road fill and outside of any heritage resources. These activities fall within the category of undertakings excluded from case-by-case review because they have little or no potential to affect historic properties. The culvert removals and replacements would have **no effect** on heritage resources.

Alternative 2 – Direct and Indirect Effects
Under this alternative, approximately 48 acres would be treated for the enhancement of aspen and/or cottonwood trees, about 26 acres would be thin saplings, about 594 acres would be commercially thinned, and about 610 acres would be underburned. Many of the acres proposed for commercial thinning would also be underburned. Long-term maintenance would occur with continued brush removal and underburning. Approximately 7.78 miles of road would be closed seasonally, while 7.64 miles of road would be permanently closed. About 8.78 miles of road are proposed for obliteration. Twelve culverts would be removed or replaced.

Potential impacts to heritage resources would be similar under this alternative to those expected under the Proposed Action (Alternative 1); however, fewer areas are proposed for treatment and fewer sites are affected. Heritage resource sites 666EA0156, 666NA0164, 666NA0206, and 666NA0210 are not contained within this alternative. This alternative would also have no effect on the remaining heritage resources.

Cumulative Effects for Alternatives 1 and 2
Anticipated projects in the vicinity of the Heritage Resources were considered for cumulative effects (Table 3-1).

Low-temperature underburning maintenance would continue with no effect to the resources. Treatment of invasive plants could occur with no effect to the archaeological resources. Heritage Resources would be avoided during the implementation of any other type of foreseeable projects

with no indirect or direct effects. There would be no cumulative effects to Heritage Resources, other than the natural processes that are already occurring.

Social Impact Analysis/Environmental Justice

On February 11, 199], 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 5 to 20 miles to the east and southwest of The Dalles Municipal watershed. The Dalles abuts the northeast end of the municipal watershed. Other communities that may have an interest in the proposal would include Maupin, Madras, Redmond, and Bend to the south and Sandy, Gresham and Portland to the West. Census data confirm that the larger communities have minorities and low-income populations that may be affected by activities in the watershed. However, no specific concerns regarding minorities or low-income populations or communities were identified during the public information process.

The North Fork Mill Creek Restoration Opportunities 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 significant potential for enhancement. Therefore, the proposal to implement fuels reduction project would not have any adverse effect on members of the CTWS.

Although there is no formal tracking system, based on observations, it suspected that many of the foliage/greenery permits are sold to low-income individuals and minorities. The fuels reduction project is not expected to affect these users because the majority of the disturbance is not in areas where permit harvesting is concentrated. It is likely that the North Fork Mill Creek Restoration project would generate more special forest products as the area is treated and new vegetation grows (e.g., firewood opportunities). Therefore, the proposal to implement fuels reduction is not expected to have any negative effect on special forest product gatherers.

Financial Efficiency Analysis

The value of the commercial fuels reduction units is expected to cover the cost of treatments in non-commercial units. Stewardship contracting allows this type of trading goods for services.

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:

Federal, State, and Local Agencies

National Marine Fisheries Service (NMFS)
US Fish and Wildlife Service
Oregon State Historic Preservation Officer
Oregon Department of Fish and Wildlife, Mid-Columbia Field Office
Oregon Department of Forestry
Oregon Parks and Recreation Department
Oregon Department of Environmental Quality

Consultation with the National Marine Fisheries Service (NMFS)
No consultation was necessary.

Consultation with the US Fish and Wildlife Service (FWS)
The effects to spotted owls for this project were consulted on with the U.S. Fish and Wildlife Service through formal consultation on FY 2007-2008 activities within the Willamette province that have the potential to adversely affect spotted owls due to habitat modification and disturbance (FWS reference: 1-7-06-F-0179). 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.

The full reference is: Biological Opinion for Effects to Northern Spotted Owls (*Strix occidentalis caurina*) from the Willamette Planning Province Fiscal Year 2007 – 2008 activities that have the potential to adversely affect, due to habitat modification and disturbance, on U.S. Department of the Interior; Bureau of Land Management, Eugene District and Salem District, and the U.S. Department of Agriculture; Mt. Hood National Forest, Willamette National Forest and the Columbia River Gorge National Scenic Area (FWS Reference Number 1-7-06-F-0179).

Consultation with the Oregon State Historic Preservation Officer (SHPO)
The National Historic Preservation Act requires consideration be given to the potential effect of federal undertakings on historic resources. This includes historic and precontact cultural resource sites. The guidelines for assessing effects and for consultation are provided in 36 CFR 800. To implement these guidelines, Region 6 of the Forest Service entered an agreement in 2003 with the Oregon State Historic Preservation Office and the Advisory Council on Historic Preservation. In accordance with the agreement, surveys of The North Fork Mill Creek project area have been conducted. Based on the results of the surveys, a No Effect determination has been made for the Proposed Action (Alternative

II). The SHPO has been consulted as to the determinations made and had no objections with this finding.

Cultural resource surveys were conducted on a planning area scale and documented in Heritage Resource Report 2008/0606060/0012. Survey methodology was conducted in accordance with the 2004 agreement between Region 6 of the Forest Service, the State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation (ACHP).

Tribes

The North Fork Mill Creek Restoration Opportunities planning area that is on National Forest System lands 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 significant potential for enhancement. There are no other known traditional native plant communities within the proposed project area. Therefore, the proposal to implement fuels reduction project would not have any adverse affect on members of the CTWS.

Confederated Tribes of the Warm Springs Indian Reservation was consulted on this project and did not raise any issues with the proposed project.

Others

Wolf Run Ditch Company
City of The Dalles Watershed
Wasco County Soil and Water Conservation District
Rocky Mountain Elk Foundation
Oregon Wild
Backcountry Horsemen
SDS Lumber Company
Mill Creek Bob Collaborative Group

A complete list of those individuals and interest groups who received information regarding this proposal can be found in the project file.

List of Preparers

The following is a list of Interdisciplinary Team (IDT) members who assisted in the development of the Environmental Assessment.

Role	Person
IDT Leader / NEPA Specialists	Jennie O'Connor
Collaborative Group Coordinator	Erin Black
Fire / Fuels Specialist	Leo Segovia
Silviculturist	Kim Smolt
Logging Systems	Steve Jones
Roads Engineer	Ken Huskey/Bob Ballard
Soil Scientist	John Dodd
Hydrologist	Mark Kreiter
Fish Biologist	Gary Asbridge/Darcy Morgan
Wildlife Biologist	Patti Walcott
Botanist / Invasive Species	Susan Nugent
Range	Dan Fissell
Recreation / Visual Quality	Kevin Slagle
Heritage Resource Specialist	Mike Dryden
Aquatic Conservation Strategy	Mark Kreiter
GIS Maps	Joyce Vandenbrook/Kim Smolt

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GLOSSARY

Anadromous Fish: Those species of fish that mature in the sea and migrate into streams to spawn.

Biological Assessment (BA): Information prepared to determine whether a proposed action is likely to: adversely affect listed species or designated critical habitat; jeopardize the continued existence of species that are proposed for listing; or destroy or adversely modify proposed critical habitat. Biological assessments must be prepared for "major construction activities." The outcome of this BA determines whether formal consultation with regulatory agencies (USFWS and NMFS) is necessary.

Biological Opinion: Document containing the opinion and rationale of the USFWS or the NMFS as to whether or not a Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of designated critical habitat.

Code of Federal Regulations (CFR): The listing of various regulations pertaining to management and administration of the National Forest in the Federal Register.

Council on Environmental Quality (CEQ): An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Critical Habitat: For threatened or endangered species, the specific areas within the geographical area occupied by the species (at the time it is listed, in accordance with provisions of Section 4 of the Endangered Species Act) on which are found those physical or biological features essential to the conservation of the species. This habitat may require special management considerations or protecting. Protection may also be required for additional habitat areas outside the geographical area occupied by the species at the time it is listed based up on a determination of the Secretary of the Interior that such areas are essential for the conservation of the species.

Cumulative Effects: The combined effects of two or more management activities. The effects may be related to the number of individual activities, or to the number of repeated activities on the same piece of ground. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Effects: Environmental consequences as a result of a proposed action. Included are direct effects, which are caused by that action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are sill reasonably foreseeable.

Endangered Species Act (ESA) of 1973: The purpose of ESA is to provide for conservation of ecosystems upon which threatened and endangered species of fish, wildlife, plants, and their habitats depend. Section 7 of ESA requires Federal agencies to ensure that any federal action is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

Environmental Assessment (*EA*): A concise public document for which a federal agency is responsible. An EA serves (1) to briefly provide enough evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact; and to aid an agency's compliance with the National Environmental Policy Act when no EIS is needed; and (3) to facilitate preparation of an EIS when one is needed.

Environmental Impact Statement (*EIS*): An analytical document that portrays potential impacts on the human environment of a particular course of action and its possible alternatives. Required by the National Environmental Policy Act (NEPA), an EIS is prepared for use by decision makers to weight the environmental consequences of a potential decision.

Ephemeral Stream: A stream or portion of a stream that flows only in direct response to precipitation or snow melt. It receives little or no water from springs and no long-continued supply from snow or other sources.

Erosion: The wearing away or detachment of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitation creep.

Evolutionarily Significant Unit (ESU): A set of populations that is morphologically and genetically distinct from other similar populations or a set of populations with a distinct evolutionary history.

Executive Order 12898—Environmental Justice: Under Executive Order 12898, Federal agencies are required to identify and address potential environmental effects, including human health, economic, and social effects of Federal actions, specifically on minority and low-income populations, and Indian tribes.

Forest Plan: Documents required by the National Forest Management Act and developed on each National Forest to define the kinds of use, goals and objectives, management practices, and activities that would be allowed to occur on an individual or group of parcels of land.

Grazing: Consumption of native forage from rangelands or pastures by livestock or wildlife.

Grazing Allotment: An area where one or more livestock operators graze their livestock. An allotment generally consists of federal land but may include parcels of private or state-owned land.

Interdisciplinary Team: A team of varied land use and resource specialists formed to provide a coordinated, integrated information base for overall land use planning and management.

Interested public: An individual, group or organization that is interested in being involved and informed in the decision-making process for the management of livestock grazing on specific grazing allotments, or has submitted written comments to the authorized officer regarding the management of livestock grazing on a specific allotment.

Intermittent stream: A stream that flows above ground at intervals or only flows periodically during the year. In contrast to ephemeral drainages, intermittent streams generally have well-defined channels.

Low Severity Burn: Small diameter woody debris is consumed; some small twigs may remain. Leaf litter may be charred or consumed, and the surface of the duff may be charred. Original forms of surface materials, such as needle litter or lichens may be visible; essentially no soil heating occurs.

Mitigation: Actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

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

Monitoring: The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives. This process must be conducted over time in order to determine whether or not management objectives are being met.

Multiple Use: A combination of balanced and diverse resource uses that considers long-term needs for renewable and nonrenewable resources, including recreation, rangeland, timber, minerals, watershed, and wildlife, along with scenic, scientific, and cultural values.

National Environmental Policy Act of 1969 (NEPA): NEPA requires federal agencies to consider environmentally sound decisions and to disclose their effects. This law details requirements for public participation, environmental analysis, and sound decision-making for all appropriate federal actions. In 1978, the Council on Environmental Quality wrote the regulations for implementing NEPA. They can be found at 40 Code of Federal Regulations, Parts 1500-1508.

National Forest Management Act (NFMA): An act passed in 1976 amending the Forest and Rangeland Renewable Resources Planning Act. NFMA requires the preparation of Regional and Forest Plans and the preparation of regulations to guide that development.

National Forest System Lands: All National Forest lands reserved or withdrawn from the public domain of the United States, acquired through purchase, exchange, donation, or other means which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system.

National Historic Preservation Act (NHPA) of 1966: NHPA requires Federal agencies to consult with American Indian Tribes, state and local groups before nonrenewable cultural resources, such as archaeological and historic structures, are damaged or destroyed. Section 106 of this act requires federal agencies to review the effects project proposals may have on the cultural resources in the analysis area.

Northwest Forest Plan (NWFP): The NWFP was a result of analysis included in the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (1994). This analysis established certain standards and guidelines to Forest Plan land allocations for protection of late-successional species.

Noxious Weeds: A plant species that is undesirable because it conflicts, restricts, or otherwise causes problems under management objectives.

Perennial Plant: A plant that has a life cycle of 3 or more years.

Perennial Stream: A stream that flows throughout the year.

Pool Habitat: That portion of the stream with reduced current velocity, often with water deeper than the surrounding areas, and which is frequently usable by fish for resting and cover.

Range Condition: The current productivity of a rangeland relative to what it could naturally produce.

Ranger District: An administrative subdivision of the Forest, supervised by a District Ranger who reports to the Forest Supervisor.

Riparian: Areas of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence.

Riparian Reserves: A riparian reserve is a land designation from the Northwest Forest Plan which sets specific reserve widths for perennial and intermittent streams.

Sedimentation: Fragmentation material that originates from weathering of rocks and is transported by, suspended in, or deposited by water or air or is accumulated in beds by other natural agencies.

Sensitive Species: A species not formally listed as endangered or threatened, but listed by the Regional Forester as needing special management to prevent their being placed on Federal or State lists.

Seral: A biotic community which is a developmental, transitory stage in an ecological succession.

Seral (*Successional*) *Community*: One of a series of biotic communities that follow one another in time on any given ecological site.

State Historic Preservation Officer (SHPO): The State Historic Preservation Officer is the official appointed or designated pursuant to Section 101(b)(1) of the National Historic Preservation Act to administer the State historic preservation program or a representative designated to act for the SHPO.

Threatened Species: Any species of animal or plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of Interior as a threatened species.

Tier 1 Key Watersheds: Those watersheds to be managed for at-risk anadromous salmonids, bull trout, and resident fish.

Tolerance interval: The range of values that represent a specific proportion or percentage of some sample or population (such as a 30%, 50%, or 80% tolerance interval), at a given level of confidence such as 95% or 90% confidence.

Tolerance level (limit): The specific value at the edge of a tolerance interval. For example, if a 30% tolerance level of snag dbh used by wildlife species in a specific vegetation condition is, say, 40 cm, this means that 30% of all individuals of the wildlife populations used less than or equal to that size snag. An 80% tolerance level would correspond to 80% of the individuals using that corresponding size snag. A 100% tolerance level means all of the individuals would use that size snag (100% tolerance intervals correspond to the maximum observed values, such as the largest dbh snag observed to be used by a wildlife species).

APPENDIX 1 – COLLABORATIVE GROUP RECOMMENDATIONS TO USDA FOREST SERVICE

North Fork Mill Creek Collaborative Working Group – Final Forest Management Recommendations

The following report from the Mill Creek Collaborative Working Group presents conclusions and recommendations for which there was the greatest general agreement among participating stakeholders and should therefore be viewed as the highest priority for implementation.

RECOMMENDATIONS

Wildlife Habitat Restoration:

Deer and Elk Winter Range – Portions of the North Fork Mill Creek and Mosier Creek watersheds have been identified in the Mt. Hood Forest Plan as B-10 Winter Range. The collaborative group recommends improving elk security by closing all trails and roads within the B-10 winter range area from December 1-April 1. The USFS should also improve deer and elk forage where possible.

Snag and Down Wood Wildlife Species – The collaborative group recommends using variable snag and down wood densities. The Northwest Forest Plan and Mt. Hood Forest Plan standards for snags and down wood should be used as starting points and adjusted using the DecAID wood advisor tool.

Old Growth Habitat – The collaborative group recommends retaining or improving all old-growth habitat (i.e. ponderosa pine stands). [This is intended to be a broad recommendation. The USFS will make proposals on a case-by-case basis and the collaborative group will have a chance to review and comment on any proposals during the NEPA phase of the process.]

Fire/Fuels Treatments:

Consider using prescribed fire or a combination of prescribed fire and mechanical treatments for restoring stand health. The intent is to restore fire to its historic role. Prescribed fire should be utilized in areas that are ready for it. Mechanical treatments that have a low impact on soil quality could be used to reduce down woody debris to forest plan levels and to masticate brush in the preparation for prescribed fire. [Mechanical treatments is meant to be fairly wide open and could include: chipping, mastication, removal of dead wood, etc.] The stands in the lower elevations would be the priority for fuels treatment (such as prescribed burning).

Vegetation Management (Thinning):

In the upper elevations, defined in the watershed analysis as zone 3 and 4 (fir dominant), we recommend the USFS restore the plantations. Many of the plantations are infected with root disease. In these plantations, we recommend variable density thinning the entire stand and having small patch openings where root disease pockets exist. These areas would be planted with resistant species. We do not recommend stand-scale clear cutting, but saving the best of what's left in the stands (recognizing in some areas, it's not great habitat). The definition of plantation would be carried over from the South Fork Recommendations. ["Stand of trees initiated: a) through direct or indirect seeding; or b) by planting seedlings following any harvest method, including salvage logging, that removed more that 90 percent of the over story of the original stand on contiguous areas larger than 5 acres. There was not agreement among Working Group members on the issue of whether stands with less than 90% over-story removal, such as shelter wood harvests, could be considered plantations."]

In the lower elevations, defined in the watershed analysis as zones 1 and 2 (pine/oak dominant and dry Douglas-fir respectively), we recommend thinning the young, small diameter in-growth that is a result of fire suppression. All of the largest diameter class trees shall be retained, and any thinning shall leave variable tree density and meet forest requirements for snags. There was agreement that the largest diameter classes would not be cut within the stands proposed for restoration.

In both the upper and lower watershed thinning treatments, restoration and enhancement of legacy features is the goal; if there is a commercial by-product we are ok with that outcome—however, commercial outputs are not the goal. Thinning recommendations should be coupled with the fuels recommendations where compatible.

Meadows and Aspen:

We recommend the use of prescribed fire to perpetuate existing areas of meadow and to stimulate and create openings for existing aspen clones. Some remnants of aspen grow in the planning area. Because of the shallow aquifer in some of the planning area, we see this as an appropriate area for aspen to thrive in small stands where ground water is present much of the year.

- In the area with a wood products emphasis, we recommend that heavy machinery be kept on existing road surfaces, to protect perennial grasses and forbs from being ripped up, so as to limit additional conversion to annuals and invasive species.
- Meadow margins should be thinned of young conifers, so as to restrict encroachment, and to prepare for reintroduction of fire.
- Cattle grazing should be closely monitored for negative impact on meadows. Cattle grazing should be limited to the drier areas. Origins of streams should be fenced from cattle so as to allow for riparian growth for fish, avian and amphibian habitat. Meadows should be included in prescribed fire program, or let burn if a wildfire occurs. Only with these caveats do we support continued grazing of the grazing allotment.

- Meadows in the deer and elk winter range should be left to burn if a wildfire occurs, so that grasses, forbs and shrub communities are perpetually healthy in the mix of ecosystems there.
- The goal is to restore aspen stands and meadows and where possible to introduce new aspen groves. Aspen groves should be managed for longevity in the planning area. Three to five groves should be fostered in the area. If trees, then thin conifer competition and include in prescribed fire program. If latent suckers, then fence from ungulates, include in prescribed fire program, and manage toward the goal of a stand of multi-aged aspen trees. Other manipulation techniques may be used, at the discretion of the silviculturist, as long as it supports these goals. Any techniques would be submitted as proposals during the NEPA phase of the process and the collaborative representatives would have the opportunity to review and make any comments at that time.
- Where trails come upon meadows, they should be skirted along the margins and shall not harm aspen groves. Motorized trails shall not be permitted in meadows.

Fish Habitat Restoration:

Some of the top priority projects for this area from a fisheries perspective lie outside of the North Fork Mill Creek Planning Area boundary and outside of the Mt. Hood National Forest boundary. These projects would benefit fish within the planning area, however. For example, the correction of fish passage problems would allow anadromous fish (steelhead) to access high-quality habitat within the planning area, and would also allow resident fish (coastal cutthroat and redband rainbow trout) to move more easily within their range.

Projects may include the replacement or removal of culverts that are partial or complete barriers to resident fish passage (redband rainbow and/or coastal cutthroat trout). It is also recommended that the Forest Service examine whether or not roads upstream from culverts are needed for future use or could be closed or decommissioned. If thinning or other timber activity is planned along North Fork Mill Creek or West Fork Neal Creek, the Forest Service could look at improving fish habitat (place LWD in the stream) simultaneously. Also, some areas may benefit from riparian thinning (by mechanical removal or prescribed burning), which would, over the long term, increase the size of riparian trees. These trees would provide shade (decrease water temperatures) and also would eventually fall into the stream as LWD.

Priority Projects

Priority 1: Replacement of culverts on Mill Creek

Replacement of culvert at River Mile (RM) 5.2

This culvert is located on North Fork Mill Creek at River Mile (RM) 5.2 (approximately 1.2 RM below the Forest boundary on Mill Creek Road, a county road, near the Harrington's house). The recommendation is to replace the culvert with a bridge or bottomless arch (culvert). Surveys completed in 2002 found it to be a complete barrier to juvenile fish and partial barrier to adult fish based on the steep grade, small size, velocity and pressure.

Replacement of culvert at the mouth

The Mill Creek culvert under Interstate 84 is a 900-foot-long unlighted culvert with a submerged mouth. Although some fish are able to navigate the culvert, replacing it would

improve passage for steelhead, coho, chinook, and lamprey. ODFW and ODOT have identified this culvert as a priority for replacement along I-84 and are working together to replace this culvert with a bridge. Given the fish passage projects that have already been completed or are planned to be completed upstream (the culverts at RM 9.5 and 5.2, respectively, on North Fork Mill Creek), eliminating passage issues at the mouth would allow fish to take full advantage of access to high-quality habitat that is accessible to them higher in the watershed.

Priority 2: Replacement/removal of culverts for resident fish

North Fork Mill Creek

- Culvert at 1700-660 crossing (on-Forest)
- Culvert at 1700-663 crossing (on-Forest)

Alder Creek

- Culvert at 1721 crossing (on-Forest, in The Dalles Municipal Watershed)

West Fork Neal Creek

- Culvert at 1700 road crossing (on-Forest)
- Culvert at 1710-710 road crossing (on-Forest)
- Culvert at 1700-641 crossing (on Forest) – needs to be resurveyed to identify passage status
- Culvert at 1700 road crossing (~0.5 mile downstream of Forest boundary)
- Culvert at 1700-630 road crossing (~0.5 mile downstream of Forest boundary)
- Culvert at 1700 road crossing (~1.5 miles downstream of Forest boundary)

Tributary to West Fork Neal Creek

- Culvert at 1700 road crossing (~1.25 miles downstream of Forest boundary)
- Culvert at 1700-730 road crossing (~1 mile downstream of Forest boundary)

Neal Creek

- Culvert at 1710 road crossing (~1.25 mile downstream of Forest boundary)

In addition, stream crossings that are associated with the recreation and trail proposals developed as part of this planning process should be identified. Culvert passage issues could be corrected in conjunction with converting roads to trails or constructing trails (for example the proposed motorized trail that crosses the headwaters of North Fork Mill Creek). Fish passage should be maintained in areas where new stream crossings are constructed.

Priority 3: Stream restoration

The reaches of both North Fork Mill Creek and West Fork Neal Creek that lie within the planning area do not meet the forest standard for amount or size of large woody debris (LWD). The standard is 106 pieces per mile (this inlcudes the medium and marge size categories for the east side). Medium is >12”diameter at 35’ from the large end and length >35’ or 2 times bankfull width. Large is >20” diameter at 35’from the large end and length >35’ or 2 times bankfull width).

If thinning or other timber activity is planned in these riparian areas, one option is to improve fish habitat (place LWD in the stream) simultaneously. Also, some areas may benefit from riparian thinning (by mechanical removal or prescribed burning), which would, over the long

term, increase the size of riparian trees. Any riparian thinning would need to be consistent with the NWFP. These trees would provide shade (decrease water temperatures) and also would eventually fall into the stream as LWD.

The collaborative representatives acknowledge that a number of these projects fall outside the watershed, but the group supports them and would like to see them move forward, if that means working together with watershed councils.

Road Density:

The current road density in the North Fork Mill Creek Watershed is twice the recommended road density for this region. Lowering the road density will enhance and restore wildlife habitat, which has been prioritized by this group. The science is virtually unanimous that elk need security, and the best way to provide that security is by creating roadless areas. This is especially true during calving season. Taking out roads will also help reduce erosion potential, and thus restore in-stream fish habitat and water quality.

Several roads were identified for closure or obliteration by USFS resource professionals. We can agree with the roads identified. If these closures or obliterations do not provide enough reduction to be consistent with the Forest Plan for road density, other roads should be closed to meet Forest Plan standards. We recommend obliteration of roads if fish, wildlife and hydrology benefits outweigh the impacts of obliteration. The USFS should explore obliterating the first portion of the road ("Entrance Management") in areas where recreational roads/trails may lead to those roads proposed for obliteration to ensure that they remain unused.

The roads identified by USFS personnel include:

- Obliteration of the 0.5 mile long sections of roads 1700-663 and 1700-664 beyond the culvert on North Fork Mill Creek at the 1700-663 crossing;
- Closure of the 1700-641 road to benefit fisheries habitat;
- Closures or obliteration of roads: 1711-640, 1711-622, 1711-624, 1710-643, 1710-644, 1700-740, 1710-620, 1700-672, 1700-671 to benefit wildlife habitat;
- Closing *all* roads within the B-10 winter range area from December 1-April 1 to improve elk security.

Recreational Trails:

1) User groups be defined in the following categories and subcategories, to conform to existing standards:
   Motorized
   - Class 1 – ATV
   - Class 2 – 4x4s
   - Class 3 – motorbikes

   Non-motorized
   - Pedestrians
   - Bicyclists
   - Equestrian & pack animals

2) Not all trails will be open to all users.

3) Roads open to passenger-vehicles shall be incorporated into the recreational trail system to provide access to the area and to other trail areas, and to provide recreational opportunities.

4) Fire access trails shall remain open to all recreational trail users.

5) A physical boundary (including, but not limited to, fencing, earthen features, brush, shrubs, and/or trees) shall be maintained along the boundary of The Dalles Municipal Watershed. The funding of the physical boundary is a priority.

6) A user education and enforcement program shall be a part of the recreational trail plan. Efforts should be made to form partnerships with local law enforcement agencies, user groups, and adjacent land management agencies. Funding should be sought through appropriations, grant programs (i.e., ATV Fund grants from OPRD), recreational fee programs, and other channels.

   The user education and enforcement plan shall consider the following specific methods for achieving its goals:

   Law enforcement
   - Increased Fire Prevention Officers.
   - Increased Law Enforcement Officers (armed)
   - Local sheriff deputies
   - Posses

   Education
   - Volunteer Trail Patrol Program
   - Posses
   - Maps
   - Signage
   - Outreach through user groups and local businesses

7) The USFS shall revisit the 1990 Road Closure decision of Road #662, including an analysis of how that affects the Section Line Trail, and then report back to recreational user group on the rationale for the decision.

   If the trail and/or road are to be closed, the trail plan shall be revised so that it will continue to provide sufficient trail opportunities for all users. A revised trail plan may increase the trail density in the northwest part of the trail system, increase new trail construction, increase the number of roads to remain open for trail use, and increase impacts on habitat and wildlife.

8) The following trailheads shall be provided for the following users:
   Surveyor's North trailhead shall be identified on the trail map. It shall be designated primary parking for hikers and bikers.

   OHV Staging Area shall be designated primary parking for motorized users.

   Gibson Prairie Horse Camp shall be designated exclusively for equestrian and pack animal user parking and camping.

Education efforts (such as erecting signage and including information on maps) shall be undertaken to inform trail users about this situation, and where parking is allowed.

9) The trails in the Winter Range Elk Habitat area may be closed from Dec. 1 – April 1. Education efforts (such as erecting signage and including information on maps) shall be undertaken to inform trail users about this situation.

10) Education efforts (such as erecting signage and including information on maps) shall be undertaken to inform all users about methods to reduce the transportation of noxious weeds into the area.

Grazing Management:

The North Fork Mill Creek collaborative group recommends that the impact of cows in the North Fork Mill Creek watershed be addressed by the USFS in several ways. The grazing of cows in the North Fork of Mill Creek has degraded water quality and fish and wildlife habitat, and resulted in a need for restoration and better enforcement. The grazing permit in question is the Long Prairie Allotment. We recommend the following projects be prioritized to maintain the highest water quality possible in order to allow fish and wildlife to recover and thrive:

1. Construction of a one-mile section of fence to restrict cattle from the North Fork Mill Creek drainage.
2. The placement of downed logs along the streambank near the headwaters of North Fork Mill Creek and West Fork Neal Creek where cows have damaged the streambank.
3. Repair fencing to remove the cows from Mill Creek ridge that are illegally there.
4. More enforcement to manage cattle distribution to prevent damage from cattle in identified sensitive areas.
5. The USFS should utilize fences that are effective cow barriers, but have the least impact on other wildlife.
6. Grazing should not be allowed to continue if identified adverse impacts on resource conditions (especially water quality) cannot be reasonably mitigated. This requires fencing projects to be completed in order to prevent cows from accessing riparian areas they are not intended to be in.

APPENDIX 2 – ISSUES GENERATED THROUGH SCOPING

Issue	Public Issue Statement	Response
Healthy Forest Restoration Action	Why is this area a priority for HFRA? It is technically within the Hood River County CWPP's defined WUI, but it is far from any homes or communities and it is outside of The Dalles Municipal Watershed. Perhaps a traditional EA, with multiple alternatives and a standard notice-comment-appeal process . . . would be more appropriate.	This project would reinforce fuel reduction efforts occurring with The Dalles Watershed Fuel Break. Also, the Hood River County CWPP identified this as a project needed to reduce hazardous fuels within the county (Hood River County, CWPP, page 120). In addition, this project fits under the National Fire Plan goals and objectives for hazardous fuels reduction projects: "Hazardous fuels reduction treatments are designed to reduce the risks of catastrophic wildland fire to people, communities, and natural resources while restoring forest and rangeland ecosystems to closely match their historical structure, function, diversity, and dynamics."
	As an HFRA project, we'd like to see a more direct correlation, in the EA, between the proposed prescriptions and the intended outcome of fuels reduction.	The intended outcome of the project is to develop an uneven-aged stand with canopy closure that would allow fire behavior to change from crown fire to surface fire, and to have stand species composition reflecting Condition Class 1 (ponderosa pine, western larch, white oak, and dry-climate Douglas-fir).The Fire/Fuels Management and Vegetation sections (Chapter 3) describe the relationship between the proposed prescriptions and intended outcome of fuels reduction in more detail.
NEPA Process	We hope you not plan on using the 6-page "Proposed Action" we recently received as a replacement for public comment on environmental documents prepared pursuant to NEPA. The notice-comment-appeal regulations are not a license to ignore the CEQ reg. These two sets of regulations must be harmonized by combining the "proposed action" with either the scoping or the EA/EIS process. The Forest	This Environmental Assessment was prepared under the HFRA authority. All of the procedural requirements of that law have been followed. This project is subject to the objection period described in Pre-decisional Administrative
	Service should not rely on "proposed actions" which are not defined anywhere in the FS regs or the CEQ	Review Process (36 CFR 218), rather than the notice and comment and appeal periods described in 36

Issue	Public Issue Statement	Response
NEPA Process continued . . .	regs. The CEQ regs require that the FS provide public comment on "environmental documents" defined as EAs and EISs, NOT proposed actions.	CFR 215. In the objection period, the Environmental Assessment will be made available to the public for review at: http://www.fs.fed.us/r6/mthood/projects/index.shtml#hoodriver
	Though not required under HFRA, you should consider more than one action alternative for this project. There is enough active involvement through the collaborative group that a second alternative could be easily developed by using group concerns over the cutting of large trees and new roads.	Based on scoping comments, Alternative 2 was fully analyzed in this environmental assessment. In Alternative 2, vegetation management treatments would occur in existing plantations and no treatments would occur in naturally appearing stands. Alternative 2 reduces the proposed restoration thinning treatments to 594 acres, compared to 2131 acres in Alternative 1. Alternatives 1 and 2 both include approximately 1 mile of temporary road construction. Neither alternative proposes building new permanent roads. Both alternatives proposed to decommission 8 miles of roads and close another 16 miles of road. See Chapter 2 for full descriptions of the two alternatives.
Community Wildfire Protection Plan (CWPP)	Explain how this project is consistent with the CWPP. Establish the boundary of the communities at risk and measure the WUI (for this project) from the homes, buildings and community infrastructure that forms the community, not from the remotest fencepost on the remotest parcels of private land in the area.	A Wildland-Urban Interface (WUI) is defined as: "an area within or adjacent to an at-risk community that is identified in recommendations to the Secretary in a community wildfire protection plan" [HR 1904, Section 101.16(A)]. This project lies within an identified WUI, as outlined in the Hood River County CWPP and Wasco County CWPP. Additionally, Wasco County CWPP identified the Mill Creek Watershed, which is adjacent to the project area, as an at-risk community. The planning area is within the wildland-urban interface (WUI) as identified in the Hood River County CWPP (see Figure 28, page 87)
	As directed by the National Fire Plan, and given limited resources, agencies must prioritize treatment of fuels in areas that will have the greatest gain in terms of protecting homes and communities, specifically "high-risk" rural communities with more	The Wasco County CWPP identifies the watershed as a community at risk and high priority for treatment. "Mill Creek Municipal Watershed is the source of water for the City of The Dalles. It is unpopulated but has high values because of the importance of the

Issue	Public Issue Statement	Response
Community Wildfire Protection Plan continued . . .	than 250 people per square mile (USDI/USDA 2001).	water supply for the city. . . . (Wasco County, CWPP, page 50)" Based on this distinction, the North Fork Mill Creek Restoration Opportunities Project is a high priority project for the Barlow and Hood River Ranger District because it is designed to reinforce fuel reduction efforts occurring with The Dalles Watershed Fuel Break.
	Cooperation with local landowners is an important step in ensuring effective fuels reduction for this area. Please explain how local landowners were involved in the development of CWPP priorities and recommendations, and what steps they are taking to reduce fuels on private land in this area.	The cooperation with local landowners and fuels reduction activities on private lands are described in the Hood River County CWPP (http://www.co.hood-river.or.us/documents/CWPP.pdf) and the Wasco County CWPP (http://co.wasco.or.us/emergsvcs/CWPP.pdf). These documents served as the basis for this project. Management of fuels on private lands is the responsibility of Oregon Department of Forestry, and there were a key played in the development of the CWPPs.
Fuels Reduction Activities	Removing canopy fuels can reduce crown-to-crown fire spread, but the science clearly shows that removing canopy cover can also increase fire hazard by increasing solar insolation which causes fuels to warm and dry and increases wind speeds. Removing shade trees also frees site resources (light, water, nutrients) that can stimulate the growth of future ladder fuels and increase the cost of maintaining fuel treatments. HFRA only grants authority to remove "hazardous fuels." Do not remove any tree that provides useful shade to keep fuels cool and moist or that helps suppress the growth of future ladder fuels.	Opening crown spacing to reduce the probability of a wildland fire transition from a surface fire to a crown fire has some trade offs. Although opening the crown spacing could increase surface rates of spread, it also makes the fire easier to control and under severe weather conditions an open stand is less likely to support a crown fire. These trade-offs are described more fully in the Fire/Fuels Management section of Chapter 3.
	We commend you on your plan to use prescribed fire to try to restore a more natural fuel level and fire regime. Please take steps to use prescribed fire at the ecologically appropriate times of year, and take steps to protect critical resources that could be adversely	The timing for prescribed fire (underburning) is described in the Fire/Fuels Management section of Chapter 3. The design criteria/mitigation measures in Chapter 2 described the steps taken to protect critical resources. The adverse effects of underburning are

Issue	Public Issue Statement	Response
Fuels Reduction Activities continued . . .	affected by fire such as water courses, pockets of large snags, etc.	described and analyzed by each resource area in Chapter 3.
	The Forest Service should anticipate some mortality from prescribed burning. Mortality is certainly a natural possibility, and it is important that "salvage" logging of any of these burned trees is NOT allowed as a subsequent project without careful and full analysis.	This project does not involve any salvage logging. As described in Chapter 2, treatment units with both proposed thinning and underburning activities would only be underburned following the completion of the logging operations. For treatment units with only underburning as the proposed treatments, no logging would occur. Any additional logging proposed in these treatment units would be subject to a full NEPA analysis: no additional analysis is planned.
	Oregon Wild provided 23 recommendations for developing fuels reduction activities. The specific recommendations are contained in the scoping letter found in the project record.	These recommendations were reviewed by the interdisciplinary team and used to develop/refine the analysis contained in Chapter 3.
Large Diameter Trees / Legacy Trees	The science on fuels reduction is very clear; the smaller, densely packed trees are significantly more flammable and risk fueling a high intensity fire. The larger mature trees are more fire resistant. The North Fork Mill Creek collaborative group was very specific in not supporting the logging of larger diameter trees.	The collaboration group recommendations (Appendix 1) state: "We recommend thinning the young, small diameter in-growth that is a result of fire suppression. All of the largest diameter class trees shall be retained, and any thinning shall leave variable tree density and meet forest requirements for snags. There was agreement that the largest diameter classes would not be cut within the stands proposed for restoration." The collaborative group recommendations, including retention of large trees, were used to develop the stand objective table (Table 2-2). This table was shared with the collaborative group and specific suggestions were incorporated, as appropriate.
	The HFRA says that the structure and composition of old growth shall be fully maintained and restored by implementing the LRMP or RMP.	This project would retain the structure and composition of pre-fire suppression old growth by promoting fire-adapted species where their health condition does not threaten the overall health of the stand. Also, the treatments would not impact the Special Old Growth Area (A7) in the planning area.

Issue	Public Issue Statement	Response
Large Diameter Trees / Legacy Trees continued . . .		Further, HFRA provides that old growth direction in the Northwest Forest Plan Record of Decision is sufficient to meet the requirements of the Act. The requirements of HFRA and a description of how the project meets the requirements are contained in the Regulatory Framework section of Chapter 2.
	The Mill Creek watershed has a severe shortage of large diameter old-growth trees. Due to this shortage there is no room to further log any large diameter trees.	Field visits and GIS data layers do not indicate a shortage of large diameter old-growth trees within the watershed. Within the planning area, large trees would be retained where appropriate as indicated in the stand objective table. Leaving all large trees would not meet the purpose and need for this project due to the infestations of dwarf mistletoe.
	The diameter classes in the current proposal include a class of 24"-30", and mentions that in	The stand objective table, including the diameter sizes, was developed based on the forest health
	some instances there are too many of these trees. After extensive field checking we have not been able to verify that there are "too many" trees in this large diameter class. Therefore we recommend not thinning trees in this diameter class. The diameter class should be modified to be 21"-30" to reflect the signs of forest and ecosystem complexity that are developing when trees reach the 21" diameter. In this situation it might make sense in some instances to use a different diameter limit for grand fir than other species.	issues within the project area. The forest health issues are summarized in memo entitled “Insect and Disease Implications for North Fork Mill Creek Restoration.” This memo summarizes the field observations by an entomologist, plant pathologist, and silviculturalist. In addition, each treatment unit was visited to determine the forest health issue and potential treatment. These documents are available in the project record and analyzed in the Vegetative Resources section of Chapter 3.
	The trees that are over 30" in diameter should not be logged or girdled under any circumstances regardless of species unless they are a very direct hazard threat to the public.	All trees over 30-inch in diameter would be retained unless there is a compelling forest health, fuels reduction or safety reason to treatment the trees. If possible, other treatment measures (e.g., pruning limbs or girdling) would be used. If the trees are girdled, they would remain on-site. The intention is to leave as many trees over 30-inch as possible. See the Stand Objective table (Table 2-2) provides more details for each tree species.

Issue	Public Issue Statement	Response
Insects and Disease	Mistletoe is a natural part of forest diversity. Mistletoe-infected trees provide some of the best habitat for nesting species like the Northern Spotted Owl. Girdling is better than taking the trees down, but leaving the trees or just pruning them is even better.	The degree of mistletoe infection in the younger Douglas-fir trees (<120 years) varies from very low levels in some stands to very high levels in others. Generally, where heavily infected Douglas-fir overstory exists, the infection level in the adjacent and understory trees is also high and would be expected to continue to increase as long as the source of infection exists. As described in Table 2-2, pruning and girdling are the first option, except when the hazardous fuels reduction objectives cannot be met without removing the tree. The impacts of mistletoe are described in the Vegetation Resources, Existing Conditions section of Chapter 3.
	The current plan appears to prescribe 1-2 acre clear cuts to deal with root rot pockets. This treatment will result in significant negative ecosystem and hydrologic impacts. To mitigate these impacts in the densest pockets of root rot you should still "leave the best of what's left" of the trees in the stand, preferably a minimum of 10 of the best remaining trees per acre in these situations.	The impacts to ecosystem and hydrologic impacts of treating the root rot pockets are described by each resource area in Chapter 3. No significant effects were identified through the analysis process. The Vegetation Resource section in Chapter 3 describes the impacts of root rot pockets Thinning and small patch openings would reduce root-to-root contact and promote the growth of species in the stands that are resistant or have an increased tolerance to root disease. Trees with improved vigor would be more resistant to root disease, as well as the commonly associated insects. In order to achieve this goal, the marking guides will “leave the best of what’s left,” but this may not meet 10 trees per acre.
Snags and Downed Woody Debris	There is a shortage of large down wood and snags across the landscape due to extensive logging over the past century. For this reason, we do not support the proposed forest plan amendment to allow the Forest Service to not meet down wood and snag standards in the project area.	This project does not include a Forest Plan amendment. This project does proposed a Forest Plan exception for Standard FW-215, related to snags. Exceptions to these standards are needed to meet the purpose and need of effective fuel reduction. Exceptions are allowed under the Forest Plan, if they are identified during the interdisciplinary process.

Issue	Public Issue Statement	Response
Snags and Downed Woody Debris continued . . .		Currently, the proposed project area is between 30 and 80 percent snag and down wood levels as outlined in the DecAID Advisor. The proposed project would retain snags and down wood at the 30 to 50 percent level in the planning area, which does not meet the FW-215. The project does not impact any designated pine marten or pileated woodpecker habitat areas (B5). Snags would be retained to meet habitat requirements for the northern spotted owl. Mitigation measures are incorporated into the proposed action to ensure that there is no major impact because adequate snags and down wood would be retained within the watershed. For a complete analysis, see the Wildlife Resources section of Chapter 3.
Road Management	The current road obliteration plan is a good step in the right direction. We encourage the USFS to include more of this type of management, as there are still significantly more roads that need to be obliterated to restore the aquatic integrity of this watershed.	All the roads within the planning area (6,600 acres) were considered for potential road decommissioning and road closure. Considering management and recreation needs, approximately 9 miles were identified for decommissioning and 16 miles were identified for closure. In addition to the road proposals, 12 culverts were identified for replacement/removal in order to improve the aquatic integrity of the watershed.
	The proposed action mentions that there will be "some temporary road construction". These temp roads need to be identified, justified and their impacts analyzed. (Please provide a map of proposed road management associated with this project.)	A map of the temporary roads is contained in Chapter 2 (Figure 2-2). Approximately 1-mile of temporary roads would be constructed to complete the project. These roads would be immediately decommissioned after use. The impacts from the temporary roads are analyzed by resource area in Chapter 3.
	The EA must also clearly state whether any roads are proposed for construction or reconstruction within Riparian Reserves, and which of these if any will require stream crossing(s).	Proposed road maintenance, including reconstruction, is detailed in Table 2-4. No road construction is proposed as part of this project. The impact of the proposed road maintenance to riparian reserves and stream crossings is analyzed in the Watershed

Issue	Public Issue Statement	Response
Road Management continued . . .		Resources and Aquatic Species and Associated Habitat sections of Chapter 3.
	New roads should only be considered as a last resort for access to treatment areas. One of your evaluation criteria of whether to build new road should be whether any degradation of soil is offset by long-term benefits brought about by the proposed action.	No new roads are being proposed as part of this project. Only 1-mile of temporary roads is being proposed. The impacts of the temporary road construction and decommissioning are analyzed by each resource area in Chapter 3, including the Soil Productivity section.
	The agency should do an analysis that illuminates how many acres of thinning are reached by each road segment so that we can distinguish between short segments of spur that allow access to large areas (big benefit, small cost) and long spurs that access small areas (small benefit, big cost).	Figure 2-2 provides a map of the proposed logging system for the project.
	In the EA, please provide a stand by stand description of the road spur lengths and the acres each spur accesses for thinning.	The Transportation section of Chapter 3 provides an analysis of the proposed log haul route. Details on how the sales would be accessed are determined during implementation, using the information provided in the environmental assessment and decision notice.
	I can't see why we want to close good gravel roads that cost taxpayers thousands of dollars to build.	One of the underlying needs for this project is to restore wildlife security and aquatic integrity within the planning area while integrating the public's need for access. In order to meet this purpose and need, the project proposed to decommission or close approximately 25 miles of road. The remaining roads in the planning area would remain open for public access.
	1700662 is a good gravel road, lets leave SOME access for recreation.	
	Do some repair work on 1711000 which has been neglected for many years.	As part of this project, the 1711000 road is proposed to have brushing, drainage, surface, and blading maintenance work complete.
	Are these roads [roads proposed for year-round closures] retained for management purposes and project implementation? Or why?	The roads are being retained to provide management/ administrative access by permission. One example is to access a water quality monitoring station.
	Will you be using the Mill Creek RD, out of The Dalles, as a haul route this summer? If so, will you be	The Mill Creek Road is not being proposed as a haul route for this project.

Issue	Public Issue Statement	Response
Road Management continued . . .	constructing the road that moves west of the cement bridge (past the new fish culvert)? Or will you be using the road that goes directly uphill and past the watershed?	
Logging Systems	And ground-based logging that allows heavy equipment off of roads may cause significant soil disturbance that will not be offset by any intended benefits to the vegetation.	The impacts of ground-based logging on soil resources are analyzed in the Soils Productivity section of Chapter 3. In addition, specific project design criteria/mitigation measures protect soil resources. These are listed in the Roads and Soils Resources sections of the Design Criteria/Mitigation Measures in Chapter 2.
Wildlife Species	Impacts on old-growth species should be discussed in detail in the EA. This should include an analysis of effects on such species as the Northern spotted owl, goshawk, bats, woodpeckers, Pine Marten, California Wolverine, Great Gray Owl, Pygmy Nuthatch or Bald Eagle, and other special status species listed in applicable management plans.	A full analysis of wildlife species can be found in the Wildlife Resources section of Chapter 3.
Water Quality	Project analysis should separately discuss each of the Aquatic Conservation Strategy objectives (under the Northwest Forest Plan).	An Aquatic Conservation Strategy analysis is included in Chapter 3. The analysis discussed each of the nine ACS objectives.
	Any commercial harvest activities or road construction in key watersheds or municipal watersheds should be avoided in order to protect water quality.	No activities are proposed in municipal watersheds. Proposed activities and the associated impacts to key watersheds are analyzed in the Watershed Resources section of Chapter 3.
Trails	Where do the funds come from and how much is needed for the new non-motorized trails? Is this recreation capitol investment money or does the project itself carry this cost?	Funding for these projects will be determined during the implementation phases of this project.