CHAPTER 3 – ENVIRONMENTAL CONSEQUENCES

This chapter presents information on the physical, biological, social, and economic environments of the affected project area, and the potential direct, indirect and cumulative effects to those environments due to the implementation of the alternatives.

Each resource area discloses the direct, indirect and cumulative effects for that resource area.

The National Environmental Policy Act defines these as:

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

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

Each of the specialist reports and biological evaluations conduct an analysis of cumulative effects resulting from this project. Table 3.0-1 lists the projects that the IDT considered in their analysis.

Table 3.0-1: List of Projects Considered in Cumulative Effects Analysis

Past Activities
Past timber harvests, including but not limited to the following sales: FY 1984 SSF Salvage Timber Sales; Hillary SSF Salvage Timber Sale (1985); Crow Timber Sales (1985)
The Dalles Watershed Fuelbreak (Willow Stewardship Sale)
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
Long Prairie Grazing Allotment
The Dalles Watershed Fuelbreak Stewardship Sales (Hodi & Alder)

North Fork Mill Creek Stewardship Sales (Appy, Buckskin, Clyde, & Eques)
Watershed Forest Fire Fuels Reduction Project (National Fire Plan Project) on City lands within the watershed. The project is currently out for contract and all work is scheduled to be completed by July 31, 2012.
Pre-commercial thinning
Bonneville Power Administration maintenance, including herbicide treatments
Ongoing incidental road maintenance
Ongoing trail maintenance
Off-highway Vehicle (OHV) Travel Management Plan implementation
Future Activities
Dog River Pipeline Replacement Project
Site-specific invasive plant treatments
Hazard tree removal along roads

3.1 Fire/Fuels Management

More information is available in the Project Record including the Fuels Specialist Report. The Fuels Report is incorporated by reference and is located in the project record, located at the Barlow Ranger District Office.

3.1.1 Methodology and Analysis Points

Landscape Scale – Fire Regime Condition Class (FRCC) Assessment

To evaluate the current conditions of lands in relation to their historic or "natural" reference condition, an interagency standardized assessment method, Fire Regime Condition Class (FRCC), was developed to describe the degree to which vegetation and fire regime (fire frequency and severity) depart from historic ecological reference conditions (Hann et al., 2005). Common causes of departure, as described in the 2010 FRCC Guidebook, include advanced succession, effective fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, and introduced insects and disease.

Assessing FRCC can help managers gain a landscape perspective of conditions, evaluate risk to ecosystem sustainability, and develop a long-term strategy to improve FRCC (Rice et al., 2006). To assess FRCC at a landscape scale, this report utilizes the five national fire regime categories, as refined in 2006 and updated in 2007 for the US Forest Service Pacific Northwest Region, and three fire regime condition classes (Rice et al., 2006). These are displayed in Table 3.1-1. Not all five categories are represented in The Dalles Watershed, as explained in the Existing Conditions section of this report.

The three fire regime condition class descriptions displayed in Table 3.1-2 (Rice et al., 2006) are used in the existing condition section to describe the extent of departure The Dalles Watershed has moved from natural or historic fire regimes. FRCC data available for this analysis covers a little over 70% of The Dalles Municipal Watershed. Gaps in data are primarily associated with non-Forest Service ownership.

Table 3.1-1: Fire Regimes of Oregon and Washington (Rice et al., 2006)

Fire Regime Group	Frequency (Fire Return Interval)	Severity
I	0 – 35 years	Low severity (underburn)
II	0 – 35 years	High severity (stand-replacing)
III A	< 50 years	Mixed severity
III B	50 – 100 years	Mixed severity
III C	100 – 200 years	Mixed severity
IV A	35 – 100 years	High severity (stand-replacement), juxtaposed
IV B	100+ years	High severity (stand-replacing), patch arrangement
IV C	100 – 200 years	High severity (stand-replacement)
V A	200 – 400 years	High severity (stand-replacing)
V B	400+ years	High severity (stand-replacing)
V C	No Fire	
V D	Non-Forest	

Table 3.1-2: Fire Regime Condition Class descriptions (Rice et al., 2006)

Condition Class	Attributes	Example Management Options – Applicable to Eastside Forests
1	• Fire regimes within or near historical range (e.g. fire frequencies have departed from historical range by no more than one return interval) • Low risk of losing key ecosystem components • Vegetation attributes (composition and structure) are intact and functioning within historical range	These areas can be maintained within the historical fire regime by such treatments as fire use.
2	• Fire regimes have been moderately altered from their historical range (e.g. fire frequencies have either increased or decreased from range by more than one interval). Moderate changes in fire size, frequency intensity, severity or landscape pattern has resulted. • Moderate risk of losing key ecosystem components • Vegetation attributes (composition and structure) have been moderately altered from the historical range.	These areas may need moderate levels of restoration treatments, such as fire use, hand or mechanical treatments to be restored to historical regime.
3	• Fire regimes have been significantly altered	These areas may need high levels of restoration

Condition Class	Attributes	Example Management Options – Applicable to Eastside Forests
	from their historical range (e.g. fire frequencies have departed from historical range by multiple return intervals). Dramatic changes in fire size, frequency, intensity, severity or landscape pattern has resulted. • Vegetation attributes (composition and structure) have been significantly altered from the historical range.	treatments, such as hand or mechanical before fire is used to restore to historical fire regimes.

Site-Specific Scale

The Fuel Characteristic Classification System (FCCS) was used to model the effects of implementing treatments described in the Proposed Action (Hudec, 2011). FCCS is a software program that supports a library of fuelbeds that can be used to represent fuels. Displayed below in Table 3.1-3, you can see that four reference fuelbeds were used to represent fuels in the Proposed Action. The FCCS fuelbed library contains fuelbeds that represent fuels throughout much of Northern America. Fuelbeds represent physical attributes, potential fire behavior, and the potential fire effects of fuels.

FCCS uses the following three categories to describe eight component fire potentials.

1. Surface fire behavior – includes reaction intensity, spread rate, and flame length components
2. Crown fire potential – includes torching and active crown fire components
3. Available fuel potential – includes flaming, smoldering, and residual smoldering components

FCCS calculates the relative fire hazard for each fuelbed, including surface fire behavior, crown fire, and available fuel potential. Relative fuelbed fire hazards are described as "Fire Potentials" and discussed in terms of a scaled index from 0 to 9, with 0 representing the lowest potential and 9 the highest potential. When using this scaled index from 0 to 9 to described a fuelbed, fire potentials could be described as follows: 0-1 very low fire potential, 2-3 low fire potential, 4-5 moderate potential, 6-7 high potential, and 8-9 very high potential. For example, an FCCS fuelbed rated with a fire potential of 539 would represent a fuelbed with a moderate surface fire potential, low crown fire potential, and very high available fuel potential. Because it is one in which fires are likely to occur with at least moderate intensity, each fuelbed was modeled using FCCS code D2L2C3. This is the FCCS default for a "dry" fuel moisture scenario. Fuel moistures under this scenario are documented in the project record, available at the Barlow Ranger District in Dufur, Oregon.

The Vegetation Resources Specialist Report (Section 3.3 in the Preliminary Assessment) describes five vegetation STAND Groups. For the purposes of completing an FCCS analysis and based on several factors including stand maturity, health, and vegetation, each STAND Group was assigned one or more FCCS Reference Fuelbed's. Field data and field surveys described in the Vegetation Resources Specialist Report for this project, including common stand exams, Forest Service Vegetation Module (FSVeg), Forest Vegetation Simulator (FVS) and Plant Associations were used to adapt and sensitize Reference Fuelbed inputs. Table 3.1-3 displays each of the STAND groups and the reference fuelbed that was assigned to represent fuels within the STAND.

Table 3.1-3: Vegetation STAND Groups and Assigned Reference Fuelbed

STAND Group	Reference Fuelbed
A1- Mature, healthy	208 – Grand fir, Douglas-fir fire exclusion
A1- Heavy brush	208 – Grand fir, Douglas-fir fire exclusion
A1- Dense, healthy	006 – Oregon white oak, Douglas-fir forest
A2	006 – Oregon white oak, Douglas-fir forest
A3- Mature	052 – Douglas-fir, Ponderosa pine/oceanspray
A3- Immature	052 – Douglas-fir, Ponderosa pine/oceanspray
D	004 – Douglas-fir/ceanothus, clearcut, prescribed fire (historical)
E- Mature	208 – Grand fir, Douglas-fir fire exclusion
E- Dense, unhealthy	208 – Grand fir, Douglas-fir fire exclusion

3.1.2 Existing Condition

Landscape Scale

Fire Regime Condition Class (FRCC) analysis was completed on The Dalles Municipal Watershed (TDWS) using available data. As stated in the Methodology and Analyses Points section, fire regime and FRCC data is only available for approximately 70% of the watershed. Due to gaps in data, non-federal lands are not represented in the information below.

Historic fire regimes that would have naturally occurred within the TDWS are displayed below in Table 3.1-4 and Figure 3.1-1. Forty-five percent of the analysis area would have had a fire return interval of less than 50 years with low and mixed severity; thirty-five percent would have been mixed severity with a return interval of 50 – 200 years; and the remaining 20% would have had high severity stand replacing fires that returned every 100 to 400 years.

Table 3.1-4: Natural Fire Regimes

Fire Regime Group	Frequency (Fire Return Interval)	Severity	% of Area
I	0 – 35 years	Low severity (underburn)	33
III A	< 50 years	Mixed severity	12
III B	50 – 100 years	Mixed severity	28
III C	100 – 200 years	Mixed severity	7

Fire Regime Group	Frequency (Fire Return Interval)	Severity	% of Area
IV C	100 – 200 years	High severity (stand-replacement)	15
V A	200 – 400 years	High severity (stand-replacing)	5

Table 3.1-5 and Figure 3.1-2 represent the existing fire regime condition class and the extent from which The Dalles Municipal Watershed has departed from historical fire return intervals and fire severity levels. Data shows 47% of the watershed is within condition class 1, described as within or near historical ranges; 14% of the watershed is within condition class 2, described as moderately altered from historical range; and 36% of the watershed is within condition class 3, described as significantly altered from historical range.

Table 3.1-5: Fire Regime Condition Class Map for The Dalles Municipal Watershed

Condition Class	Attributes	% of Area
1	• Fire regimes within or near historical range (e.g. fire frequencies have departed from historical range by no more than one return interval) • Low risk of losing key ecosystem components • Vegetation attributes (composition and structure) are intact and functioning within historical range	47%
2	• Fire regimes have been moderately altered from their historical range (e.g. fire frequencies have either increased or decreased from range by more than one interval). Moderate changes in fire size, frequency intensity, severity or landscape pattern has resulted. • Moderate risk of losing key ecosystem components • Vegetation attributes (composition and structure) have been moderately altered from the historical range.	14%
3	• Fire regimes have been significantly altered from their historical range (e.g. fire frequencies have departed from historical range by multiple return intervals). Dramatic changes in fire size, frequency, intensity, severity or landscape pattern has resulted. • Vegetation attributes (composition and structure) have been significantly altered from the historical range.	36%
No Data		3%

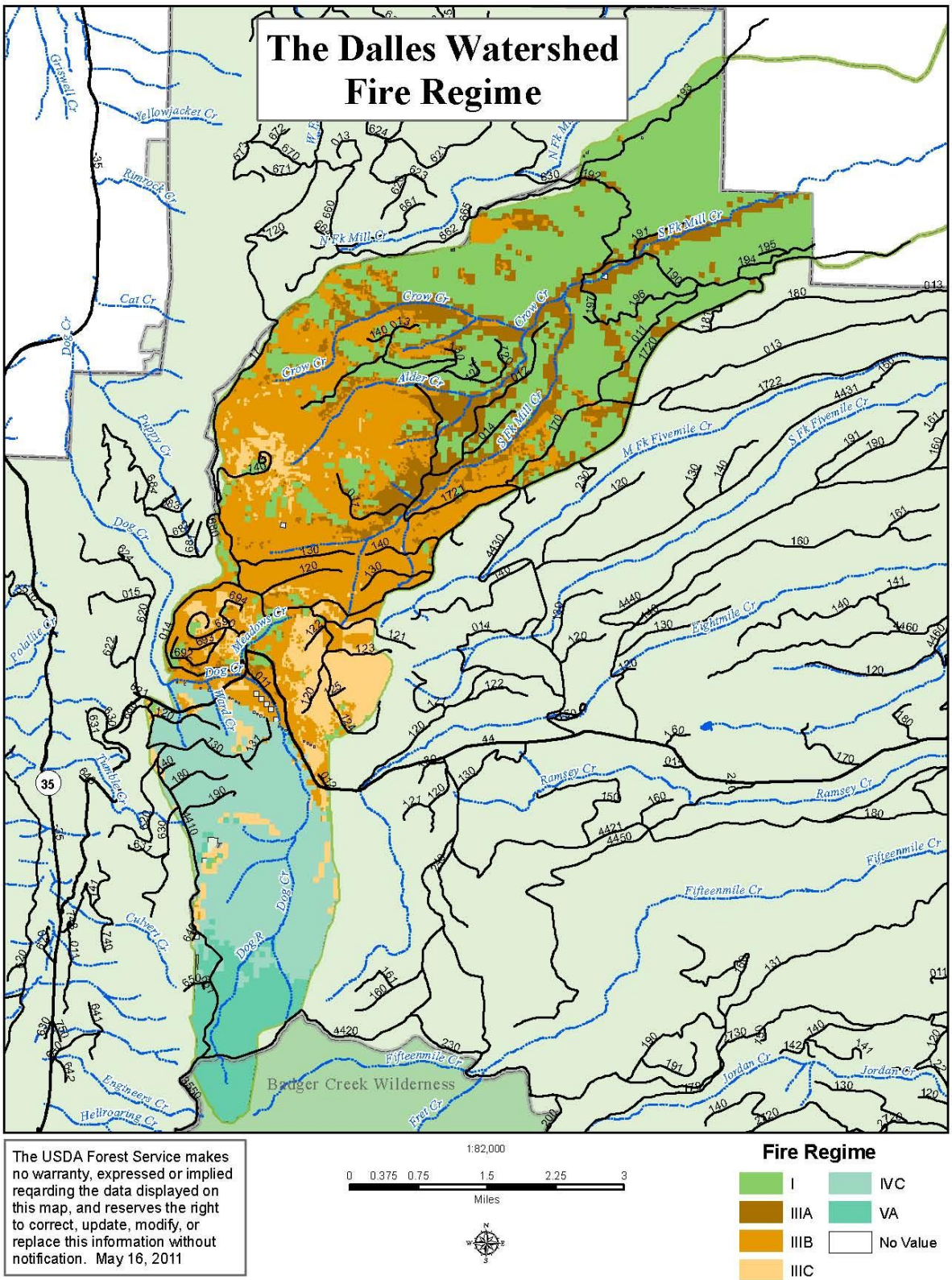


Figure 3.1-1: Fire Regime Map of The Dalles Watershed

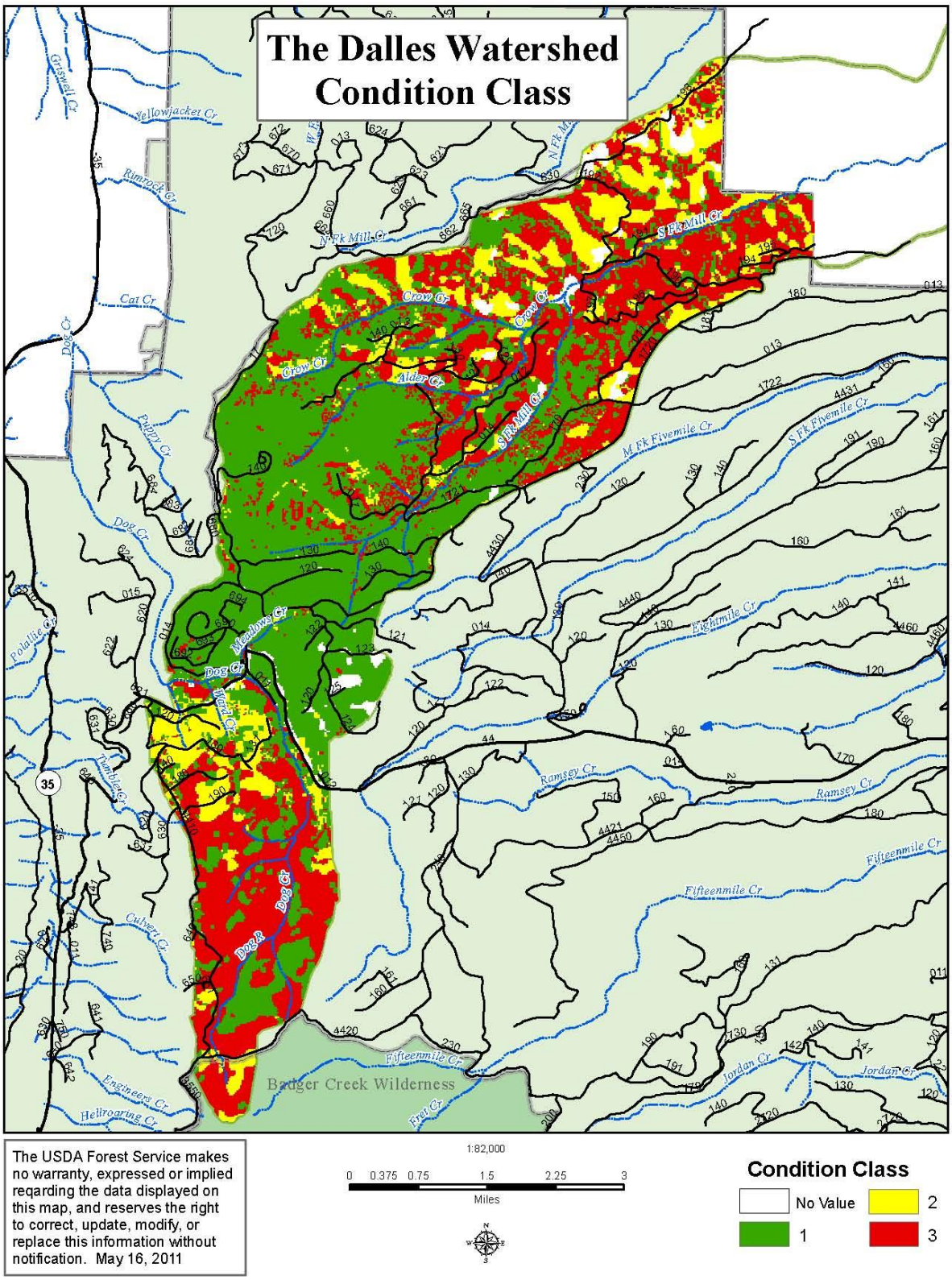


Figure 3.1-2: Condition Class Map of The Dalles Watershed

An analysis of fire history was completed as part of The Dalles Watershed Fuel Break project and is still applicable for this project. This analysis included fire records from 1985 to 2005 and shows a total of five wildfires occurring within The Dalles Municipal Watershed, and another 35 adjacent to Watershed. Historical averages predict that annually two wildfires can be expected to occur within or adjacent to the watershed. This data does not reflect the upward trend of annual fire occurrence numbers, or the occurrence of wildfires originating on lands protected by Oregon Department of Forestry. Primarily due to restricted public access, human caused fires within the watershed have been limited.

Most fires within the area have been quickly suppressed at less than 10 acres with the majority of the fires growing to less than 1 acre. However, a review of fire history maps indicates larger fires, greater than 1000 acres, occurred in the area with a return interval of 40 to 60 years.

Site-Specific Scale

An assessment of existing condition was completed at the site-specific STAND scale using the Fuel Characteristic Classification System (FCCS) (Hudec, 2011). The following site-specific STAND assessment is focused on the existing or pre-treatment fire potential of the STAND's included in Table 3.1-6. The discussion in this section does not address every STAND that may occur within the watershed, but rather only those described in the Vegetation Resources Specialist Report (Section 3.3 in the Preliminary Assessment) for inclusion in the Proposed Action.

Table 3.1-6 shows the existing fire potential for each of the vegetation STAND groups, for example a mature and healthy A1 STAND group has a Fire Potential rating of 449. In other words, moderate surface fire potential, moderate crown fire potential, and very high available fuel potential. Further, for this stand group, should a fire occur the expected rates of fire spread would be 3.2 chains per hour and flame lengths of 2.4 feet.

When analyzing each STAND group and considering the fire potential components it is apparent that moderate to very high fire potential currently exists in each of the pre-treatment STAND groups.

Also, Table 3.1-6 displays rate of spread and flame length for each of the reference fuelbeds. Rate of spread and flame length are two indicators of fire suppression resistance to control. Figure 3.1-3 displays flame length and fire suppression interpretations for various flame lengths. When considering the flame lengths in Table 3.1-6 and generally accepted fire suppression interpretations in Figure 3.1-3, if sufficient resources were on hand to outpace rates of spread, about 2/3 of the stand groups could be directly attacked with hand tools, while the remaining 1/3 would need to be suppressed with mechanized equipment.

The information in Table 3.1-6 models dry fuel moistures, but does not capture the most severe weather or fuel moisture conditions that would produce faster rates of spread, longer flame lengths, and more severe fire effects. Based on professional opinion, the rate of spread and flame length indicators of fire suppression resistance to control could be applied to the entire municipal watershed.

Table 3.1-6: Existing (pre-treatment) Fire Potential and Fire Behavior

STAND Group	Reference Fuelbed	Fire Potential (0 – 9)			Fire Behavior	
		Surface Fire	Crown Fire	Available Fuel	Rate of Spread	Flame Length
A1-Mature, healthy	208 – Grand fir, Douglas-fir fire exclusion	4	4	9	3.2	2.4
A1-Heavy brush	208 – Grand fir, Douglas-fir fire exclusion	5	4	9	5.8	3.3
A1-Dense, healthy	006 – Oregon white oak, Douglas-fir forest	7	6	5	12.2	5.4
A2	006 – Oregon white oak, Douglas-fir forest	6	6	7	10.6	5.9
A3-Mature	052 – Douglas-fir, Ponderosa pine/oceanspray	5	5	7	5.8	3.3
A3-Immature	052 – Douglas-fir, Ponderosa pine/oceanspray	5	5	6	6.1	3.2
D	004 – Douglas-fir/ceanothus, clearcut, prescribed fire (historical)	8	7	6	16.1	7.8
E-Mature	208 – Grand fir, Douglas-fir fire exclusion	4	4	9	4.7	3.5
E- Dense, unhealthy	208 – Grand fir, Douglas-fir fire exclusion	4	4	9	3.6	3.1

Figure 3.1-3: Flame Length and Fire Suppression Interpretation

Flame Lengths (Feet)	Fire suppression Interpretations
< 4	Fires can generally be attacked at the head or flanks by persons using hand tools. Handline should hold the fire.
4 - 8	Fires are too intense for direct attack on the head by persons using hand tools. Handline can not be relied on to hold fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective. Fires are potentially dangerous to personnel and equipment.
8 - 11	Fires may present serious control problems, i.e., torching, crowning, and spotting. Control efforts at the head will probably be ineffective.
> 11	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

3.1.3 Effects Analysis/Environmental Consequences

No Action – Direct and Indirect Effects

Under the No Action alternative, fire occurrence and fire suppression would continue at present or slightly increased levels; historical fire return intervals would continue to be skipped, resulting in uncharacteristic increases in surface and ladder fuels; and wildfire severity would continue to increase. As a result of the uninterrupted or unabated check of fuel accumulations, landscape scale FRCC would become further departed from historic conditions, and resilience to disturbance would continue to decrease.

Continued accumulation of surface and ladder fuels would make control of wildfires increasing difficult. Fire response options would become more complex, fires would be of longer duration and require increased use of ground disturbing equipment and firefighting resources. Larger and more intense wildfires increase firefighter and public exposures to hazards.

Proposed Action – Direct and Indirect Effects

Hazardous fuel reduction treatments that would be implemented under the Proposed Action are described in Section 2.2.2 of the Preliminary Assessment.

On a landscape scale, FRCC outside the Proposed Action treatment units would continue departing from historic conditions and resilience to disturbance would continue to decrease. However, building upon the fuel treatments implemented under The Dalles Watershed Fuelbreak and the treatments in the Proposed Action, progress would be made toward moving FRCC 3 and 2 departures closer to historic or natural fire regimes. The majority of Proposed Action treatments fall within existing FRCC 3 and 2 areas and implementation of Proposed Action treatments would result in an overall localized level of movement toward historic or natural FRCC (FRCC 3's moving toward 2 and FRCC 2's moving toward 1). Fire suppression resistance to control would be improved, ability to protection the municipal watershed would be improved, and risk of stand replacing wildfire would be reduced.

On a localized scale, FCCS was used to model the effects of implementing Proposed Action treatments. The modeled results are summarized in Table 3.1-7 and Table 3.1-8. Table 3.1-7 displays a side-by-side comparison of existing condition fire behavior and Proposed Action fire behavior and Table 3.1-8 displays a side-by-side comparison of existing condition fire potentials and Proposed Action fire potentials.

To model the effects of the Proposed Action on existing condition fire potentials and fire behavior, vegetation and fuel treatments, including combination treatments, described in Section 2.2.2. of the Preliminary Assessment were applied to the model (Hudec, 2011). FCCS modeling of Proposed Action fire potentials and fire behavior are fully documented in the project record, located at the Barlow Ranger District in Dufur, Oregon.

Table 3.1-7 shows that all Proposed Action treatments would result in a moderate to significant reduction in rate of spread and in all but a few cases, Proposed Action treatments would result in a moderate to significant reduction in flame length.

The few STAND groups (A1-Dense PCT & 006, A3-Immature & 052, and A3-Immature & 052 with no prescribed fire) that would result in slight increases in flame length are a result of treatment limitations for younger, high density stands. As fine fuel loadings resulting from Proposed Action implementation decay (3 to 5 years from treatment implementation), flame lengths in these STAND Groups would decrease.

Recalling the flame length and fire suppression interpretations in Figure 3.1-3 coupled with the Proposed Action flame lengths in Table 3.1-7, if sufficient resources were on hand to outpace low to moderate rates of spread, nearly all of the STAND Groups could be directly attacked with hand tools, while only a couple of the STAND Groups may need to be suppressed with mechanized equipment as shown by the modeled fuel moisture scenario.

Based on professional opinion, the Proposed Action would result in a decreased resistance to control. Proposed Action treatments would contribute toward reducing or slowing fire spread and intensity; and within and adjacent to treated areas, would increase opportunities for firefighters to directly suppress wildfires with a reduced need for mechanized equipment.

Table 3.1-7: Comparison of Existing Condition and Proposed Action Fire Behavior

STAND Group & Reference Fuelbed	Treatment Units	Existing Condition Fire Behavior		Proposed Action Fire Behavior	
		Rate of Spread	Flame Length	Rate of Spread	Flame Length
A1-Mature, heavy brush & 208	5, 7, 18, 22, 24, 28, 30, 32, 34, 35, 38, 39, 40, 41, 42, 44, 46, 47, 48, 49, 52, 53, 54	3.2	2.4	0.5	0.6
A1- Dense & 208	108.1, 108.2, 109.2, 109.3	5.8	3.3	0.7	0.7
A1- Dense PCT & 006	124	12.2	5.4	7.5	5.8
A2 & 006	108.2, 109.2	10.6	5.9	1.8	1.8
A3- Mature & 052	33, 35, 36.1, 36.2, 45, 46, 50, 51, 53	5.8	3.3	1.5	1.1
A3-Mature UB only & 052	108.1, 108.2, 108.3, 109.2, 109.3	5.8	3.3	2.1	1.4
A3-Immature & 052	150, 151, 152, 153, 155, 156, 157, 158, 159, 164, 165	6.1	3.2	5.1	3.4
A3-Immature, No RX Fire & 052	123, 124	6.1	3.2	4.5	3.7
D & 004	120, 121, 122, 125, 126, 127, 128, 129, 130, 131,	16.1	7.8	6.3	4.2

STAND Group & Reference Fuelbed	Treatment Units	Existing Condition Fire Behavior		Proposed Action Fire Behavior	
		Rate of Spread	Flame Length	Rate of Spread	Flame Length
	132, 135, 136, 137, 140, 141, 142, 143, 144, 145, 146				
E- Mature & 208	7, 34, 46, 47, 48, 49, 53	4.7	3.5	1.4	1.1
E- Dense & 208	108.2, 109.2, 109.3	3.6	3.1	1.6	1.2

Table 3.1-8 displays how the Proposed Action would affect the STAND Group surface fire potential, crown fire potential, and available fuel potential as a whole. Fire Potential categories and their components can not only provide indicators of resistance to control, but also indicators of potential fire effects.A direct effect of all Proposed Action treatments is a reduction in surface fire potential (reaction intensity, spread rate, and flame length) and crown fire potential (torching and active crown fire).

Table 3.1-8: Comparison of Existing Condition and Proposed Action Fire Potentials

STAND Group & Reference Fuelbed	Proposed Action Treatment Units	Existing Condition Fire Potential			Proposed Action Fire Potential		
		Surface Fire	Crown Fire	Available Fuel	Surface Fire	Crown Fire	Available Fuel
A1-Mature, heavy brush & 208	5, 7, 18, 22, 24, 28, 30, 32, 34, 35, 38, 39, 40, 41, 42, 44, 46, 47, 48, 49, 52, 53, 54	4	4	9	2	2	7
A1- Dense & 208	108.1, 108.2, 109.2, 109.3	5	4	9	2	2	4
A1- Dense PCT & 006	124	7	6	5	5	5	4
A2 & 006	108.2, 109.2	6	6	7	3	3	6
A3- Mature & 052	33, 35, 36.1, 36.2, 45, 46, 50, 51, 53	5	5	7	2	2	5
A3-Mature UB only & 052	108.1, 108.2, 108.3, 109.2, 109.3	5	5	7	3	2	5
A3- Immature & 052	150, 151, 152, 153, 155, 156, 157, 158, 159, 164, 165	5	5	6	5	4	5
A3- Immature, No RX Fire & 052	123, 124	5	5	6	4	4	5

STAND Group & Reference Fuelbed	Proposed Action Treatment Units	Existing Condition Fire Potential			Proposed Action Fire Potential		
		Surface Fire	Crown Fire	Available Fuel	Surface Fire	Crown Fire	Available Fuel
D & 004	120, 121, 122, 125, 126, 127, 128, 129, 130, 131, 132, 135, 136, 137, 140, 141, 142, 143, 144, 145, 146	8	7	6	5	2	5
E- Mature & 208	7, 34, 46, 47, 48, 49, 53	4	4	9	2	2	9
E- Dense & 208	108.2, 109.2, 109.3	4	4	9	3	1	6

The Proposed Action primarily through a reduction in ladder fuels would result in an overall decrease in crown fire potential (torching and active crown fire) and a reduced potential for large stand replacing wildfire while allowing more wildfires to remain on the surface where they could be more easily controlled. Within and adjacent to Proposed Action treatment units, overstory mortality would be reduced.

In nearly all cases, Proposed Action fuel treatments result in a reduction of available fuel potential (flaming, smoldering, and residual smoldering). However, this reduction is not significant, but is probably unavoidable in the short-term. Overall the effect of the proposed fuel treatments would be a reduction in available fuel potential from the highest potential indexes to middle or higher potential indexes. This minimal reduction in available fuel potential is the result of several conditions, including:

- When large volumes of surface and ladder fuels exist on the landscape and action is taken to reduce these fuel loadings, such as the treatments in the Proposed Action, surface fuel loadings typically increase. Hand and mechanical treatments could transfer ladder fuel loadings to the surface resulting in high volumes of surface fuel loadings in the form of twigs, limbs and branches, treatment of small trees and the trampling of brush.

- Highly successful fire suppression activities that led to several skipped fire return intervals and resulted in an unabated buildup of surface and ladder fuels.

- Absent or infrequent treatment of surface and ladder fuels to mitigate the buildup of surface and ladder fuels.

Through a combination of hand and mechanical treatments, grapple and hand piling and burning, and underburn and jackpot burns a significant amount of hazard fuels would be disposed of through removal and/or prescribed burning. Follow up prescribed fire prescriptions must be implemented within a window of fuel moisture and weather parameters that result in meeting resource objectives such as limiting mortality to overstory trees, reducing smoldering and long-duration burning, and other objectives. Initial prescribed fire entries that follow a long absence of

fire returns must be designed to limit the intensity of the prescribed fire. Limiting surface fire intensity would result in a desirable level of overstory retention while simultaneously maintaining a higher than optimal post-treatment surface fuel loading. In time surface fuel loadings could be reduced through maintenance prescribed fire entries.

Overall, under the Proposed Action at a landscape scale, and based on current trends, fire occurrence and fire suppression would continue at present or slightly increased levels. For areas outside the Proposed Action treatments, historical fire return intervals would continue to be skipped, with continued uncharacteristic increases in surface and ladder fuels; and wildfire severity as a result of increased fuel loadings would continue to increase.

Cumulative Effects

Past, present and future vegetation and hazardous fuels treatments that reduced surface and ladder fuels when combined with the Proposed Action treatments would result in beneficial cumulative effects. The projects considered in this cumulative effects analysis include The Dalles Watershed Fuelbreak, City of The Dalles fuels reduction projects, North Fork Mill Creek Restoration Opportunities and maintenance prescribed burning. These projects collectively would move The Dalles Municipal Watershed and the adjacent Mill Creek Watershed as a whole toward reversing the buildup of surface and ladder fuels that have occurred in the absence of historic fire return intervals and move FRCC closer to historic conditions.

Cumulatively, the vegetation and fuel treatments that reduced surface and ladder fuels would decrease fire suppression resistance to control allowing firefighters to safely suppress wildfires before they spread. Fires occurring within or adjacent to the treated areas would have lower flame lengths and slower rates of spread. Fires occurring within or adjacent to the treated areas would have less severe fire effects at the surface level and less potential for landscape scale stand replacing fire.

3.1.4 Consistency Determination

Management activities implemented under the Proposed Action would comply with all applicable laws and regulations, including:

- The Proposed Action complies with the following Mt hood Land and Resource Management Plan standards and guidelines: B7-067, FW-132 – FW-136, FW-097, FW-127-129, FW-132-138, and FW-175 through encorporating mitigations into applicable prescribed fire prescriptions; C1 through piling and prescribed fire treatment of "wood residue" resulting from vegetation treatments; FW-265 through incorporating desired conditions into applicable prescribed fire prescriptions; and FS-267 through the development of a site specific prescribed fire burn plan for prescribed fire treatments.

- The National Fire Plan goals and objectives by reducing hazardous fuels and the potential for severe wildland fire behavior and potential for wildfire and post-fire resource and property damage.

- The Dalles Municipal Watershed is addressed in the Wasco County Community Wildfire Protection Plan (CWPP). The Proposed Action meets one of the primary purposes of the CWPP by reducing wildire hazards, in the form of hazard fuel reduction. Further, the CWPP includes the City of the Dalles Municipal Watershed as a high priority area for reduction of hazard fuels and water resource protection.

- Forest Service Manual 5100 – Fire Management, Chapter 5140 – Fire Use and through incorporation the 2008 Interagency Prescribed Fire Planning and Implementation Procedures Guide (2008 Guide). FSM 5140 requires that the planning, approval, and implementation of all prescribed fire projects comply with the 2008 Guide. All prescribed fire treatments described in the Proposed Action would be planned, approved, and implemented through a site specific prescribed fire burn plan.

3.2 Air Quality / Smoke Management

3.2.1 Methodology and Analysis Points

Air quality is a measure of the presence of air pollution. Ambient air quality is defined by the Clean Air Act of 1963 as the air quality anywhere people have access, outside of industrial site boundaries. Ambient air quality standards are standards of air quality designed to protect human health or welfare. Air resource management includes any activity to anticipate, regulate, or monitor air pollution, air pollutant emissions, ambient air quality, or the effects of air pollution resulting from fires or fire management (Sandberg et al., 2002). This report analyses the potential effects of the No Action and Proposed Action alternatives.

National Ambient Air Quality Standards (NAAQS) and thresholds for criteria pollutants are established by the US Environmental Protection Agency (USEPA) to protect public health (ODEQ, 2011). For the purpose of analyzing the air quality effects of prescribed fire and wildfire this report will focus on NAAQS standards for Particulate Matter 10 (PM10) and PM2.5. These small particulates can 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 can 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. Table 3.2-1shows the NAAQS for these two criteria pollutants.

Table 3.2-1: 2010 NAAQS for PM10 and PM2.5

Pollutant	Averaging Time	NAAQS Violation Determination	Federal Standard (NAAQS) Exceedance Level	Oregon State Standard Exceedance level
PM2.5	24-hour	98^{th} percentile of the 24-hour values determined for each year.	35 µg/m³	35 µg/m³

Pollutant	Averaging Time	NAAQS Violation Determination	Federal Standard (NAAQS) Exceedance Level	Oregon State Standard Exceedance level
		3-year average of the 98th percentile values.		
PM2.5	Annual Average	3-year average of the annual arithmetic mean	15 µg/m³	15 µg/m³
PM10	24-hour	The expected number of days per calendar year with a 24-hour average concentration above 150 µg/m³ is ≤ 1 over a 3-year period.	150 µg/m³	150 µg/m³

The 98th Percentile is a NAAQS standard and is the 98th percent highest sample day. For example, it is the 4th highest sample day if a site has 200 sample days per year (200*0.98) =196; 200-196= 4 (ODEQ, 2011). The three year (2008 through 2010) average 98th percentile PM2.5 level for The Dalles is 20µg/m³. The Federal and State NAAQS exceedance level is 35µg/m³ (ODEQ, 2011).

3.2.2 Existing Condition

Climatology of the Project Area

The 2004 Dalles Watershed Assessment for the project and surrounding areas provided the following climatology description: "Temperature in The Dalles is moderated by marine air moving up through the Columbia Gorge. Occasional extremely cold temperatures occur as the result of arctic air flowing west from the inland areas. There are also periods of very hot days during the summer caused by high pressure areas stagnating over the Great Basin Desert to the south, often accompanied by "Chinook Winds". Temperatures have ranged from –30 degrees F to 115 degrees F, both recorded at The Dalles. Most years the range is –3 degrees to 107 degrees Fahrenheit (Northern Wasco County Soil Survey, 1982).

The annual average precipitation ranges from 13 inches on the eastern edge to over 40 inches on the higher slopes to the west. Between 70 and 80 percent of the annual precipitation is between November and March and about 5 to 10 percent occurs from June to August. Measurable precipitation can be expected on about 75 days a year in The Dalles. There are sunny days about 20 to 30 percent of the time in December and January; 55 to 65 percent of the time in April, May, and June; and 75 to 85 percent in July, August, and early September (Wasco County Soil Survey). Precipitation maps from the Hood River Department of Forestry disagrees with the Soil Survey and shows the annual precipitation ranging from 10-15 inches on the eastern side of the watershed to 40- 50 inches in the upper Mill Creek drainage.

The relative humidity varies dramatically throughout the day during the summer. In the early morning hours when the air temperature is the lowest, relative humidity of 90 to 100 percent occurs in the summer. It is not unusual, however, to have a relative humidity of 10 to 20 percent during the warmest part of summer days. High humidity throughout the day is common in late fall and winter. The yearly average is 35 percent relative humidity (Northern Wasco County Soil Survey, 1982)."

Non-Attainment Areas

As designated by the USEPA, non-attainment areas are identified by air quality regulatory agencies through ambient air monitoring of areas that exceed NAAQS. The air regulatory agency for Oregon is Oregon Department of Environmental Quality (ODEQ). Criteria pollutants for the tracking of NAAQS, include PM10, PM2.5 and ozone. The closest non-attainment area to The Dalles Municipal Watershed is Portland, Oregon (US EPA, 2011). Like most of the entire State of Oregon, the City of the Dalles and surrounding areas meet the National Ambient Air Quality Standards (ODEQ, 2011).

Sensitive Airsheds

The Clean Air Act for the Prevention of Significant Deterioration (PSD) program identifies three classes of areas. Class 1 areas are the "cleanest" area and receive special visibility protection. They are allowed very limited increases in sulfur dioxide and particulate matter concentrations in the ambient air (FSM 5280). Class II areas are also protected under the Clean Air Act, but identified for somewhat less stringent protection from air pollution damage than a Class I Area. Sensitive areas within the vicinity of The Dalles Municipal Watershed are identified in Table 3.2-2.

The effects of PM10 and PM2.5 particles are reductions in visibility due to absorption and scattering of light by suspended particles. Almost all smoke particles from wildfire and prescribed fire, residential wood stoves and fireplaces, industrial boilers, field burning, diesel combustion, and other combustion processes can be characterized as fine particulate, primarily PM2.5 (ODEQ, 2011).

Table 3.2-2: Sensitive Airsheds

Sensitive Area	Reason for Sensitivity	Distance and Direction from Project Area
Mt Hood Wilderness Area	Class I Airshed – Visibility Protection	3 miles to the west
The Badger Creek Wilderness Area	Class II Airshed – Visibility Protection	4 miles to the south

Air Quality

The ODEQ Air Quality Division is responsible for protecting Oregon's air quality. ODEQ monitors air pollution to ensure that communities meet the national ambient air quality health

standards (NAAQS), to report hourly health levels to the public, and to protect Oregon's pristine views (ODEQ, 2011).

Air pollutants of greatest concern to Oregon DEQ are:

- Ground-level ozone, commonly known as smog
- Fine particulate matter (mostly from wood smoke, other combustion sources, cars and dust) known as PM2.5 (2.5 micrometers and smaller diameter)
- Hazardous air pollutants (also called Air Toxics)

In order to report one air quality health index to the public, ODEQ uses the USEPA Air Quality Index (AQI). The AQI normalizes the air pollutants described above to report one health level. Reporting is updated hourly and posted online. The USEPA AQI is displayed in Table 3.2-3 below.

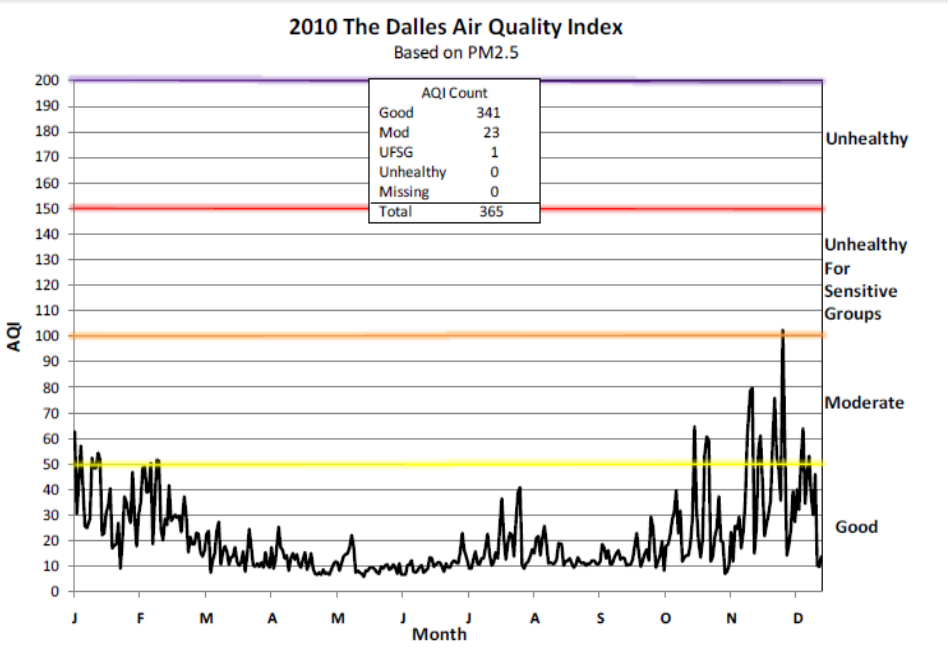
Table 3.2-3: Air Quality Index Health Category Descriptors

Air Quality*	AQI	Health Advisory
Good	0-50	No health impacts expected.
Moderate	51-100	Usually sensitive people should consider reducing prolonged or heavy outdoor exertion.
Unhealthy for Sensitive Groups	101-150	People with heart disease, respiratory disease (such as asthma), older adults, and children should reduce prolonged or heavy exertion. Active healthy adults should also limit prolonged outdoor exertion.
Unhealthy	151-200	People with heart disease, respiratory disease (such as asthma), older adults, and children should avoid prolonged or heavy outdoor exertion. Everyone else should reduce prolonged or heavy outdoor exertion.
Very Unhealthy (Alert)	201-300	People with heart disease, respiratory disease (such as asthma), older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.

*For the purposes of this report, the EPA AQI color coded warning system is not displayed.

The following clipped graphic (Figure 3.2-1) from ODEQ's 2010 Air Quality Data Summary shows the 365 day Air Quality Index for the City of The Dalles. Ninety-three percent of the year the Air Quality was "Good" (the highest rating); six percent of the year Air Quality was "Moderate"; less than one percent of the year fell into the "Unhealthy for Sensitive Groups" category; no days fell into the "Unhealthy" or the "Very Unhealthy" categories. Days reaching into a "moderate" AQI occurred in the fall or winter months from mid-October through early February when temperatures are cooler and more stagnant air conditions exist.

Figure 3.2-1: 2010 The Dalles Air Quality Index



3.2.3 Effects Analysis / Environmental Consequences

No Action – Direct and Indirect Effects

Climatology of the Project Area
Under the No Action alternative climatology and the seasonal changes in weather patterns that affect duration of wildfires and the dispersal of wildfire smoke would remain unchanged.

Non-Attainment Areas
Due to the continued improvement of air quality in the area, under the No Action alternative The City of The Dalles and The Dalles Municipal Watershed attainment of NAAQS would remain unchanged or slightly improve.

Sensitive Airsheds
Under the No Action alternative effects to Class I and Class II airsheds would remain mostly unchanged. However, as fire return intervals are skipped and surface and ladder fuels increase wildfire smoke production will also increase. As a result of small wildfires, short-duration and infrequent deterioration of visibility is possible. During landscape scale wildfires, substantial, medium-duration (a few days to several weeks) visibility affects to Class I and Class II airsheds would be possible.

Air Quality
Air Quality throughout Oregon has steadily continued to improve and this trend is likely to remain unchanged under the No Action alternative. However, under the No Action alternative the buildup of forest fuels as a result of skipped historical fire return intervals would also continue which would result in increased live and dead fuel loadings. When a wildfire occurs

under environmental conditions that allow for high intensity wildfires, these increased fuel loadings would place large levels of particulates in the airshed that would affect both human health and visibility.

Although occurrence of large wildfires is infrequent, when wildfires occur they could be a significant source of air pollution. The duration of smoke impacts could be short-term or could occasionally continue for weeks. Due to the dryness of both live and dead fuels combustion is more complete resulting in larger amounts of particulates entering the airshed.

Proposed Action – Direct and Indirect Effects

Climatology of the Project Area
Under the Proposed Action climatology and the seasonal changes in weather patterns that affect duration of wildfires and the dispersal of wildfire smoke would remain unchanged. These seasonal changes are also likely to affect the duration of prescribed fire burning and smoldering duration and the dispersal of smoke. Prescribed fire would be implemented during two separate burning windows. The first would occur from early spring through early summer and the second from late summer through winter.

During spring burning conditions soil and surface fuel moistures are higher which can result in longer periods of post burn smoldering, however, smoke dispersal is generally good. During late summer burning conditions soil and surface fuel moistures are drier resulting in a rapid and more complete combustion of available fuels, and a generally good dispersal of smoke. Due to cool to very cool nighttime temperatures in the fall, subsidence of smoke down slope or down draw is possible. Later in the fall when seasonal rains have occurred and higher nighttime humidity's are common, subsidence of pile burning smoke becomes less likely.

Non-Attainment Areas
Due to the particulate matter in The City of the Dalles and The Dalles Municipal Watershed area being well below NAAQS standards, under the Proposed Action smoke from prescribed fire treatments is unlikely to be of sufficient quantities to alter attainment of NAAQS.

Sensitive Airsheds
The Proposed Action would mechanically remove fuels, mostly logs and boles, resulting in a decrease in fuels available for smoke production. Prescribed burning of post-treatment residue would occur during weather conditions that minimize visibility effects to Class 1 and Class II airsheds.

Air Quality
Air quality throughout Oregon has steadily continued to improve and this trend is likely to remain unchanged under implementation of the Proposed Action prescribed fire treatments. During implementation of Proposed Action prescribed fire treatments short-duration (several hours to several days) increases in particulate levels and smoke exposures would be expected. These increases would occur as a result of prescribed burning of hazardous fuel loadings. Prescribed burning would be implemented during the late spring and mid- to late-fall seasons when prescribed fire prescriptions could be developed to meet desirable resource objectives,

such as reducing surface and ladder fuel loadings while retaining overstory trees, minimizing fire spread and combustion duration, and minimizing smoke effects to air quality and visibility.

Proposed Action fuel treatments will not reduce wildfire occurrence which is largely dependent upon lighting or careless fires caused by humans. However, should a wildfire occur and stay within the project area where fuel loadings have been reduced then a proportionate reduction in emissions could also be realized. Although the dynamic nature of landscape scale wildfire and movement patterns are unknown and unpredictable, the fuel reduction treatments would reduce the spread and intensity of a wildfire so emissions would be reduced compared to no treatment.

Health effects to humans are directly related to exposure. Due to the distance from the Proposed Action prescribed fire treatments to populated areas, health effects would be minimal or unlikely.

Cumulative Effects

Cumulative effects to Air Quality are possible when combined with other particulates that share the airshed. Other sources that share the airshed include prescribed burning being implemented by other Federal, State, or local entities, agricultural burning, road and/or agricultural field dust, pollen, wood stove burning, vehicle emissions, and other upwind sources. Particulates from industrial and automotive sources also contribute to regional particulate loading. It is not possible to predict the amount of particulates contributed by these sources. The projects considered in this cumulative effects analysis include other fuels reduction projects on the Hood River and Barlow Ranger District that overlap in the airshed. These projects include: The Dalles Watershed Fuelbreak; North Fork Mill Creek Restoration Opportunities; Billy Bob Hazardous Fuels Reduction; and maintenance prescribed burning.

If considered alone emissions produced by wildfire and emissions produced by prescribed fire would be considered episodic and limited in duration. However, the cumulative effects on air quality of prescribed burning smoke, produced as a result of implementation of the Proposed Action in combination with the other projects or producers as described above, could result in an incremental decrease in air quality as PM 2.5 and PM 10 particles combine. As such, the cumulative effects resulting from implementing the Proposed Action are minimal and cannot be accurately measured. These types of shared effects on air quality and particulate levels are predicted and managed by Oregon Department of Forestry through the State Smoke Management Plan.

3.2.4 Consistency Determination

Mitigation of Smoke Production

Management activities implemented under the Proposed Action would comply with all applicable air quality laws and regulations.

The Oregon Smoke Management Plan, which is administered by the Oregon State Forester, regulates the amount of forestry related burning that can be done at any one time. The amount of burning that can occur on any one day depends upon the specific type of burning, the tons of fuel loadings to be ignited, and the atmospheric conditions available to promote particulate matter

mixing and transportation of smoke away from sensitive areas. Through compliance and cooperation in the implementation of the Oregon Smoke Management Plan, the Proposed Action would comply with the following laws and regulations:

- The Federal Clean Air Act (CAA), which is the primary legal basis for air quality regulation across the nation.
- Oregon Smoke Management Plan, ORS 477.013, as administrated by Oregon Department of Forestry
- Oregon State Implementation Plan (The Federal Clean Air Act Implementation Plan)
- Oregon Administrative Rules, OAR 629-0048-0001: Smoke Management Rules.
- Oregon Visibility Protection Plan for Class I Areas, OAR 340-200-0040, Section 5.2
- Mt Hood National Forest Land and Resource Management Plan Standards and Guidelines for Air Quality, FW-039 through FW-053

The Proposed Action complies with Forest Service Manual 2500 – Watershed and Air Management, Chapter 2580 – Air Resource Management by minimizing the impacts of management activities on air quality through compliance and cooperation with Federal, state and local air regulatory authorities to prevent significant adverse effects of air pollutants, mitigation of adverse impacts from prescribed fire on air resources through the application of Best Smoke Management Practices, and protection of air quality related values within Class I areas.

Prescribed Fire Burn Plans

As required by Agency policy (Forest Service Manual 5100 – Fire Management, Chapter 5140 – Fire Use and through inclusion, the 2008 Interagency Prescribed Fire Planning and Implementation Procedures Guide), a site-specific prescribed fire burn plan would be developed for all prescribed fire units in the Proposed Action. Prescribed fire plans are implementation documents used to implement approved actions as identified in a NEPA document. Plans are developed to ensure that purpose and need goals and resource management objectives identified in the Proposed Action are clearly defined, that site specific prescriptions are developed to meet these goal and objectives, and to ensure plans and mitigations are in place to mitigate against undesirable fire effects, including smoke intrusions into sensitive airsheds, visibility impairment to Class I and II airsheds, and human health effects.

Best Smoke Management Practices (BSMPs) that would be incorporated into prescribed fire burn plans include:

- Mechanical removal of fuels to reduce emission production
- Pre-identification of sensitive receptors
- Contingency plans for discontinuing prescribed burning under undesirable smoke conditions
- Pre-addressing potential affects to transportation systems and contingency mitigations to manage undesirable conditions
- Pre-identified methods for notifying the public about potential smoke impacts
- Adhering to smoke management direction provided by the Oregon Department of Forestry
- Implement prescribed fire during favorable meteorological conditions, including favorable smoke mixing days, discontinuing ignition early to reduce or eliminate subsidence conditions, and burning piles in cool/wet weather

- Implement prescribed fire during meteorological conditions that minimizes potential visibility deterioration effects to Class I and Class II airsheds
- Developing prescribed fire prescriptions that increase combustion efficiency and reduce smoldering. Burn when fuels are dry. If conditions require, covering piles. When resource objectives can be met, using aerial ignition or other rapid ignition methods. Minimizing dirt in piles and chunking piles.
- Cooperation with interagency partners when competing for burn days.
- Utilizing test fires to assess potential smoke impacts.
- Incorporation of BSMPs into the Smoke Management & Air Quality element of the prescribed fire burn plan.
- Completing smoke monitoring and defined in the Monitoring element of the prescribed fire burn plan.

3.3 Vegetation Resources

More information is available in the Project Record including the full Silvicultural Specialist Report. The Silvicultural Report is incorporated by reference and is located in the project record, located at the Barlow Ranger District.

3.3.1 Methodology and Analysis Points

Landscape Scale

Information on the vegetative conditions of the larger landscape within which The Dalles Watershed Phase II 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 The Dalles Watershed Phase II project level.

Site-Specific Scale

The analysis area is 8,152 acres. The analysis area boundary for disclosing effects at this more site-specific level is the North Fork Mill-South Fork Mill Creek subwatershed, as well as parts of

Fivemile Creek subwatershed, 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, 1990s, as well as field reviews conducted in the year 2010 (on file at the Hood River Ranger District in Mt. Hood-Parkdale, Oregon).

Common Stand Exams

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

Forest Service Vegetation Module

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

Forest Vegetation Simulator

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

Plant Associations

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

3.3.2 Existing Condition

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 true 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 also 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

Site-Specific Scale

All proposed treatments in the project occur within the upper end of the North Fork Mill Creek watershed and the headwaters of the South Fork Mill, Alder, and Crow Creeks. The project area is dominated by three vegetation types, mixed conifer dry, ponderosa pine-Douglas-fir, and mixed conifer moist type areas. The majorities of the dry mix conifer and ponderosa pine-Douglas-fir types are growing on warm, dry sites and covers 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 3,954 acres of mix conifer dry types dominated by Douglas-fir and grand fir with minor species components of ponderosa pine and western larch in the overstory. There is an estimate of 2,652 acres of ponderosa pine-Douglas-fir type with a component of grand fir. Finally the last dominate vegetation type is the mixed conifer moist type that covers an estimate of 1,511 acres within the project area. This type is dominated by Douglas-fir and grand fir with a component of ponderosa pine and western larch in the overstory and western hemlock and western red cedar in the understory.

Tree density within these Douglas-fir dominated stands is relatively high compared to what most commonly existed historically on these sites (refer also to discussion in Section 3.1, 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 caused 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 and 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 throughout much of the Douglas-fir forest type in Mill Creek watershed, including the project area. Prior to this, there appears to have been numerous mature, overstory ponderosa pine and western larch in these stands, along with 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 comprised of 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 3.3-1 below displays the present stand size class distribution within the project area boundary.

Table 3.3-1: Acres and Percent of the Stand Size Class for the Project Area

Stand size class	Acres	Percentage of area
Grassland/Non-forested	36	<1%
Seedling/sapling (.5"- 4.9" DBH)	113	1.5%
Pole/immature/multi-story (5"- 20.9" DBH)	7,860	96.5%
Mature/over-mature (21" + DBH)	143	2%

The majority of the project area contains stands of immature pole size (5-20.9 inches DBH) trees. Also, the majority of the project area is in a multi-story structure with areas with large legacy trees (see Figure 3.3-1 and 3.3-2). 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 project area. Individual legacy ponderosa pines have become surrounded by grand fir ingrowth and there are signs of drought stress (flat tops and fading crowns) from being out competed by more shade tolerant tree species.

On average the proposed treatment units are below Forest Plan standards for snags. Currently, there are roughly 3.5 snags per acre 20 inches DBH and greater.

Figure 3.3-1: Mature/Over-mature Stand

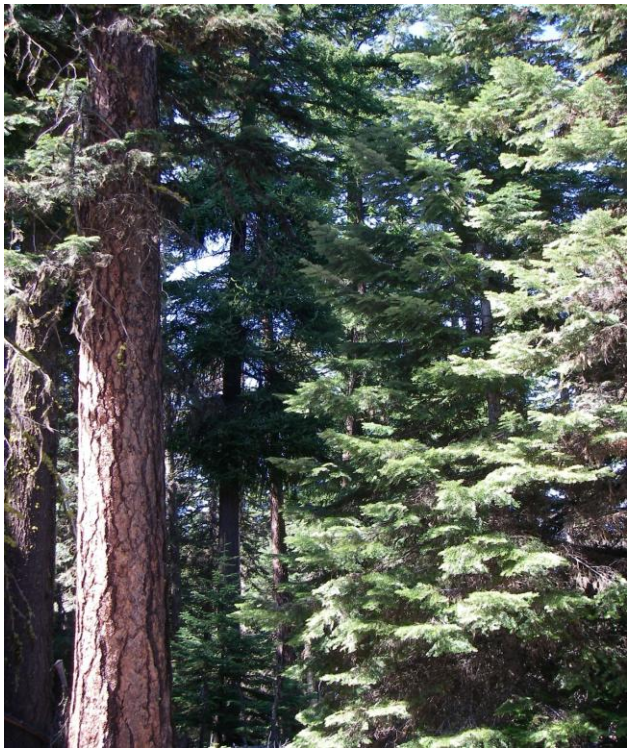


Figure 3.3-2: Dense Multi-story Stand

Table 3.3-2: Existing Site and Vegetative Condition for The Dalles Watershed Phase II Project Area

STAND Group	Forest Type: Vegetation Composition	Forest Structure: Density, Size & Age Classes	Vegetation Condition	Other
A1	Mix Conifer Dry and Interior Douglas Fir (East of Cascades. 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. Include 50-60 year old plantaions from past harvests
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.

STAND Group	Forest Type: Vegetation Composition	Forest Structure: Density, Size & Age Classes	Vegetation Condition	Other
A3	Ponderosa pine/Douglas-fir type. Major species of PP and DF, minor amounts of GF, LP, and WL	Multi storied forest, from 300-500+ tpa overall, with main canopy composed mostly of DF and PP 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).	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	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.	

STAND Group	Forest Type: Vegetation Composition	Forest Structure: Density, Size & Age Classes	Vegetation Condition	Other
E	Mixed conifer moist 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.	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.

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

Table 3.3-3: Existing Site and Vegetative Condition of Proposed Treatment Stands within The Dalles Watershed Phase II Project Area

STAND Group	Plant Association	Acres within proposed treatment areas
A1	Grand fir/dwarf Oregon grape-shiny leaf Grand fir/oceanspray-eastside	1352
A2	Grand fir/pinegrass-elk sedge	22
A3	Douglas-fir/common snowberry-ninebark Douglas-fir/pinegrass-elk sedge Ponderosa pine/ bluebunch wheatgrass	1760
D	Douglas-fir/common snowberry-ninebark Douglas-fir/pinegrass- elk sedge Grand fir/big huckleberry-dwarf huckleberry Grand fir/dwarf Oregon grape-shiny leaf Grand fir/oceanspray-eastside Grand fir/ vine maple/vanilla leaf	435
E	Grand fir/big huckleberry-dwarf huckleberry Grand fir/vine maple/vanilla leaf	93
TOTALS		3660

Acreages are rounded and not agree with overall acreage due to approximations from GIS.

Table 3.3-4: Existing Site and Vegetative Condition of Proposed Treatment Stands within The Dalles Watershed Phase II Project Area

STAND Group	Proposed Action Acres (Logging System)	Proposed Action Units
A1	680 Tractor	5, 18, 22, 24, 28, 30, 32, 35, 38, 40, 41, 42, 44, 48, 52, 150, 151, 152, 153, 155, 156, 157, 158
	310 Cable	7, 32, 39, 41, 46, 47, 48, 53, 54,
	46 Helicopter	32, 34, 49, 165
	314 Activities associated with Rx burning	53, 108.1, 108.2, 109.2, 109.3, 124
A2	8 Cable	46
	10 Mix of mechanical and hand treatments (Associated with Rx burning activities)	108.2, 109.2

STAND Group	Proposed Action Acres (Logging System)	Proposed Action Units
A3	112 Tractor	33, 35, 36.1, 50, 157, 158, 159, 164
	165 Cable	36.1, 36.2, 45, 46, 51
	33 Helicopter	36.1, 50, 51
	1454 Mix of mechanical and hand treatments (Associated with Rx burning activities)	53, 108.1, 108.2, 108.3, 108.4, 109.1, 109.2, 109.3, 123, 124
D	435 Mix of mechanical and hand treatments	120, 121, 122, 125, 126, 127, 128, 129, 130, 131, 132, 135, 136, 137, 140, 141, 142, 143, 144, 145, 146
E	24 Tractor	48
	28 Cable	7, 46, 47, 48, 53
	18 Helicopter	34, 49
	23 Mix of mechanical and hand treatments (Associated with Rx burning activities)	53, 108.2, 109.2, 109.3
TOTALS	3660	

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

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 it would 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. For more information on fires role within the ecosystem refer to Fire/Fuels Management in Section 3.1 of the Preliminary Assessment.

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 Dalles Watershed Phase II project 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 and Douglas-fir 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; 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 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 and mid 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 high in 12 inch plus Douglas-fir. Minor to moderate dwarf mistletoe infections are also present in western larch and ponderosa pine. Many of the larger (24 inch plus) Douglas-fir in the stands within the project area are infected with dwarf mistletoe with a dwarf mistletoe rating of 3 or more (more than 50 percent of the crown is affected). Large witches' brooms are common on these trees; some mortality has occurred in trees that are severely infected. The degree of infection in the smaller diameter ranges (5-21" DBH) of Douglas-fir trees, western larch, and ponderosa pine varies across the project area, from very low levels in some stands to very high levels in others. Generally, where heavily infected 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 project area are perfect conditions for the proliferation of root disease. Most of the stands in the watershed have some level of root disease present, found most often in the South Fork Mill and Alder 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). Root disease organisms can cause increased stress, severe reduction in tree growth, and direct or indirect mortality to trees. Trees infected with *P. weirii* are sometimes killed by bark beetles in combination with other root diseases. The Douglas-fir beetle and fir engraver are commonly associated with laminated root rot (Schowalter and Filip 1993 *in* Rippy et al. 2005). It is recognized that root decay and stem decay are natural agents processing downed wood and creating a variety of structure in the forest. Though the organisms themselves are a natural and integral part of the ecosystem, the condition of the vegetation across the landscape and within individual stands is in many cases not natural. 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 it can slow the rate of spread if the host species are 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. Current stand conditions have provided an abundance of susceptible species and available habitat for these organisms (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.

Figure 3.3-3: Example of Root Disease Pocket and Associated Downed Wood Fuel Concentrations from the Mill Creek watershed

Timber harvesting has been a major contributor to the change in vegetative conditions that have occurred across the project area as well as the Mill Creek watershed. 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 grand 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 1,550 acres of the area proposed for management has previously been treated, during the period from 1963 to 2010 (see Table 3.3-5 below). The

district does not have records of historical harvest on the city of The Dalles lands or for federal lands between 1880 and 1960, only information from field observations.

Table 3.3-5: Acres by Harvest Type in The Dalles Watershed Phase II Project Area

Decade	Clearcut	Shelterwood	Thinning
1963-1969	17 3	0	0
1980-1989	212	145	593
1990-1999	44	70	0
2000-2010	0	0	313
Total	429	215	906

3.3.3 Effects Analysis/Environmental Consequences

The baseline condition against which changes to the vegetation would 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 Dry ponderosa pine/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 in Section 3.1, Fire and Fuels Management; (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.

No Action – Direct and Indirect Effects

No acres are treated under this alternative, and thus there are no direct effects to the vegetation. Existing conditions as described above 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, stand structure and composition, forest type, stand density, fuel loading, or impacts to residual trees. Ultimately, with no vegetation treatments the stand would remain in dense overstocked conditions and maintain high fuel loadings and latter fuels that put the stands at high risk for stand replacing wildfires. Refer to Table 3.3-6 for density and fuels loading measurements overtime for the proposed treatment areas if left untreated. Overtime the dry mix conifer sites, currently occupied by densely stocked Douglas-fir and grand fir stands, and would experience the continuing spread of root disease and resultant mortality over the long-term. Also, a continued infestation and mortality from dwarf mistletoe would continue adding to the already abundant fuel loadings and latter fuels. By maintaining high tree competition, stems would continue to grow in height, but diameter growth would continually slow. These trees would become more dependent on neighboring trees for support. When trees develop in this manner they are more likely to blow down in large groups or if drought conditions persist, also adding to the existing fuel loading.

In the long term, the stand structure and composition would be dominated by Douglas-fir and grand fir in both the overstory and the understory and would not be moved towards a more historic disturbance regime with fire resistant species. With no vegetation treatments the ponderosa pine/Douglas-fir stands would continue to have grand fir dominate the understory

suppressing regeneration of shade intolerant fire resistant species like ponderosa pine or western larch. Young stands would continue to grow in densely stocked conditions with very little regeneration of desired fire resistance species. Densely stocked stands would continue to have large amounts of small patches with increasing crown closure with very little species and structural.

Table 3.3-6 provides modeled density measurements for the proposed treatment areas if no action was taken. The four density measurements below provide important information for stand conditions. Information from Table 3.3-6 shows that the areas quadratic mean diameter decreases and the density of the stand increases over time with higher fuel loadings, trees per acre and stand basal area. With higher densities the stand remains at a high risk for stand replacing wildfires.

Table 3.3-6: Resulting density levels from FVS modeling of the no action alternative

Time After Treatment	[1]Basal Area (BA)	[2]Trees per Acre (TPA)	[3]Quadratic Mean Diameter (QMD)	[4]Fuel Loading (tons/acre)
Existing Condition (2010)	195	526	10.5	24.9
2020	188	415	10.0	31.2
2100	200	406	9.5	84.8

1. Basal Area is the cross-sectional area of all stems of a species or all stems in a stand measured at breast height and expressed per unit of land area.
2. Trees per acre is a the average number of stems within an acre.
3. Quadratic mean diameter is the diameter corresponding to the tree of arithmetic mean basal area, or average diameter by basal area. The use of the quadratic mean gives greater weight to larger trees and is equal to or greater than the arithmetic mean.
4. Fuel loading is the oven dry weight of all fuel in an area and is measured by weight not mass. The amount of fuel present in the stand can have an effect on fire behavior. Very low volumes of fuel can result in a low intensity, creeping fire. On the other hand, large volumes of fuel could result in a blow-up fire that is difficult to control. The more fuel burning, the more heat produced. Generally, the greater the volume of fuel, the more intense the fire will be.

Proposed Action – Direct and Indirect Effects

Forest types within the Project Area

The majority of the fuels reduction treatment proposed occurs within the ponderosa pine/Douglas-fir dominated forests of concern, located on the warm, dry/moist grand fir, Douglas-fir and dry ponderosa pine habitat associations. About 1,459 acres of this type would change from what is currently dense, mostly closed canopy forest to a semi-open condition. This represents 20 percent of the total acres of these forest types within the vegetation analysis area. Small inclusions of known moist mix conifer habitat, approximately 93 acres, are also present with in Proposed Action. Treatment would be used to open the canopy in the stands to encourage regeneration. The average overall structure and species composition would not be changed in this alternative.

Also, this alternative proposes 1765 of jackpot burning and low intensity underburns in ponderosa pine/Douglas-fir 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.

Forest structure and composition moving towards fire resistant
Within the thinning treatments this alternative would implement a mix of mechanical and hand thinning on approximately 1,894 acres, including 435 acres of sapling stands. The stands being treated are either reforested stands ("plantations") from early regeneration harvest, stands that were selectively harvested over many decades, or natural stands with no known treatments. 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 grand fir and severely infested dwarf mistletoe Douglas-fir, ponderosa pine, and western larch. Thinning from below must retain some young trees of desired species if stands are to retain a healthy age structure. (Perry et al. 2004). Overall, the average stand diameters would be maintained or increase (Lindh and Muir 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 from a QMD of 10.5 to 13.8 inches.

About 1,352 acres of stands to be treated have a moderate to high incidence of root disease. Treating the rot pockets with patch cuts and encouraging the growth of both fire and root rot resistant species would improve species diversity, move the stand composition toward historical conditions in regards to species and structure, while improving the resilience to fire and improving forest health. By treating rot disease pockets with patch cut, the high concentrations of fuel loadings (Figure 3.3-3) and infested materials would be removed before it can add to the fuel loading. Patch cutting would provide a mosaic of densities within the project area and further reduce the risk of larger stand replacing wildfires by providing a break in tree canopies and reducing the trees per acre. 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 would provide the conditions necessary for the highly shade intolerant larch and ponderosa pine to become established, especially if followed by some application of fire to reduce the brush competition and improve germination conditions. The restoration of larch and ponderosa pine in patch cuts would move the area toward more historic conditions that include more fire resistant species. Restoration should strive for landscape heterogeneity to protect habitat and other environmental values (Arno and Fischer, 1995).

For the jackpot burning and low intensity prescribed burn treatments on 1,765 acres 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/Douglas-fir trees of all sizes and ages. Most of these trees would survive the low to moderate intensity burn, though some of the smaller seedlings and saplings and thin bark grand fir 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 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 300-600+ trees per acre down to about 50-120 trees per acre where appropriate. Refer to Table 3.3-7 for density and fuels measurements overtime for the proposed treatment areas. The mosaic in trees per acre would move the stands to more historic conditions.

The reduction in trees per acre would reduce the fuel loading and ladder fuels further protecting stands from large stand replacing wildfire. With the reduction in densities, fuel loading, and increasing the mean diameter the overall all flame lengths and rate of spread would also decreases. The treatment areas flame length is reduce from on average of 4 feet to an average of 2 feet. Refer to Table 3.3-7 for density and fuels measurements overtime for the proposed treatment areas. More thorough descriptions of flame length reduction and fire rate of spread is in the Fire/Fuels Management section.

The majority of the 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 3.3-4). This would reduce competition among trees for moisture and light, improving growth and vigor in residual trees (Cochran and Seidel 1995; Williamson 1982). A semi-open condition would lead to regeneration of more shade intolerant fire resistant species like western larch and ponderosa pine. 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. In the young stands, low tree densities would move the stand towards historic conditions by providing the space, nutrients, and light to grow while reducing completion and fuel loading.

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).

Species composition would change slightly, with ponderosa pine increasing in proportion within those units where it currently exists. Restoring ponderosa pine to a dominate factor in the overstory would move the stands towards more historic fire regimes. This is because ponderosa pine would be chosen over grand fir and 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 in some stands. In root disease pocket treatments that are about an acre or more in size, pine and larch may be planted 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). Many grand firs 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 (Arno and Fischer, 1995).

Figure 3.3-4: Target Canopy Cover

For stand structures that are single storied, closed canopy, and essentially even-aged, (composed of 80-100 year old Douglas-fir) they would be moved to a more open-canopied stand to encourage ponderosa pine regeneration after treatment. Ponderosa pine regeneration is an essential part of the historic vegetation component and it is needed to restore stands to more historic fire regimes and conditions. 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 wide spacing. Reducing the canopy cover would stimulate growth in the herbaceous layer. Opening up the multi-storied stands fuel loadings would be reduced and latter fuels removed creating a stand that would be less susceptible to large scale events

Thinning and burning in the few moist mix conifer stands in the area would promote regeneration in canopy openings of root rot resistant tree species and promote growth and regeneration of hardwoods if present. Also, for the present 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. 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). Fire mosaic in these areas would also remove some of the competing understory vegetation and conifer seedlings, and allows sunlight to reach the forest floor. Fire would not burn every acre within this forest composition due to natural variability of the landscape, moisture levels, and design criteria for aquatic and wildlife habitat providing for a more historic mosaic. While the area proposed within this forest structure and composition is not large, the aesthetic value attached to it could be meaningful for many people.

Table 3.3-7 provides modeled density measurements for the Proposed Action. Information from Table 3.3-7 shows that the areas quadratic mean diameter increases over time and the density of the stand decrease after the initial treatment. With lower densities the stands risk for stand replacing wildfires decreases. Stand conditions move towards historic conditions and fire regimes with larger diameter green retention trees and lower fuel loadings.

Table 3.3-7: Resulting density levels from FVS modeling of the proposed action

Time After Treatment	BA	TPA	QMD	Fuel Loading	Flame Length (Feet)
Initially after treatment	124	332	10.7	12.5	2.3
2020	130	250	13.6	17.5	2.3
2100	205	123	18.5	62.3	2.1

Table 3.3-8 compares the action and no action alternatives. Compared to the no action the proposed action would lower trees per acre, basal area, and fuel loading. Also, the proposed action results in higher quadratic mean diameters, lowers the risk for stand replacing wildfires, moves the stands to more historic vegetation conditions and fire regimes, and reduces stand fuel loadings.

Table 3.3-8: Differences between the action and no action alternatives from FVS modeling

Time After Treatment	BA		TPA		QMD		Fuel Loading	
	No Action	Action	No Action	Action	No Action	Action	No Action	Action
Initially after treatment	195	124	526	332	10.5	10.7	24.9	12.5
2020	188	130	415	250	10.0	13.6	31.2	17.5
2100	200	205	406	123	9.5	18.5	84.8	62.3

Comparison to historical conditions

The character of the existing stands in The Dalles Watershed Phase II project area are heavily influenced by past fire suppression and logging activity, as described earlier in the existing conditions section. 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 move the stand towards more historic conditions. Some improvement of conditions would occur for ponderosa pine and western larch regeneration, survival, and growth by creating openings, releasing existing pine, and applying periodic underburning. Over time, 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, interlocking crowns, 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.

Thinning in the sapling stands would reduce stand densities to more historic levels moving the stand towards a more historical fire regime. Reduce densities and the reduction in fire susceptible species would also move the stand towards a more historic species and structural composition that was more fire resistant with low fuel loadings. Latter fuels may persist with in sapling stands to any remnant trees left from the initial harvest, but with added space, light and nutrients retention trees would have increased growth and vigor and reach a mature state faster.

The prescribed burn treatments are an attempt to functionally replace wildland fire with prescribed fire in applicable forest types. The majority of the forests types in the project area are adapted to fire, of variable intensities and sizes (as described more thoroughly in section 3.1 Fire / Fuels Management). 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).

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." Reducing stocking levels would reduce latter fuels and current and future fuel loading. Lower latter fuels and fuel loadings would reduce the risk of a large scale stand replacing event.

There is an increased risk of blowdown, bending and breakage of the residual trees from snow loading or windthrow, which would add to fuel loadings and latter fuels. 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. In locations of higher blowdown potential (i.e. ridge tops) treatments may vary to reflect the need to provide support trees around our desired leave trees.

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).

Thinning and burning, in the short term, would decrease the amount of small diameter (less than 15 inches DBH) snags densities. In the long term, with the proposed treatments, stands would provide greater number of green retention trees for snag recruitment in the future. Snag densities of trees 20 inch DBH and greater would increase in the future, and move the stands closer to Forest Plan standards for snag densities (FVS runs).

Mechanical treatments in combination with prescribed fire have been shown to be the most effective in altering fire behavior 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) Within the proposed treatment areas the canopy closure would be reduced from 69% to 49% on average and the canopy base height would increase from 28 feet to 45 feet on average (FVS runs). By reducing the canopy closure and increasing canopy base height the proposed treatment areas would result in stands that are more resilient to stand replacing wildfire.

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.

Insect and Disease Processes and Forest Vulnerability

Dwarf mistletoe

A direct reduction in dwarf mistletoe populations would occur with treatments proposed under this alternative. This would occur mostly because many of the trees parasitized by dwarf mistletoe would be removed from the site in the thinning treatment. There would still be several

dwarf mistletoe-infected trees left throughout the area, mainly in the overstory, 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. 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, openings such as those proposed would reduce the rate of spread of the dwarf mistletoe in the retained Douglas-fir. Rate of spread may not be decreased in stands that are bordered by untreated stands with high mistletoe infections. 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. The overall effect of reducing the presence of dwarf mistletoe in the stands is the reduction in mistletoe mortality. Less mortality would reduce fuel loadings and less infected trees would reduce latter fuels from infected branches or witches brooms.

Root disease

Recommendations from the Region 6 Pathologist for the North Fork Mill watershed area, which is north The Dalles Watershed Phase II project area, were used due to similar existing conditions of root disease. "Clearing the laminated root rot patches, or clearing a buffer around the patches. Clearings of sufficient size could be prepared were natural regeneration of resistant species (where present) would be encouraged. 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). Treating the rot pockets with patch cuts and encouraging the growth of both fire and root rot resistant species would improve species diversity, move the stand composition toward historical conditions in regards to species and structure, while improving the resilience to fire and improving forest health. By treating rot disease pockets with patch cut we are removing the high concentrations (Figure 3.3-3) of fuel loadings and removing the infested material before it can add to the fuel loading. Patch cutting would provide a mosaic of densities within the project area and further reduce the risk of larger stand replacing wildfires by providing a break in tree canopies and reducing the trees per acre.

Cumulative Effects

Discussions of the cumulative effects are limited to those past, present and reasonably foreseeable activities that have been determined to have a cumulative effect on the vegetative resource. Refer to Table 3.0-1 for a list of all activities that were considered in this cumulative effects analysis.

Landscape Scale
The total acreage treated by thinning or prescribed burning in the action alternative is 3,662 acres. This is less than 50% of the proposed project area and represents 9% of the Mill Creek watershed. Because Proposed Action alternative treats a substantial portion of the dense Douglas-fir and grand 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 lower intensity, 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 (Pollet and Omi, undated).

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.

3.3.4 Consistency Determination

NFMA Findings for Vegetation Manipulation

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

The Healthy Forest Restoration Act (HFRA) 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 H. R. 1904—8 watershed health, and retaining the large trees contributing to old growth structure. The proposed treatments meet this requirement by retaining large trees 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. Large trees, as appropriate for the forest type, to the extent that the large trees promote fire-resilient stands, are to be retained according to HFRA. Grand fir trees in the pine/oak and Douglas-fir forest type are neither appropriate for the forest type, nor do they promote fire-resilient stands. Only the largest of the grand fir trees would be retained in stands in this forest type. Large Douglas-fir trees with large brooms created by dwarf mistletoe infection provide ladder fuels that also do not promote fire-resilient stands.

Suitability for Timber Production

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

- Meet the definition of forestland as described in 36 CFR 219.3
- Technological feasibility exists to ensure soil productivity and watershed protection. All sites considered for treatment would use established harvesting and site preparation methods. In combination with resource protection standards in the Forest Plan and applicable Best Management Practices, these methods would be sufficient to protect soil and water resource values.
- There is reasonable assurance that lands could be restocked within 5 years of final harvest *(this **generally** does not apply to the proposed harvest units, as they would be thinned. Small openings in root disease pockets would be regenerated with rot resistant species.).*

Suitability for even-aged and 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).(Forestwide Standards (FW) 316 and 317), (C1-019-021),(C1-024). Created openings should be no more than 2 acres (FW 323 and 324) and should be focused in areas of stands that are diseased, infested with damaging insect populations, or damaged by storms (C1-022).

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)(FW 318-347). The resource objective here is fuel reduction while maintaining structure for aesthetics, wildlife, nutrient cycling, and future stand composition and health (FW 148-169). Project design criteria/mitigation measures such as patch openings, and risk of windthrow are written into the design of the Proposed Action to meet Forest Plan direction.

Suitability for reforestation

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

3.4 Soil Productivity

3.4.1 Methodology and Analysis Points

Soil distribution is complex across the Mill Creek watershed 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 are located in the Mount Hood National Forest Soil Resource Inventory (SRI, Howes, 1979), and in the Soil Survey of The Dalles Watershed (High, 1989, unpublished survey). The scale at which the mapping was produced in the SRI is one inch to the mile, which makes it most useful as an initial broad-scale planning tool to identify and display maps of possible soil concerns or sensitive areas. The Dalles Watershed Soil Survey was mapped at a scale of four inches to the mile, four times finer than the SRI. As a result, it has been and continues to be valuable for site-specific planning such as this, and is the survey that will be used in this analysis.

The analysis area for soil resources in this Preliminary Assessment are the proposed treatment boundaries. A comparison of alternatives will be conducted using applicable Forest Plan standards and guidelines as the method of measure (Table 3.4-1) to answer the following questions:

If the Proposed Action is implemented, what measurable *changes* occur to the soil, and of the changes, which does the Forest Service 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 the Proposed Action? In addition, is it possible to reduce risks through mitigations or project design criteria? What would happen if no action is taken? For this analysis the following three measures would 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 different circumstances – *undisturbed; bare soil; and bare and compacted* soil. Surface soils across the entire area are very consistent, resulting in similar erosion hazard ratings.

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% detrimental soil condition in an activity area following project completion would protect site productivity, maintain water movement through the soil, reduce erosion risks and associated sedimentation, and protect organic matter. All soils within the planned treatment areas have a 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 forest carbon and nutrient cycles in the plant communities on north facing slopes *or* the burning of uncharacteristically high amount of organic matter on south facing slopes.

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

Management actions that displace, burn or compact soil or that remove ground cover are considered to result in a greater risk to soil productivity. The analysis will also consider restorative actions and the design criteria and best management practices that minimize impact. These actions would include landing use (some existing landings would be reused and some new landings would be created), skidding with ground based equipment (some would use existing skid trails and some areas would have new skid trails), the use of low impact (low ground pressure) harvester felling equipment, skyline lateral yarding and corridors, temporary road use (some roads are existing, some would be built on top of already disturbed ground and some would be on previously undisturbed ground), post harvest temporary road and landing obliteration, post harvest erosion control activities and post harvest landing slash burning. Other aspects of the Proposed Action would not have a meaningful or measurable effect on soil productivity.

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), North Fork Mill watershed to the north (2008), Mill Creek Watershed Analysis (1997), the 17 road fuel break on the west (2002), and the most recent effort called ‘The Dalles Watershed Fuelbreak’, which is now being implemented. Personal observation and conclusive knowledge of how soils respond to the proposed types of management actions was used to predict impacts.

Table 3.4-1: Summary of Forest Plan Soil Standards Guiding the Soils Analysis (full texts of these standards are on pages Four-49 and Four-50 of the Forest Plan)

<table>
<tr><td>FW – 022 (Page Four-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 – 025 (Page Four-49)</td><td>In the first year following surface disturbing activities, the percent effective groundcover by soil erosion hazard class should achieve at least the following levels:
<table>
<tr><th>Soil Erosion Hazard Class</th><th>Effective Groundcover</th></tr>
<tr><td>Slight to Moderate</td><td>60%</td></tr>
<tr><td>Severe</td><td>75%</td></tr>
<tr><td>Very Severe</td><td>85%</td></tr>
</table></td></tr>
<tr><td>FW – 032, 033, 036 (Page Four-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. On sites producing less that 15 tons per acre, at least 80% of naturally occurring levels should be maintained (paraphrased).</td></tr>
</table>

The following assumptions were used in the soils analysis for this project:

- Damage on skid trails would not exceed 12 feet in width
- The conceptual layout of logging system patterns have been designed to ensure less than 15% of the area is impacted (sufficient ground disturbance to cause detrimental soil condition) within each proposed treatment that uses ground-based equipment
- Undisturbed soils meet the Forest Plan groundcover standards

3.4.2 Existing Condition

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), including incorporation into the Forest Plan as part of the soil productivity section.

Soils across the planning area have been derived from 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 very consistent across the proposed treatment areas, and across the watershed as a whole.

Soils in this analysis have been divided into two main categories. The two main categories are soils that have formed under a hotter, dryer, and more open canopy on south facing slopes (based on vegetation types and surface soil characteristics) versus those that have formed on more northerly slopes. Soils developed on south facing slopes tend to have a more developed, darker topsoil that 'stores and protects' site organic matter from loss during fire. Soils developed over time on northerly slopes where organic matter accumulates on the surface tend to be slightly lighter in color and store nutrients above ground in the duff and woody material compared to their south facing counterparts. These two types are further divided into soils on less than 30% slope and those on greater than 30% slope. A summary of the soils within the entire planning area and accompanying ecological characteristics are illustrated below in Table 3.4-2.

Table 3.4-2: Soil Types on the Mt Hood National Forest within the Planning Area and Useful Ecological Characteristics

	North and West Slopes – Upper Mill Creek	*South and East Slopes– Lower Mill Creek*
Soil types	13/14 → 1 → 5 → 6 → 10 → 4 → 7 → 8 → 3	
Soil characteristics	Glacial, Deeper, Lower rock content, Gentle slopes →	Steep, Higher 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)

A summary of soil mapping units and their associated management interpretations is located in Table 3.4-3 below. Soils 2, 5, 7 and 8 are on south facing slopes; and soils 4, 6 and 10 occur on north facing slopes. Soil types with an 'E' on the end are greater than 30% slope and are proposed for either skyline or helicopter tree removal.

Key observations from the table include:

- All potentially impacted soils have a severe compaction hazard
- Erosion risk for soils on less than a 30% slope run generally from slight to severe to very severe for undisturbed, bare soil, and bare compacted soil, respectively
- Erosion risk for soils on greater than a 30% slope run generally from moderate to very severe to very severe for undisturbed, bare soil, and bare compacted soil, respectively

Table 3.4-3: Summary of Soil Types in the Analysis Area and Associated Management Interpretations from The Dalles Watershed Soil Survey

		Erosion Hazard		
Soil Map Units	**Compaction Hazard**	**Undisturbed**	**Bare Soil**	**Bare and Compacted Soil**
Less than 30% slope				
2C, 2D	Severe	Slight	Severe	Very Severe
4C	Severe	Slight	Moderate	Severe
4D	Severe	Slight	Severe	Very Severe
5D	Severe	Slight	Severe	Very Severe
6C	Severe	Slight	Moderate	Severe
6D	Severe	Slight	Severe	Very Severe
7D	Severe	Slight	Severe	Very Severe
8D	Severe	Slight	Severe	Very Severe
10C	Severe	Slight	Moderate	Severe
10D	Severe	Slight	Severe	Very Severe
Greater than 30% slope				
2E	Severe	Moderate	Very Severe	Very Severe
4E	Severe	Moderate	Very Severe	Very Severe
5E	Severe	Moderate	Very Severe	Very Severe
6E	Severe	Moderate	Very Severe	Very Severe
8E	Severe	Moderate	Very Severe	Very Severe

Soil erosion risk

No active erosion from previous and current vegetation management was observed during the field reconnaissance for this project. Based on visual observation of current activities in the watershed, all stands proposed for treatments are expected to meet the effective groundcover standard following ground disturbing activities.

Detrimental soil conditions

The results of field surveys from the adjacent North Fork Mill Creek Planning Area are shown in Table 3.4-4 below. Areas examined showed existing detrimental damage from previous activity, primarily on non-system roads and old skid trails.

The conceptual layout of logging system patterns for the proposed treatment areas have been designed to ensure less than 15% 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%, 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 completed thinning unit in the West Fork Hood River watershed was yarded with a large log loader. Random shovel probes occurring right behind the machine as it moved through the unit showed virtually no impact at all, and not even close to what would be considered detrimental.

Table 3.4-4: Summary of Stands Monitored with Shovel Probe Transects

Planning Area	Acres	Silv Treat-ment*	Logging System	Fuel Treat-ment	Previous Entries	% Current Detrimental Soil Impacts
NF Mill Creek 1	12	Unknown	Ground	None	1	6
NF Mill Creek 2	12	Unknown	Ground	None	1	<1
NF Mill Creek 3	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. NF Mill Creek 1 and 3 are now part of the Buckskin sale area, and NF Mill 2 is a part of the Eques sale area.

Fuel reduction by masticating (grinding or mowing essentially) is proposed in two areas. This type of project is occurring just up the road (1720) to the northeast and was monitored on May 13th, 2011. The mower is mounted on an excavator frame and is making one pass as it moves along parallel with the road. Shovel probe examination concluded almost no damage by one pass of the machine, especially in areas where thicker root mats from grasses and forbs were present. While some detrimental damage was noted where the mowing started (due to wet conditions), it was localized and given the size of the treatment area, should not result in going over 15% within the unit boundary.

Organic matter levels

The Proposed Actions would change conditions where dense, dead material is either on the ground, on its way to the ground, or still standing; and where there are dense, live stands of trees. In both cases the result would be increased light reaching the forest floor, faster nutrient turnover, more water and nutrients available for the remaining live trees, an increase in grass and forb production, and reduced large organic matter available to burn. There would likely be localized and discontinuous acres that do not meet the 15 tons per acre standard. This is most likely to occur in planning stands 5, 7, 18, 53, 54, 123, and 124, which occur on some of the driest soil and vegetation types.

3.4.3 Effects Analysis / Environmental Consequences

No Action – 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 widespread. 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 a wildfire situation, etc. This is especially true on north facing soils (4, 6, and 10) and where there have been pockets of trees that have died off and are now falling over. These effects would likely be localized to no more than a few acres, but some isolated areas may experience a temporary decrease in site productivity.

Detrimental Soil Conditions
It is assumed that previously 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 uncharacteristically hot wildfire. In addition, organic matter decomposition is influenced substantially by temperature, moisture, and fire, thus the rate of decay and cycling would continue accordingly.

Proposed Action – Direct and Indirect Effects

Soil Erosion Risk
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) is dependent on weather events that provide the energy to move soil material from one location to another. In order to diminish this risk while soils are exposed, certain erosion control techniques are practiced to lessen erosive energies. The effectiveness of these ‘Best Management Practices’, or BMP, is discussed by Rashin et.al. in a recent publication of the Journal Of The American Water Resources Association. Comparing the Proposed Action to their application of studied BMP would indicate the proposed buffers, logging system criteria, etc. would substantially reduce the risk of offsite 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% 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. In conclusion, by maintaining proper amounts of protective groundcover along with BMP design criteria, the risk of erosion and subsequent sediment delivery caused by the Proposed Action is extremely small.

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

Organic Matter Levels
It is likely that some localized acreage would be lower than Forest Plan standards for organic matter, which is an intention of the Proposed Action for a fuel reduction project. This is most likely to come about on south facing soils where treatments are proposed (soils 2, 5, 7 and 8). In these areas, the standard to be measured against is 8 tons per acre (80% of 10 tons, per the Graham et. al. paper). When this standard is not met in these dry ecosystems , it is not expected to be a substantial impact to nutrient cycling due to the following: these are not clearcuts followed by intense burning and extreme loss of current and future organic matter; the shape and extent of some of the impact is narrow and discontinuous; and many of the soils impacted would retain sufficient organic matter reserves in the remaining standing trees and mineral topsoil due to the way in which they have developed.

Cumulative Effects

There are no activities occurring in either time or space within the proposed treatment unit boundaries. No adverse cumulative effects are expected. The method of soils analysis is cumulative by nature as explained in the Mt Hood Forest Plan (specifically FW-22). More clearly stated, an area (proposed unit) is evaluated by considering previous damage (if any) that still meets the detrimental condition definition, plus any expected detrimental soil impacts caused by the Proposed Action. As discussed in the existing condition section, previous vegetation management activities, including past timber sales, are considered as contributing factors as to what the current soil conditions are. Although this project would have a slight measurable impact to soils, the effects are very minor. Therefore, this project would not contribute cumulatively with past vegetation management activities. In addition, all projects in the Cumulative Effects project list located in Table 3-1 have been reviewed to ensure the accuracy of this section.

3.4.4 Consistency Determination

The Proposed Action is consistent with all applicable laws, regulations, and Forest Plan guidance with the exception of the organic matter standard across scattered acreage in the driest ecotypes.

3.5 Water Quality

3.5.1 Methodology and Analysis Points

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 Forest Plan standard as Special Emphasis Watersheds (FW-064). 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). In addition, some representative sediment erosion and transport concentrations are derived from the Forest Service Watershed Erosion Prediction Project (WEPP) Model. Documentation of the model, assumptions and limitations can be found on the web site http://forest.moscowfsl.wsu.edu/fswepp.

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

Table 3.5-1: Strengths and Weaknesses of the Water Quality Analysis Approach

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

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

3.5.2 Existing Condition

The Dalles Watershed Phase II project is located primarily in the South Fork Mill Creek Watershed on the Mt. Hood National Forest in Hood River and Wasco Counties. Vegetation includes mixed conifer forests, meadows, and open grassy slopes. Average annual precipitation ranges from 50 inches on the west side to 30 inches on the east side, occurring mostly during the winter months. Elevation in areas proposed for treatment ranges from 2,500 to approximately 5,000 feet. The primary aquatic feature in the project area is The Dalles Municipal Watershed which is the primary water supply for the City of The Dalles, Oregon. The water supply serves over 12,000 residents and is closed for public access. The Dalles Municipal Watershed Management Unit actually encompasses portions of two separate watersheds: Dog River, a tributary to the East Fork Hood River; and South Fork Mill Creek, the major tributary in the Mill Creek Watershed. Water is diverted from Dog River and transported over to the South Fork Mill Creek system where it is stored in the Crow Creek Reservoir along with flow from Crow Creek, Alder Creek and South Fork Mill Creek. This water is then utilized by the City of The Dalles.

The Dalles Watershed Phase II project is located primarily within portions of three 7th field watersheds, 14B (S.Fk Mill Creek), 14D (Alder Creek), 14C (Crow Creek). A very small portion of the proposed treatments are located in another 7th field, but the total acreage is so low that

potential treament effects are expected to be unmeasureable at the 7th field watershed scale. All of the above mentioned 7th field watersheds are located within the North-South Fork Mill Creek 6th field sub-watershed and the Middle Columbia/Mill Creek 5th field watershed. S. Fk. Mill Creek is part of a Tier 1 Key Watershed as identified in the Northwest Forest Plan. These 7th field watersheds were used as the basis for the site-specific analysis, while the 6th field sub-watershed were used for other, larger scale cumulative effects analysis and compliance with the NWFP Aquatic Conservation Strategy Objectives.

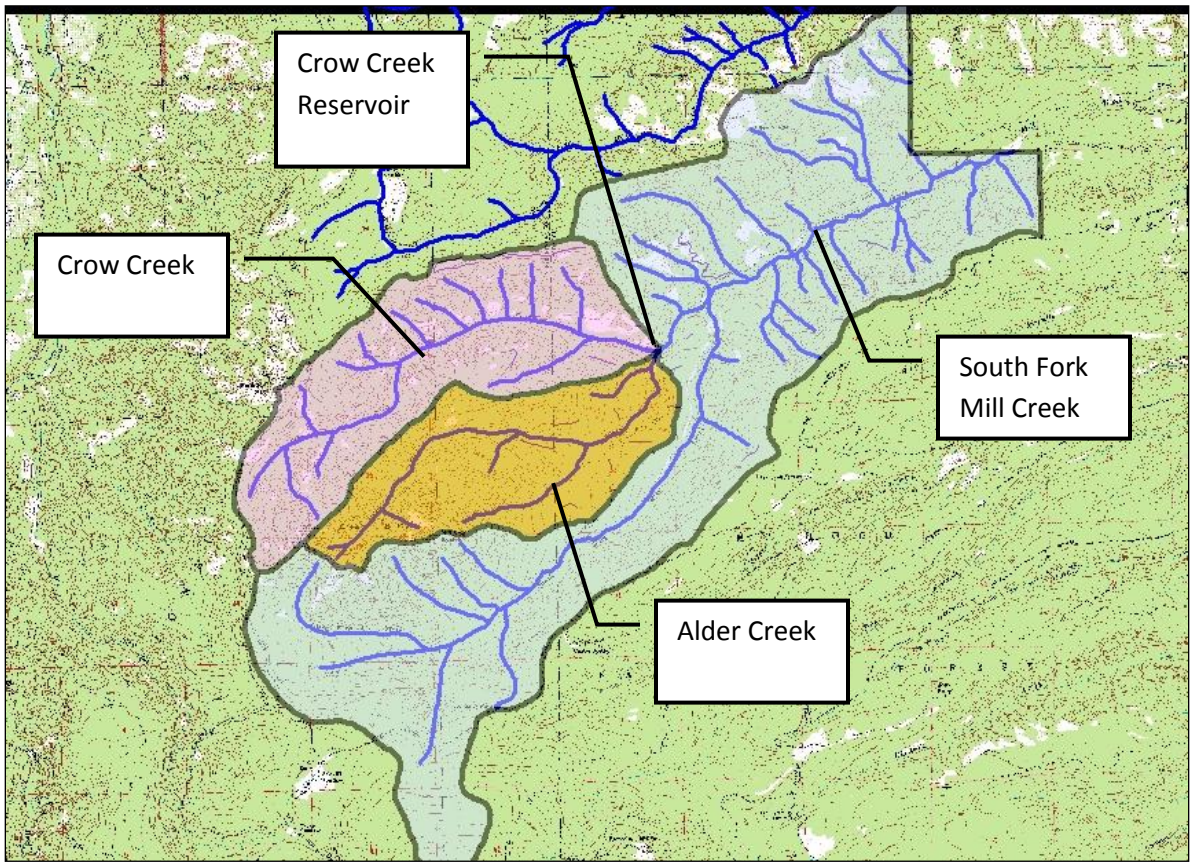


Figure 3.5-1: Map of the Water Quality Analysis Area
7th field watersheds used in the Water Quality Analysis

There are many streams, springs and wetlands located within these sub-watersheds. The primary streams include South Fork Mill Creek, Alder Creek , and Crow Creek. There are approximately 47 miles of stream in the National Forest portion of these 7th field watersheds in the following categories: 20 miles of perennial streams (flow year around) and 27 miles of intermittent streams - (streams that dry up for part of the year and do not contain fish).

The Dalles Municipal Watershed

As described above, the majority of the project area is located in The Dalles Municipal Watershed. The municipal watershed consists of approximately 25,500 acres that is mostly on National Forest land. The objective to manage this area to maintain high quality drinking water was formalized between the City of The Dalles and the United States Department of Agriculture

(USDA) in a 1912 cooperative agreement. This agreement was competed "for the purpose of conserving and protecting the water supply of Dalles City, Oregon" and generally identified obligations of each party which includes that the USDA would "extend and improve the Forest upon these lands by seeding and planting and by the most approved methods of silviculture and forest management". Since the initial agreement between The Dalles and the USDA, further specific direction has been issued through the 1972 document entitled "Comprehensive Management Plan – The Dalles Municipal Watershed" and the 1972 Memorandum of Understanding (MOU) between The Dalles and US Forest Service. The MOU's stated purpose was to maintain and protect "the quality of water from National Forest lands and City owned lands within the City of The Dalles Watershed…". The MOU formally accepted the 1972 "Comprehensive Management Plan – The Dalles Municipal Watershed" as management direction for activities in the watershed. The comprehensive management plan emphasized the need to maintain or improve water quality, while recognizing that certain types of land management activities may be consistent with that goal. Resource and activity programs can only be initiated if they have the approval of both the US Forest Service and the City of The Dalles and each of these entities are involved at all levels of "planning, implementing and monitoring…".

In addition to the MOU, The Dalles Municipal Watershed has been designated as a Special Emphasis Watershed (B6 Management Area) in the Forest Plan. As such, it is recognized as having a primary goal to "Maintain or improve watershed, riparian, and aquatic habitat conditions and water quality for municipal uses…" A secondary goal is to maintain a healthy forest condition through timber management practices.

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 50 sites are monitored for water temperature throughout the Forest. In addition, other water quality monitoring occurs at various locations throughout the Forest depending on the year. This could be turbidity monitoring, instream sediment sampling, water chemical sampling, or surveys of physical stream conditions. Currently, approximately 25 miles of physical stream habitat is surveyed every year and to date approximately 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. The Miles Creeks TMDL plan for stream temperature was approved by the Environmental Protection Agency on February 5, 2009. Listed streams for water temperature are removed from the 303(d) list and stream recovery would be achieved through the implementation plan specified in the Middle Columbia-Hood (Miles Creeks) Subbasin TMDL. All streams in the planning area are listed as either Category 2 – Attaining Some Criteria or Category 4A – Water Quality Limited, TMDL Approved for criteria that this project may have some effect on.

Stream Temperature

Water temperature data has been collected by the Forest Service on the above mentioned stream systems for several years. Data has been collected on continuous temperature recording dataloggers in two locations on S. Fk. Mill Creek (see figure below) and for one year on Crow Creek. Grab samples were collected during stream surveys in S. Fk. Mill Creek (1999), Crow Creek (1998) and Alder Creek (1998) .

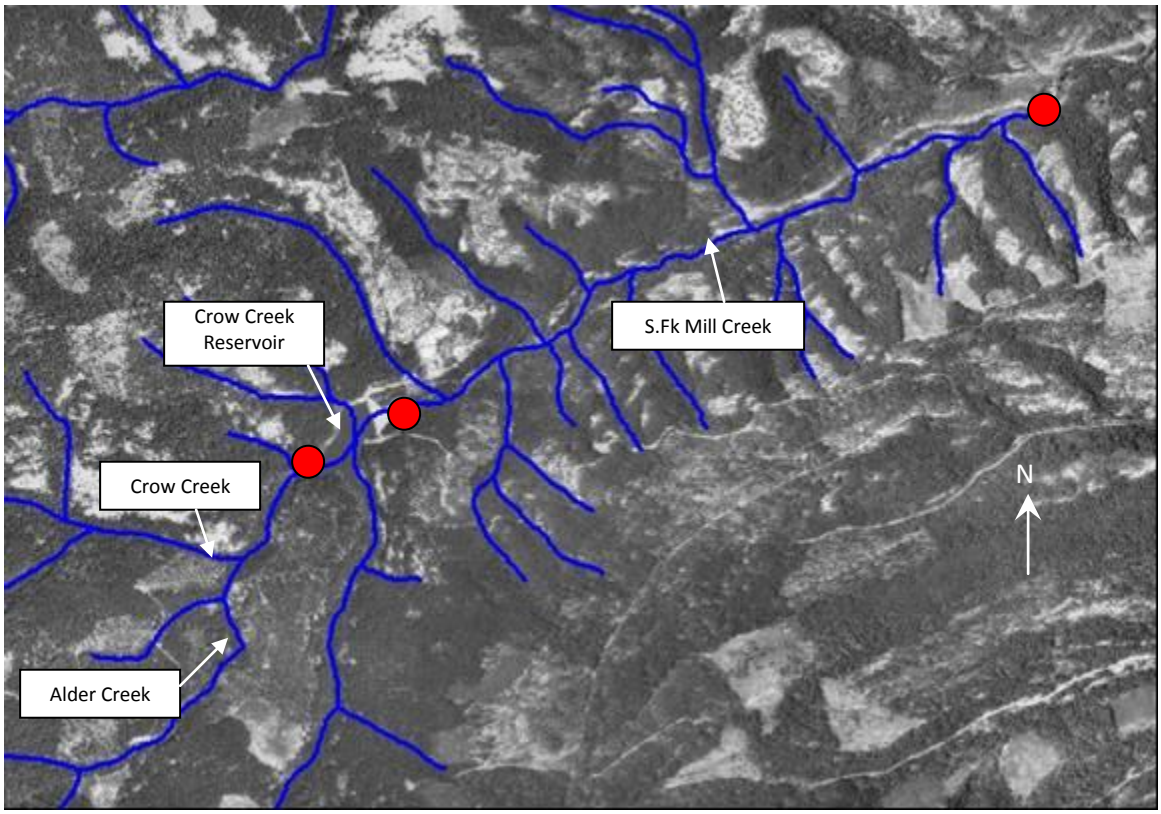


Figure 3.5-2: U. S. Forest Service Water Temperature Monitoring Sites

Water temperature monitoring sites in the City of the Dalles Municipal Watershed project area. Monitoring sites are shown as red circles on the map.

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

Table 3.5-2: Highest 7-Day Average Maximun Stream Tempertures in the Analysis Area

Stream	1998	1999	2000	2005
S. Fk Mill Ck @ Forest Boundary	ND	ND	ND	13.66˚C
S. Fk Mill Ck Below Crow Creek Dam	ND	13.32˚C	15.39˚C	16.97˚C
Crow Creek	14.7˚C	ND	ND	ND

ND = Not Deployed for that Year

As mentioned above, all streams in the planning area are listed as either Category 2 – Attaining Some Criteria or Category 4A – Water Quality Limited, TMDL Approved for water temperature.

The Dalles Municipal Watershed MOU identifies water quality objectives and water quality criteria that would be used in "developing, implementing, and monitoring the present on-going management activities within the Watershed." The 1972 document entitled "The Water Quality Objectives and Raw Water Quality Criteria for the Surface Waters of The Dalles Watershed Supplies" (Exhibit "C" of the MOU) contains water quality objectives that were used as a basis for preparing "management alternatives and management direction for The Dalles Municipal Comprehensive Watershed Management Plan". According to the MOU the specific criteria apply to the Wicks Reservoir intake which is located approximately 6.5 miles downstream from the project area. The "Desirable Criteria" and "Permissable Criteria" for water temperature is <13° C.

Stream Channel Condition and Sediment

Alder Creek, Crow Creek and S. Fk. Mill Creeks have high channel gradient headwaters and moderate gradient, confined middle sections. All three creeks are "A" Rosgen channel types in the extreme upper portions of the streams and grade into "B3" and "B4" channel types throughout the rest of the planning area (HRRD stream surveys, 1998 and 1999). These channels are generally stable and Rosgen (1996) identified this channel type as having a "low to moderate" sensitivity to human disturbance. He also identifed riparian vegetation as having a "neglible to moderate" controlling influence on the stability of a A and B channels. These channel types are generally not a large source of sediment due to channel bed and bank erosion.

Stream surveys conducted in Alder Creek, Crow Creek and S. Fk. Mill Creeks in 1998 and 1999 support the characterization of stable stream banks and channel bed. Both Alder Creek and Crow Creek had less than 0.3% of the entire surveyed length (8.7 miles) identified as unstable. South Fork Mill Creek had less than 0.5% of the entire surveyed length (7.7 miles) identified as unstable. Pebble count data for all three streams identified well graded substrate except for some excess fine material identified in Alder Creek.

Another potential source of coarse and fine sediment to surface water in the area is roads. Sediment can wash off road surfaces into adjacent streams. 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. Following is a table displaying total specified road densities for 7th field watersheds within the planning area.

Table 3.5-3: Sub-watershed Road Density

Sub-watershed	Road Density (mi/mi^2)
S.Fk. Mill Creek-14B	1.8
Crow Creek-14C	0.9
Alder Creek-14D	2.6

All of the road densities are below 3 mi/mi^2 indicating road derived sediment is probably not a major source of pollution in these sub-watersheds. This conclusion is supported by actual field data from stream surveys that did not identify excessive sediment deposition or channel erosion in any of the 16.4 miles of surveyed channel reaches in the project area (HRRD stream surveys, 1998 and 1999).

"The Water Quality Objectives and Raw Water Quality Criteria for the Surface Waters of The Dalles Watershed Supplies" identifies the "Permissable Criteria" for turbidity, which is used as a surrogette for sediment, as <20 Jackson Turbidity Units (JTU) above natural existing conditions. The "Desirable Criteria" is <2 JTU measured at the Wicks Reservoir intake.

Riparian Area Condition

The riparian area adjacent to a stream or wetland is important in providing wildlife habitat, as well as bank and channel stability (the roots of riparian plants and trees hold soil in place). In many cases, this vegetation also shades the stream and regulates water temperatures. Riparian vegetation can be modified by a variety of natural and human caused events. The most likely human caused modification in the project area is past timber harvest activity. Part of the 1998 and 1999 stream surveys included an assessment of the condition of riparian vegetation along the 16.4 miles that were surveyed. As described above, these surveys were in Alder Creek, Crow Creek and South Fork Mill Creek, which constitute the major streams within the planning area. These surveys identifed an intact, unharvested riparian area along both Alder Creek and Crow Creek, while South Fork Mill Creek had a 1000 foot section that had a harvested riparian area. Photographs of this section indicate that the hardwood canopy has closed back in over the channel in this portion. In addition to observations about timber harvest units, stream surveyors also collected data on stream shading utilizing a solar pathfinder. This instrument measures the amount of shade that is provided to a stream channel. Since only one harvest unit was noted during the survey, these shade values should represent some of the natural variability that would be found in stream shading for this area. These shade values are probably on the high end of

natural variability since fire exclusion has removed this major riparian area disturbance factor from the landscape.

Table 3.5-4: Shading on Streams in the Analysis Area

Stream	Ave. Stream Shading (%)	Max and Min Stream Shading (%)
S.Fk. Mill Creek-Reach 1	29%	0 – 97%
S.Fk. Mill Creek-Reach 2	11%	0 – 38%
Crow Creek	27%	0 – 54%
Alder Creek	23%	0 – 44%

3.5.3 Effects Analysis / Environmental Consequences

No Action – 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. 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 may burn with a lower severity due to the presence water and other fire resistant features. Rhoades and others (2011) found that stream temperatures in burned areas increased by an average of 4 degrees C compared to unburned areas in the Hayman Fire Complex in Colorado. Research on the effects of wildfire on stream temperature is limited, but there is quite a bit of research on burning after clearcut logging. In the central Oregon Cascades, clearcut 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, clearcut 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 burned 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, 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. Rhoades and others (2011) found that basins that burned at high severity on >45% of their area had four times the turbidity as basins burned to a lower extent and these values remained elevated through 5 years post-fire. The researchers concluded that due to the slow pace of tree colonization and forest regrowth, recovery of the watersheds burned by the Hayman Fire would continue for decades. Based on the research above and personal observations from over 18 years as a professional hydrologist involved with assessing risks and monitoring damage of large wildfires on water quality, it is reasonable to conclude that in the event of a high severity burn, the City of The Dalles water supply could be severely impaired due to high turbidity 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 small trees due primarily to fire exclusion creating ample stream shading. In addition, very little ground disturbance occurs in The Dalles Municipal Watershed due to the protection provided by existing agreements between the City of The Dalles and the US Forest Service. 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 intesity 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 - Direct and Indirect Effects

This alternative proposes to treat vegetation to discourage fire from spreading into The Dalles Municipal Watershed and improve riparian conditions. Treatments would vary depending on the existing vegetative conditions. In total, approximately 3660 acres are proposed for some type of treatment. A detailed description of the location and type of treatments and Project Design Criteria/Mitigation Measures (PDC) can be found in Chapter 2 – Alternatives, Including the Proposed Action of this document.

Stream Temperature

This alternative proposes to thin vegetation within Riparian Reserves. Vegetation removal near water bodies has the potential of increasing solar radiation to surface water which in turn may increase water temperature. The following analysis utilizes tools contained within the *Northwest Forest Plan (NWFP) Temperature TMDL Implementation Strategies: Evaluation of the Northwest Forest Plan Aquatic Conservation Strategy (ACS) and Associated Tools* (2005) document to identify necessary shade so that stream temperatures within treatment areas would not increase as a result of the proposed vegetation treatments. The previously mentioned document is the result of work between the US Forest Service and the BLM and identifies how to maintain sufficient stream shading to meet the Clean Water Act while providing the opportunity to treat Riparian Reserve vegetation to improve riparian conditions. The State of Oregon DEQ conditionally approved the Strategy in September 2005 as the temperature TMDL implementation mechanism under the Clean Water Act.

The concept of the sufficiency analysis is to maintain a primary shade zone of vegetation next to the stream and identify a secondary shade zone and other areas within the Riparian Reserves further away from the stream that can be treated to reach Riparian Reserve Objectives while maintaining stream temperatures. In order to maintain sufficient shade next to the stream, the primary shade zone is untreated. The size of this zone is dependent on the current height of the trees and the hill slope. This relationship is shown in the table below.

Table 3.5-5: Width of Primary Shade Zone

Height of Tree	Hill slope <30%	Hill slope 30% – 60%	Hill slope >60%
Trees < 20 feet	12 feet	14 feet	15 feet
Trees 20 to 60 feet	28 feet	33 feet	55 feet
Trees > 60 feet	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’+. The proposed prescription for riparian area treatments would thin vegetation that would be >60’ tall, which translates into a maximum primary shade zone of 60’ for the project area. This area would be left untreated next to perennial streams to maintain current stream shading and water temperatures.

In addition, vegetation treatments within the secondary shade zone (55’ to 100’ from the stream), would leave a canopy closure of at least 50% which would provide consistency with the

Sufficiency Analysis. Due to project design criteria / mitigation measures that meet the Sufficiency Analysis, there should be no increase in stream temperature resulting from implementation of this project and would meet the Clean Water Act for water temperature.

Vegetation treatments in The Dalles Watershed Phase II project would have the benefit of reducing the risk of negative effects that may result from a catastrophic wildfire. This reduction in risk of catastrophic wildfire is discussed in the Fire section of this document. Potential effects of catastrophic wildfire on water quality are discussed in the No Action Alternative of this section.

Sediment

Some ground distubing activites in this alternative have the potential to dislodge soil particles which in turn may increase erosion. These activities include new temporary roads, landings, skid trails, yarding corridors, burn piles, underburning areas and areas of road maintenance and repair. A detailed discussion of soil erosion and sedimentation is contained in the soils section of this document. According to the soils analysis, amounts of erosion and sediment delivery are expected to be small due to maintaining protective groundcover along with implentation of Best Management Practices (BMP) or Project Design Criteria/Mitigation Measures (PDC) as they are referred to in this document.

The Proposed Action would re-open approximately 2.1 miles of old existing temporary roads that have been closed with berms or other devices. These temporary roads can be reopened with minimal earth movement without side casting material and would be decommissioned after project completion. This alternative would construct approximately 3.2 miles of new temporary roads.

Road maintenance prior to log haul would help maintain the design drainage of the road surface which reduces the potential for larger sediment inputs that eventually may enter stream courses. This includes the placement of new aggregate surfacing where necessary, blading, removing debris, brushing out encroaching vegetation, removing berms, and ditch and culvert inlet cleanout where needed. Aggregate road surfacing can minimize the amount of fine sediment from road surfaces entering streams following log haul, especially during and following rainfall events. The following WEPP model runs show the difference in erosion and sediment delivery (shown as sediment leaving buffer in table below) between a native surface road and a gravel surface road. All of the model inputs stayed the same except surface material which was changed from native to gravel surface

Table 3.5-6: WEPP Model Run Showing the Difference in Erosion and Sedimentation between a Gravel Surface Road and a Native Surface Road

	Road Prism Erosion	**Sediment Leaving Buffer**
Native Surface Road	277 lbs.	99 lbs
Gravel Surface Road	144 lbs.	65 lbs.

Results from the WEPP model runs show that in this situation, the native surface road produced 277 pounds of eroded soil while the gravel surface road produced 144 pounds of eroded soil which is a 50 percent reduction in eroded soil. It should be noted that under some circumstances,

gravel surfaced roads may produce more runoff and erosion than native surface roads (WEPP manual).

Some road maintenance activities have the potential to increase road related erosion and sediment during rainfall events. This increase is associated primarily with blading, ditch cleaning and culvert cleaning on aggregate and native surface roads although ditch cleaning associated with paved roads is a potential sediment source. Most of the road maintenance work would be brushing out existing vegetation and minor blading and spot rocking of the road surface. Two roads that would require the most work to reopen include the 1720170 and 1721140 roads that would require brushing, blading, culvert cleaning and ditch cleaning. Any fine sediment created by road maintenance activities would most likely be washed from the road surface in the first few precipitation events immediately after work has been completed. Personal observations through 23+ years as a professional hydrologist and field work completed for this project and The Dalles Fuelbreak project indicate that most road-related sediment would be trapped and stored in the ditches or on the forest floor below cross drains. Implementation of PDC that include installation of erosion control measures to minimize or eliminate sediment introduction into streams would further reduce the risk of sediment introduction. Any sediment delivered to streams during these activities would be minimal, short-term duration, and undetectable at a sub-watershed (6^{th} field) or watershed (5^{th} field) scale. The probability of any degradation to water quality or fisheries resources caused by sedimentation due to road construction, reconstruction and maintenance is extremely low.

Log hauling would not measurably increase the amount of fine sediment in streams. The roads along the haul route have for the most part, well vegetated road ditchlines that allow any eroded soil to be stored adjacent to the roads. The potential for sediment input into streams along the haul routes would further be minimized by permitting haul only when conditions would prevent sediment delivery to streams. The contract administrator would restrict log hauling when necessary to minimize water quality degradation. Haul would be stopped if there is rutting of the road surface or a noticeable increase in the turbidity of water draining to the road ditches or at stream crossings. The majority of these crossings are at intermittent or small perennial streams that would have very little flow during the normal season of operation. These channels also have numerous natural roughness elements such as woody material and boulders that would store sediment near the point of origin.

The reopened temporary roads re-trace the alignment of older overgrown or decommissioned roads that are sufficiently stable. Re-opening these roads and the construction of a new temporary road wouldn't pose a risk of introducing sediment to streams because almost all of these roads would be outside of the Riparian Reserves. Approximately 600 feet of a new temporary road would skirt the outer 50' of a Riparian Reserve along Alder Creek just off Forest Road 1721. The new temporary road is located on dry ground, would not cross stream channels, and would have no hydrologic link to any water source. As a result, there would be a very low probability of any sediment from temporary road surfaces reaching streams. The new temporary road and re-opened temporary roads would be decommissioned and revegetated immediately following completion of harvest operations to help reduce compaction, increase infiltration rates, minimize surface erosion, and re-establish natural drainage patterns.

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. Lakel and others (2010) looked at the effectiveness of a variety of treated and untreated buffers in trapping sediment adjacent to timber harvest units. They concluded that streamside management zones (buffers) between 25' and 100' were effective in trapping sediment before it could enter streams. These streamside management zones consisted of both treated and untreated areas. The study also found that thinning within buffers was an appropriate forest management tool, "because the practice did not significantly increase erosion".

Other studies also support the effectiveness of mitigating sediment delivery by maintaining a buffered area adjacent to surface water. Burroughs and King (1989) found that 80% 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.

Prescribed fire units are not expected to introduce additional sediment into surface water. A literature review by Beschta (1990) states that "Management practices that prevent the occurrence of hot slash burns and encourage rapid revegetation would help minimize potential increases in fire-related sedimentation from upslope source. Relatively "cool" burns" (such as the prescribed fire 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 such as ground based logging restrictions on ground over 30 percent side-slope, ripping and water barring disturbed areas, and seeding disturbed areas. It is unlikely that any material would reach the aquatic system due to buffering by the Riparian Reserves and the other required mitigation measures such as ripping and water barring skidtrails.

Vegetation treatments in The Dalles Watershed Phase II project would have the benefit of reducing the risk of negative effects that may result from a catastrophic wildfire. This reduction in risk of catastrophic wildfire is discussed in the Fire section of this document. Potential effects of catastrophic wildfire on water quality are discussed in the No Action Alternative.

Cumulative Effects

The table below provides a qualitative summary of potential cumulative watershed effects. It shows existing and potential projects, effects from those projects that may result in cumulative effects with The Dalles Watershed Phase II, whether these projects overlap in time and space and an assessment if a measureable cumulative effect is expected. Findings of this summary are supported by the analysis above which utilizes pertinent research, mitigation measures and design features and applicable management standards and guidelines.

Table 3.5-7: Cumulative Effects for Water Quality

Project	Potential Effects	Overlap In Time	Overlap In Space	Measurable Cumulative Effect?	Extent, Detectable?
Existing Old Forest Service Timber Harvest Units	Coarse and Fine Sediment	No	Yes	No	Projects are completed. No remaining sediment, stream temperature and water quantity effects due to mitigation measures and design criteria implementation on the original projects and natural recovery.
	Stream Temperature	No	Yes	No	
	Water Quantity	Yes	Yes	No	

Project	Potential Effects	Overlap In Time	Space	Measurable Cumulative Effect?	Extent, Detectable?
Forest Service Vegetation Treatment Activities Planned or Underway (Pre-commercial treatments and other vegetation treatments such as Willow, Hodi and Alder Stewardship sales.)	Coarse and Fine Sediment	Yes	Yes	No	There may be an overlap in timing of these projects with The Dalles Watershed Phase II 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 The Dalles Watershed Phase II Project.
	Stream Temperature	Yes	Yes	No	Some projects are completed so there are no remaining stream temperature effects due to natural recovery. The more recent vegetation treatment projects conform to the Northwest Forest Plan Stream Temperature Sufficiency document. The Dalles Watershed Phase II Project would maintain the primary shade zone so there should be no increase in stream temperature from this project.
	Water Quantity	Yes	Yes	No	No cumulative water quantity effects due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines and natural recovery on both the existing projects and The Dalles Watershed Phase II Project.

Project	Potential Effects	Overlap In Time	Space	Measurable Cumulative Effect?	Extent, Detectable?
Private Land Activities (National Fire Plan Project, past timber harvest and other activities)	Coarse and Fine Sediment	National Fire Plan-Yes Other Projects-No	Yes	No	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/hazardous fuels treatment have a chance of some short-term introduction of fine sediment but these activities would either be well downstream from The Dalles Watershed Phase II Project and/or have mitigation that would minimize or eliminate potential sediment introduction (see design criteria for the City of The Dalles Watershed Fuels Reduction project document).
	Stream Temperature	Yes	Yes	No	Some projects are completed so there are no remaining stream temperature effects due to natural recovery. The Dalles Watershed Phase II Project would maintain the primary shade zone so there should be no increase in stream temperature.
	Water Quantity	Yes	Yes	No	No cumulative water quantity effects due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines on The Dalles Watershed Phase II Project and natural recovery for some of the projects on private land.
Misc. Tree Salvage (Hazard Trees)	Coarse and Fine Sediment	Yes	Yes	No	There may be an overlap in timing of this project with The Dalles Watershed Phase II 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.

Project	Potential Effects	Overlap In Time	Overlap In Space	Measurable Cumulative Effect?	Extent, Detectable?
	Stream Temperature	Yes	Yes	No	Some projects are completed so there are no remaining stream temperature effects due to natural recovery. The Dalles Watershed Phase II Project would maintain the primary shade zone so there should be no increase in stream temperature.
	Water Quantity	Yes	Yes	No	No cumulative water quantity effects due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines and natural recovery in both projects.
Dog River Pipeline Replacement Project	Coarse and Fine Sediment	Yes	Yes	No	There may be an overlap in timing of this project with The Dalles Watershed Phase II 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 Dalles Watershed Phase II Project would maintain the primary shade zone so there should be no increase in stream temperature.
	Water Quantity	Yes	Yes	No	No cumulative water quantity effects due to mitigation measures and design criteria implementation, conformance with existing standards and guidelines in The Dalles Watershed Phase II Project.

Project	Potential Effects	Overlap In Time	Overlap In Space	Measurable Cumulative Effect?	Extent, Detectable?
Road Maintenance Activities	Coarse and Fine Sediment	Yes	Yes	No	There may be an overlap in timing of these activities with other ground disturbing activities in The Dalles Watershed Phase II 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 this project. In addition, these activities are within the same 6th field sub-watershed, but it is unlikely that this would mix with any minor fine sediment from The Dalles Watershed Phase II Project due to the 7 mile distance from the road maintenance area and the confluence with South Fork Mill Creek.
Proposed OHV Project	Suspended Sediment	Yes	No	No	New OHV trails are proposed in the same 6th field sub-watershed. There is a chance of some short-term introduction of fine sediment from OHV trail construction and use but it is unlikely that this would mix with any minor fine sediment from The Dalles Watershed Phase II Project due to the 7 mile distance from the OHV area and the confluence with South Fork Mill Creek. 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	No	No	The Dalles Watershed Phase II Project would maintain the primary shade zone so there should be no increase in stream temperature.

Project	Potential Effects	Overlap In Time	Space	Measurable Cumulative Effect?	Extent, Detectable?
Invasive Plant Treatments	Coarse and Fine Sediment	Yes	Yes	No	There may be an overlap in timing of this project with The Dalles Watershed Phase II 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 Dalles Watershed Phase II Project would maintain the primary shade zone so there should be no increase in stream temperature.

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

Sediment
No detrimental cumulative effects are expected as a result of sediment introduction due to the small amount of sediment expected from this project. As described in the direct and indirect effects section, mitigation measures and project design criteria / mitigation measures aimed at minimizing erosion and sedimentation reduce the potential of erosion and delivery of the material to adjacent surface water.

Water Quantity
A peak flow analysis was completed for this project and is displayed in the 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 (Forest Plan Standard FW-067, pg. Four-55) and the sub-basins were found to be in compliance with Forest Plan Standard FW-064 so no cumulative effects are anticipated for water quantity.

3.5.4 Consitency Determination

Numerous existing plans provide guidance for projects in the form of Standards and Guidelines and recommended Best Management Practices (BMP). These documents include the Forest Plan, the Northwest Forest Plan and associated supporting documents, and The Dalles Municipal Watershed MOU and supporting documents and the Middle Columbia-Hood (Miles Creeks) Subbasin TMDL. A summary of applicable water quality Standards and Guidelines and BMP from these documents are displayed below.

Forest Plan Standards and Guidelines

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

Northwest Forest Plan Standards and Guidelines

- Standards and Guidelines dealing with Fire/Fuels Management – FM-1,4
- Standards and Guidelines dealing with Key Watersheds (NWFP ROD pg. C-7). The primary Standard & Guideline that pertains to this project is no net increase of new roads in this Key Watershed.
- Standards and Guidelines dealing with Riparian Reserves (NWFP ROD pg. C-31 through C-38). The primary Standard & Guideline that pertain to this project are Fire/Fuels Management – FM-1,4.

The Dalles Municipal Watershed MOU
Guidance for projects located in The Dalles Municipal Watershed are contained in the document "Comprehensive Management Plan – The Dalles Municipal Watershed". This document divided up the municipal watershed into different planning units with "Resources and Uses" that were determined to be compatible with the primary objective of maintaining or improving the "present quality and quantity of water…". The Dalles Watershed Phase II Project is located primarily in planning units "C – Brooks Meadow and Shellrock Boundary" and "D – Upper Mill Creek" "E – Blackburn Canyon, North Crow Creek and Lower Mill Creek" and "E – Breeds Flat and Middle Mill Creek Area". A small portion is located in "G – Mill Creek Natural Area". Descriptions for Resources and Uses that pertain to this project can be found in the Comprehensive Management Plan.

Middle Columbia-Hood (Miles Creeks) Subbasin TMDL
Continue to follow Forest Plan and Northwest Forest Plan Standards and Guidelines as well as the Northwest Forest Plan (NWFP) Temperature TMDL Implementation Strategies: Evaluation of the Northwest Forest Plan Aquatic Conservation Strategy (ACS) and Associated Tools (2005), until a Water Quality Restoration Plan can be developed.

Other Pertinent Guidance

In addition to the plans discussed above other documents such as US Forest Service "General Water Quality Best Management Practices" and the draft "EPA Region 10 Source Water Protection Best Management Practices for USFS, BLM" provide guidance about potential BMP for this project. Those BMP would be incorporated where appropriate.

Key Watershed
The NWFP states that "The amount of existing system and 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 3.2 miles of new temporary road would be constructed and 2.1 miles of existing temporary roads would be reopened 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.

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

Table 3.5-8: Change in Sub-Watershed Road Density

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)
S.Fk. Mill Creek-14B	1.8	1.9	1.8
Crow Creek-14C	0.9	1.5	0.9
Alder Creek-14D	2.6	3.1	2.6

Road densities increase slightly when temporary roads are included but would return to pre-project levels when temporary roads are decommissioned.

Special Emphasis Watersheds and Peak Flow Analysis
Mill Creek watershed is identified in the Mt. Hood National Forest Land and Resource Management Plan as a Special Emphasis Watershed (Forest Plan Standard FW-065, pg. Four-55). Forest Plan Standard FW-064 states that "Watershed impact areas at the subbasin or area analysis level should not exceed 25 percent" (pg. Four-53) as part of a cumulative watershed effects analysis. This threshold is set to disperse activities in time and space to "minimize cumulative watershed effects" which in this case is primarily increased peak flow (Forest Plan Standard FW-061, pg. Four-53). These increased peak flows can cause stream channel damage in the form of increased bank erosion, channel bed scour, channel widening, and sedimentation. An analysis of the watershed impact area for the sub-basins that are part of The Dalles Watershed Phase II Project is displayed in the table below.

All sub-basins are well below the maximum Watershed Impact Area percentage of 25% after implementation of The Dalles Watershed Phase II Project, so this project is consistent with this standard.

Table 3.5-9: Watershed Impact Area

	Maximum Watershed Impact Area from Forest Plan	Pre-project Implementation Watershed Impact Area	Post-project Implementation Watershed Impact Area
S.Fk. Mill Creek-14B	25%	5.4%	5.7%
Crow Creek-14C	25%	6.1%	6.5%
Alder Creek-14D	25%	4.4%	5.0%

Consistency with Law and Direction (Northwest Forest Plan, Mt. Hood NF Management Plan and Clean Water Act)

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

- The inclusion of Best Management Practices (BMP) to meet water quality standards and the Clean Water Act. These BMPs reduce or eliminate potential degradation from increased water temperature and sedimentation.

- Establishment of Riparian Reserves and meeting standards within the Tier 1 Key Watershed.

- Designing prescriptions within Riparian Reserves to contribute to attainment of Aquatic Conservation Strategy Objectives (see the Aquatic Conservation Strategy section for more information).

3.6 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 Barlow Ranger District. The analysis and conclusions of the evaluation are summarized below. Reference material is contained in the full Biological Evaluation.

3.6.1 Methodology and Analysis Points

The primary concerns from implementing the Proposed Action for aquatic resource are: potential increase in water temperature, sedimentation, loss of future Large Woody Debris (LWD) and pool habitat.

The Forest Service conducted a level II stream survey on South Fork Mill Creek in 1999. Of which three stream reaches were identified from the Forest Service boundary located at river

mile (RM) 8.4 to the headwaters (RM 16.3), and on both Alder Creek (One stream reach surveyed from the confluence with Crow Creek to RM 3.2) and Crow Creek (One stream reach surveyed from the back water of Crow Creek Reservoir to the headwaters at RM 5.0) in 1998. It is assumed that conditions documented in both 1998 and 1999 US Forest Service surveys have not changed, as no substantial human activity or natural events have occurred to the streams since 1998 and 1999 when the surveys were conducted.

The following information sources where utilized to create an overview of the existing conditions, both abiotic (Sedimentation, Pools, etc) and biotic (aquatic species) within the project providing the foundation on which this analysis is based.

- Modified Version of Hankin and Reeves Level II Stream Surveys which were completed in both 1998 (Alder and Crow Creek) and 1999 (South Fork Mill Creek)
- Middle Columbia-Hood (Miles Creeks) Subbasin TMDL Monitoring for stream temperature in South Fork Mill Creek.
- Mill Creek Watershed Analysis (2000)
- Miles Creeks Watershed Analysis (1994a)
- ODEQ Website for 303(d) listed streams
- Northwest Forest Plan ROD (1994)
- Northwest Forest Plan Survey and Manage ROD (2001)
- Mt. Hood National Forest Land and Resource Management Plan (1990)

3.6.2 Existing Condition

The location of the proposed project area is in The Dalles Municipal Watershed, which is in the headwaters of South Fork Mill Creek, Alder Creek, and Crow Creek 7th field subwatersheds of the North Fork Mill and South Fork Mill Creek 6th field subwatershed of the Mill Creek 5th field watershed (tributary to the Columbia River). The Dalles Municipal Watershed is located on the Barlow Ranger District of the Mt. Hood National Forest (MHNF) and supplies drinking water to the residents of The Dalles, Oregon. The legal description for the project area is: T1S, R10E, Sec's 13, 23-25, 36 and T1S, R11E, Sec's 8-11, 14-22, and 28-32. Figure 1.0-1 displays the location of the proposed project area.

The scale of this analysis is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action [50 CFR 402.02]. The action area of evaluation for Aquatics under this Preliminary Assessment is defined as the stream reaches of the South Fork Mill Creek, Alder Creek, and Crow Creek 7th field subwatersheds which are located in the proposed project area. This will include portions of all three stream reaches that are within or near treatment unit boundaries upstream of the eastern project boundary (T2S, R11E, sec(s). 9, 15, and 16).

The analysis for log haul routes located outside of any treatment areas include areas of the following subwatershed with stream crossings prior to reaching state highway 35: The northern haul route uses FS road 1700 system and is located in both the North Fork Mill Creek (stream crossing at ~RM 12) and West Fork Neal Creek (stream crossings at ~RM 3.3 – 4.5)

subwatersheds. The southwestern haul route uses FS road 4400 system and is located in both the Dog River (stream crossing ~ RM 5.5) and Upper East Fork Hood River (stream crossings at Tumble Creek at ~RM 1.2 and on Culvert Creek at ~RM 0.2) subwatersheds. The haul routes located outside of the treatment areas of the South Fork Mill Creek, Alder Creek, and Crow Creek 7th field subwatersheds are located on improved Forest System Roads (Level II and III improved aggregate and paved road surfaces) and state highway 35, which presently meet Forest standards. Due to the identified road systems (1700, 4400, state Hwy 35) meeting standards with minimal maintenance needs there is a negligible potential of effects to aquatic ecosystems with the use of these road systems for log hauling (including snow plowing) therefore, they will not be analyzed any further in this analysis.

Water Temperature

Brazier and Brown (1973) state that, "Direct solar radiation can be transmitted, absorbed, or reflected." Ice (2000) concluded, "Only direct solar radiation (not diffused) can possibly affect stream temperatures." Increases of water temperature to the streams located in or downstream of the Proposed Action are of a concern due to South Fork Mill Creek was listed on the 2004-2006 Oregon Department of Environmental Quality (ODEQ) 303(d) list for not meeting state stream temperature standards from river mile (RM) 0.0 to RM 10.6 (see Table 3.6-1). In December 2008 ODEQ developed a Total Maximum Daily Limit (TMDL) for water temperatures of the stream networks in the Miles Creeks Watershed of which South Fork Mill Creek and its tributaries (Crow Creek and Alder Creek a tributary to Crow Creek) are part of. South Fork Mill Creek just below Crow Creek Reservoir has met ODEQ state water quality standards for temperature since at least 1994 (FS records from 1994 - 1996 and again from 2009 through 2010). Additional information on water temperature can be found in the water quality section of this Preliminary Assessment.

Table 3.6-1: 2009 and 2010 Stream Temperature Summary for South Fork Mill Creek Located on the Barlow Ranger District Just Downstream of Crow Creek Reservoir (7-day average maximum temperatures did not exceed specified thresholds for Oregon site)

Station No.	Stream Name	Days Deploy	Date Deployed	Date Pulled	Days >18° C [1]	Days >16° C [2]	Days >13° C [3]	Max 7-day Avg Max ° C
ML2500	S. Fk Mill	139	6/25/10	10/8/10	0	0	55	14.5
ML2500	S. Fk Mill	106	6/05/09	10/21/09	0	0	76	15.5

[1] **The 18.0° C** threshold applies to salmon and trout rearing and migration use.

[2] **The 16.0° C** threshold applies to core cold-water habitat.

[3] **The 13.0° C** threshold applies to specific timeframes (see "Detailed Summaries by Monitoring Site") for salmon and steelhead spawning use.

Sedimentation

South Fork Mill Creek
South Fork Mill Creek is meeting presently meeting ODEQ water quality standards for sediment with small cobble (64-90 mm) being the dominate substrate in Reach 1, with 10% of the substrate sampled in the fine category (<6 mm). Very coarse gravel (32-45 mm) dominated in Reach 3, with 14.4% of the substrate sampled in the fine category. All three stream reaches surveyed in 1999 on South Fork Mill Creek are located in the project area.

Alder Creek
Alder Creek's dominate substrate in 1998 was Coarse gravel (16-22.3 mm), with 25% of the substrate sampled was in the fine category (<6 mm). This fine substrate was observed in sections of dry channel where the water had slowed, dried, and deposited fines. This sedimentation would likely be flushed out during higher flows. No bank instability was observed during the survey (US Forest Service, 1998a).

Crow Creek
Crow Creek's dominate substrate in 1998 was very coarse gravel (32-48 mm), with 8% of the substrate sampled in the fine category (<6 mm). The fine sediment observed was associated with debris jams and low surface flow areas (US Forest Service, 1998b).

For more information on sedimentation for this project area see both 3.5 Water Quality and 3.4 Soils Productivity sections in the Preliminary Assessment.

Large Woody Debris

Large Woody Debris (LWD) is an important component to creating and maintaining the quality and quantity of fish spawning and rearing habitat in a stream by creating and maintaining pools. Large woody debris creates hiding cover for both juvenile and adult fish from predators, especially in debris jams (accumulation of 3 or more pieces of LWD). Large woody debris creates micro habitats for a multitude of aquatic macro invertebrates, which are an important food source for both salmonids. According to Buffington (1998), LWD helps create channel roughness, which helps deposit spawning gravels in high gradient mountain streams. Otherwise, these streams would only have inhospitable large bed load materials to salmonids because of high shear stresses.

Definitions of woody debris size categories can be found below in Table 3.6-2. Comparisons of the existing in-channel woody debris densities per mile to eastside Mt. Hood Land Resource Management Plan (Forest Plan), project implementation guide (PIG), and National Marine Fisheries Service (NOAA Fisheries) standards can be found below in Table 3.6-3 and are discussed further in this section. **NOTE:** Only woody debris that is within the bankfull channel and meets the size criteria below is counted.

Table 3.6-2: Definition of Wood Size Classes East of the High Cascades

Size	Diameter	Length
Small	>6 inches at 20 feet from large end	>20 feet or 2X the bankfull width
Medium	>12 inches at 35 feet from large end	>35 feet or 2X the bankfull width
Large	>20 inches at 35 feet from large end	>35 feet or 2X the bankfull width

Table 3.6-3: Existing Number of In-Channel Woody Debris and Woody Debris Density vs. the Forest Plan, PIG, and NOAA Standards (total of both medium and large size classes)

Stream	Reach	Measured/ *Corrected* Length	Total Number of Pieces In-Channel				Density per Mile			Standard Density per Mile	
			Small	Medium	Large	Total (M+L)	Medium	Large	Total	Forest Plan	PIG / NOAA
S. Fk Mill	1	2.86	54	37	7	44	12.9	2.4	15.4	**106**	**20**
S. Fk Mill	2	CROW CREEK RESERVOIR									
S. Fk Mill	3	5.01	69	33	8	41	6.6	1.6	8.2	**106**	**20**
Alder	1	3.53	NA	66	16	82	18.7	4.5	23.2	**106**	**20**
Crow	1	5.19	NA	147	29	176	28.3	5.6	33.9	**106**	**20**

*South Fork Mill Creek survey was completed in 1999 and both Alder and Crow Creek's were surveyed in 1998. All stream reaches identified above are present in project area.

South Fork Mill Creek
South Fork Mill Creek wood in the small size class made up 55% of the total wood in Reach 1 and 63% in Reach 3. Wood was a major source of cover for fish in both Reach 1 and Reach 3. South Fork Mill did not meet the Forest Plan, NMFS, or PIG Standards in either Reach 1 or 3.

Thirty-four percent of the total countable wood was located in debris jams. Nine debris jams were identified in Reach 1. Beaver activity was noted in association with these jams, and most of the wood in the debris jams was too small to be counted. Eighty-one percent of the countable wood in the debris jams in Reach 1 was in the small size class. A large debris jam with vegetation growing on it was observed at about RM 9.9. A total of 104 debris jams were identified in Reach 3. Most of the wood in these debris jams were too small to be counted. Forty three percent of the countable wood in the debris jams of Reach 3 was in the small size class and 41% was in the medium size class.

Alder Creek
Alder Creek small wood comprised 44% of the total wood in the stream. It was vital to the creation of debris jams, which in turn created pools and cover for fish. Wood played the major role for fish cover.

A total of 166 debris jams were identified on Alder Creek. Fifty-three percent of the total wood in the stream was located in jams. Wood in debris jams was distributed evenly in the small and medium size classes with small wood at 48% and medium wood at 45%. Large wood was 7%.

Crow Creek
Crow Creek small wood made up 45% of the total wood in the stream. It was found both as individual pieces and in jams. Wood was the main cover component for fish.

A total of 190 debris jams were identified during the survey. Forty three percent of the total wood in the stream was located in these jams. Of the wood found in the jams, 48% was small, 39% was medium and 13% was large wood. Debris jams were crucial in creating side channel habitat and were also responsible for channel shifts noted during the survey.

Pools

High quality and quantity pools are an important habitat for all life stages of salmonids. Pool tails found on the downstream end of a pool can have high levels of gravel sized substrates, which adult salmonids like to spawn in. Pool tails typically have good subsurface hydraulic upwelling which allows for oxygenated rich water to reach the incubating eggs, and alevins. Pools are also, an important habitat for juvenile salmonids. Pools provide good hiding cover from predators, while allowing them to wait for food (typically aquatic macro invertebrates), which drifts downstream into the pools. See Table 3.6-4 for additional pool habitat information found in South Fork Mill, Alder, and Crow Creeks.

Table 3.6-4: Existing Number of Pools; Primary Pools (pools >=3' depth) Frequency vs. The Forest Plan Standard; and Frequency of Pools of all Depths vs. the PIG and NOAA Standards (shown in bold).

Stream	Reach	Avg. Bankful Width	Avg. Width Wetted	Pool to Riffle Ratio	Total Number		Primary Pools per Mile	Forest Plan Standard per Mile	Pools all Depths per Mile	NMFS Standard per Mile	PIG Standard per Mile
					Primary	All Depths					
S Fk Mill	1	6.5	16.4	1:2.2	9	94	2.8	116	**32.9**	**56**	**56**
S Fk Mill	2	CROW CREEK RESERVOIR									
S Fk Mill	3	10.0	10.9	1:3.8	8	209	1.6	176	**41.7**	**70**	**56**
Alder	1	5.8	5.2	1:4.5	0	152	0	303	**43.0**	**96**	**96**
Crow	1	12.9	8.7	1:3.5	2	246	0.4	136.4	**47.4**	**96**	**96**

*South Fork Mill Creek survey was completed in 1999 and both Alder and Crow Creek's were surveyed in 1998. All stream reaches identified above are present in project area.

South Fork Mill Creek
Pools in South Fork Mill had good depth with an average residual depth of 1.4 feet. Step-pool sequences were most abundant in the middle of Reach 3. Sixty-eight percent of the pool control structures were substrate, twenty-seven percent were wood, and five percent were a combination of wood and substrate. Forest Plan Standards for pool frequency were not met in either Reach 1 or 3. The small size of the stream would not promote the formation of deep pools. NMFS and PIG standards were also not met.

Alder Creek
Alder Creek had a few pools identified during the survey, which provided good depth and cover but the majority of the pools were shallow and just had over 1 foot of residual depth. Step pool sequences were present throughout the survey with riffles dominating these sequences. The higher gradient of this system leads to the formation of these types of step habitats. Fifty-nine

percent of the pool control structures were wood, 32% were substrate and 9% were a combination of wood and substrate.

Crow Creek
Crow Creek's average residual pool depths were 1.1 feet. Not many deep pools were encountered during the survey but the fish observed were commonly seen in pool habitat. Step-pool sequences were found intermittently throughout the survey. The majority of the sequences were dominated by riffle habitat. Pool controls were 48% substrate, 40% wood, and 12% a combination of wood and substrate.

PETS Fish and/or Aquatic Species in or Downstream of Action Area

Regional Forester's Special Status Species List - Federally Threatened Date: January 2008

Mid-Columbia River steelhead trout (NOAA)
Mid-Columbia River steelhead trout and their critical habitat are present in the North Fork Mill and South Fork Mill Creek 6th field subwatershed, but are not present in project area or area of influence. South Fork Mill Creek has three barriers, Wicks Water Filtration Plant (RM 1.0), Mill Creek Falls (RM 3.0), and Crow Creek Reservoir (RM 11.1), two of which are human-made and have altered fish migration. Wicks Filtration Plant diverts water for use by The Dalles and dewaters the creek during most summers creating a migration barrier. During the winter months the section of the creek between the confluence and the filtration plant is not dewatered and does provide passage for runs of steelhead (Rod French, (ODFW), personal communication, 2006). Steelhead trout are present in South Fork Mill Creek and have been documented by ODFW up to Mill Creek Falls which is 4.5 RM from the project boundary and is a historic and current barrier to fish passage (US Forest Service, 2000a). Mill Creek Falls is also the upper extent of designated critical habitat for steelhead in South Fork Mill Creek (National Marine Fisheries Service (NMFS), 2005).

Other Threatened Fish Species found on Mt. Hood National Forest
Lower Columbia River Steelhead, Lower Columbia River Chinook and Coho salmon, Columbia River Bull trout, as well as Upper Willamette River Chinook salmon do reside on Mt. Hood National Forest, but do not reside in the project area or in the Mill Creek 5th field watershed, and therefore, will not be discussed any further in this section.

Regional Forester's Special Status Species List - Sensitive Vertebrates and Invertebrates January 2008

Special Status Species are those plant and animal species identified by the Regional Forester for which population viability is a concern, as evidenced by:

- Significant current or predicted downward trends in population numbers or density.
- Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution." (FSM 2670.5)

Special Status aquatic species that reside, or potentially reside, within the action area include:

Rainbow/Interior Redband Trout
Interior redband trout maybe present in the North Fork Mill and South Fork Mill Creek 6th field subwatershed, but are not present in project area or area of influence. Genetic analysis of salmonids from the mainstem of 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 it is assumed they are the inland variety (Gregg et al., 1995). Salmonids in South Fork Mill Creek upstream from Mill Creek Falls are cutthroat trout (US Forest Service, 2000a). For this analysis, resident rainbow trout distribution is assumed to be identical to steelhead distribution. Thus, activities in the project would have no effect on rainbows in South Fork Mill Creek and they would not be discussed further.

Columbia Duskysnail
This species of aquatic mollusk has been found across the Forest during surveys conducted over the past several years (Mt. Hood National Forest, unpublished data). Habitat requirements for this species are fairly specific: cold well oxygenated springs, seeps, and small streams, preferring areas without aquatic macrophytes. Individuals have not been found in larger streams and rivers, or glacial streams.

Surveys were conducted during 2010 at 12 locations throughout the project area. Columbia duskysnails were found in 2 of the 12 sites surveyed in 2010. Both positive sites were located on Crow Creek adjacent to units 35 and 47, which is both above and below the confluence with Alder Creek. Seven of the 12 sites surveyed were found to be intermittent stream channels and did not have suitable habitat.

Barren Juga
This species of aquatic mollusk is found in fresh water habitats in small to medium sized highly oxygenated cold water streams at low elevations. The species prefers streams that have moderate velocity level bottoms with stable gravel substrates. The known range of this species is the Columbia River Gorge in Oregon and Washington. The 2010 surveys did not find Barren Juga to be present in the project area. They have not been found in the Mt. Hood National Forest, but have been found in the Columbia Gorge National Scenic Area.

Purple-lipped Juga
The Purple-lipped Juga is endemic to Oregon. It is found in large streams at low elevations. These snails prefer riffle habitat with stable gravel substrates, in cold well oxygenated water. It is more tolerant of silt and slack water than other Juga subspecies. The known range of the species is the Lower Deschutes River drainage, below Pelton Dam, and the Warm Springs River in Wasco and Sherman Counties, OR. Sites where the species are known to occur are located on the Warm Springs Reservation and Prineville BLM in Deschutes Wild and Scenic River Area. The 2010 surveys did not find Purple-lipped Juga to be present in the project area.

Scott's Apatanian Caddisfly
This species of caddisfly inhabits small cold mountain streams. The species has been found in four locations on Mt. Hood: from an alpine stream below Timberline Lodge, the south fork of

Iron Creek, from a stream at the junction of Highways 35 and 48, and on a tributary of the Salmon River. The species may occur in other localities on or near Mt. Hood, however extensive surveys have not been conducted. The 2010 surveys did not find Scott's Apatanian Caddisfly to be present in the project area.

Rare and Uncommon Species and Rationale for Survey Recommendation January 2008

There are two species of rare and uncommon aquatic mollusks known to occur or that potentially occur on the Forest: Columbia duskysnail and Basalt Juga. The former is also a special status species and is discussed above. Although the Basalt Juga has only been found on Forest in the North Fork Mill Creek drainage it was not found to be present in the project area during the 2010 survey effort, therefore it is not believed to present in the project area.

Essential Fish Habitat September 2000

Chinook and coho essential fish habitat (EFH), as defined by NOAA (50 CFR Part 600) is, "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". Chinook and coho EFH as defined by NOAA is not present in the project area. Chinook and coho EFH as defined by NOAA is present in Mill Creek watershed. Chinook and coho salmon are known to be present in Mill Creek about 4.2 RM's downstream from the confluence of the North and South Forks of Mill Creek, about 11.4 RM's downstream from the project boundary. Although no chinook or coho have been observed at the confluence there are no physical barriers that would prevent them from reaching that point. Observations of chinook and coho in Mill Creek are usually 1 to 2 RM above the city of The Dalles. Above the confluence of North and South Fork Mill Creek's there is likely no fish passage up South Fork Mill Creek due to the lack of flows (Rod French, ODFW, personal communication). As such, activities in the project would have no effect on chinook and coho EFH and they would not be discussed further.

Management Indicator Species 1990

Salmonids

Because of their relative sensitivity to change, salmonids were selected as "an indicator species group" for aquatic habitats. This group of species is especially important for their commercial and game values and because they occupy the spectrum of aquatic habitats on the Forest. These requirements are restricted enough that it is reasonable to assume that if the life history needs of salmonids are met, the rest of other fish species found on the Forest would be met (see FEIS, III-58). Management Indicator Species (MIS) for the Forest include the threatened anadromous species (Chinook salmon, coho salmon, steelhead, and bull trout), coastal cutthroat trout, and rainbow trout. A forest-level analysis of the status of these species and their habitat was conducted in March of 2011. The state of Oregon, in concert with the regulatory agencies, manages fish populations while the Forest manages the habitat. For a population to be viable, attributes such as species abundance, productivity, spatial structure, and genetic diversity are needed for the species to maintain its capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment. All of these attributes are affected by habitat and other environmental conditions that influence species behavior and survival.

The only MIS fish species within the project is cutthroat trout. Cutthroat trout are widespread and do not have Endangered Species Act listed status. Cutthroat trout are either confirmed or suspected to occupy about 15 miles of stream and about 26 acres of reservoir habitat in the project area. In total, there are 1,370 miles of native trout habitat on the Forest, therefore 1% of the total length of stream habitat for native trout is found within the project area. A 2011 analysis of watershed condition conducted at the 6th field level determined that overall physical aquatic habitat in North Fork Mill and South Fork Mill Creek 6th field subwatershed was given a classification rating of 1.8, which is between "Properly Functioning" and "Functioning at Risk".

Cutthroat trout (Oncorhynchus clarkii)

South Fork Mill Creek
Salmonids known to be present in South Fork Mill Creek above Mill Creek Falls include only cutthroat (See Project Record). Forest Service personnel observed cutthroat trout while electroshocking and made ocular observation of salmonids during surveys in South Fork Mill Creek up to RM 16.3 (US Forest Service, 1999, MHNF, unpublished data). The Dog River aqueduct augments streamflows and may act as a corridor for fish passage from the East Fork Hood River watershed. The aqueduct is not screened and removes virtually all of the water from Dog River. A 2010 genetic analysis (Smith et al. 2010), conducted by MHNF, ODFW, and USFWs Abernathy Fish Technology Center of cutthroat trout from the Mt. Hood National Forest identified two outlier populations between the Hood River Ranger District and Barlow Ranger District. One of those two groups was Upper Dog River (above the Dog River irrigation pipeline to South Fork Mill Creek), South Fork Mill Creek, and Crow Creek. Alder Creek did not have genetic samples taken from its waters

Alder Creek

Salmonids known to be present in Alder Creek include only cutthroat trout. Forest Service personnel observed cutthroat trout while electroshocking and made ocular observation of salmonids during surveys in Alder Creek from RM 1.5 to RM 1.7 (MHNF, unpublished data). Stream surveyors also observed cutthroat trout during their survey up to river mile 1.8 which is above the FR 1721 culvert (US Forest Service, 1998a). The FR 1721 road was identified as a fish passage barrier during a 2000 survey resulting in a fragmented population of cutthroat in Alder Creek.

Crow Creek
Salmonids known to be present in Crow Creek only include only cutthroat trout. Forest Service personnel observed cutthroat trout while electroshocking and made an ocular observation of a salmonid during surveys in Crow Creek up to RM 4.8 (MHNF, unpublished data). Stream surveyors also observed cutthroat trout during their survey (US Forest Service, 1998b).

3.6.3 Effects Analysis/Environmental Consequences

No Action – Direct and Indirect Effects

Consequences of the no action alternative to aquatic species and their habitat, such as water temperature, sediment, large woody debris, and pool quality and quantity, would be maintained or improve over time, unless a wildland fire occurs in either South Fork Mill, Alder, or Crow Creek 7th field subwatersheds. The level of environmental consequences to aquatic species is difficult to determine. They would be based on size, location, time, and severity of the wildland fire to aquatic species and their habitat. A small ridgeline wildland fire in early spring may have no consequences to aquatic species. But, a large watershed scale wildland fire may have long-term consequences to aquatic species and their habitat by causing water temperatures to increase because degraded streamside shade, increase sediment to the stream channel because of unstable soils, loss of long-term LWD because of loss of existing instream and floodplain LWD, and the loss of quality and quantity of pools because of increased sedimentation and loss of LWD in the stream channel and floodplain.

No short or long-term direct and indirect effects to aquatic species or their habitat from the no action alternative would occur. Water quality and habitat conditions would likely maintain their current trend without harvest activities. As stated in the environmental consequences section, water quality parameters such as stream temperature, sediment, LWD, and pools are expected to be maintained or improve over time in the project area, unless a high severity burn occurs. A high severity burn could increase both stream temperature and sediment, and decrease existing and future LWD, as well as pool quality and quantity in the stream channel. Although it is difficult to predict exactly where and to what extent a potential fire would burn in the South Fork Mill, Alder, or Crow Creek 7th field subwatersheds, aquatic species could be affected by a severe burn in riparian areas. Depending on the amount, fine sediments (ash or soil erosion resulting from burning of vegetative ground cover) could cover spawning gravels and/or food-producing riffle areas. Waters (1995) states that suspended sediment entering redds can act like a sediment trap, and the entry of oxygen required for salmonid embryo and Alvin's development is prevented. Similarly, large quantities of fine sediments resulting from a severe fire could have a negative effect on aquatic mollusk habitat and could impact potential populations within seeps and streams in and downstream of the burned area. If water temperatures increase, salmonid spawning and egg incubation could be negatively affected, and temperatures exceeding 22°C place the fish at risk for mortality (Bjornn and Rieser 1991). Still, although there may be detrimental impacts to aquatic species if a severe fire occurs within the planning area, it is impossible to specify the level of impact given the multiple fire scenarios that could take place. Thus, the no action alternative is assumed to have no effects and no impacts on aquatic species.

If no action is taken in riparian reserves, stands may require a longer period of time to reach the size and quantity of large woody debris sufficient to sustain physical complexity, including pools, and stability of the riparian reserves and associated streams.

The no action alternative in the *The Dalles Watershed Phase II Planning Area* would have a **NE** "No Effect" determination for federally listed as threatened Middle Columbia River DPS steelhead trout and their critical habitat. Regional Forester's special species listed as sensitive

interior redband trout, Columbia duskysnail, Barren Juga, purple-lipped Juga, and Scott's Apatanian Caddisfly would have a **NI** "No Impact" determination. Chinook and coho salmon EFH would be a **NAA** "Not Adversely Affected" determination due to EFH is not present in the project area and because the no action alternative to aquatic species and their habitat would not occur because no treatments would occur.

Proposed Action – Direct and Indirect Effects

Water Temperature
Due to the Proposed Action design criteria, there should be negligible, if any, possibility of shade reduction to the stream channels in or downstream of the proposed project area. Therefore, shade reductions that would result in water temperature increases are not expected to occur in South Fork Mill, Alder, or Crow Creek 7th field subwatersheds.

No Short or long-term indirect effects to water temperature from vegetation removal in the secondary shade zones from mechanical treatments or by underburning/slash pile burning (including Jackpot burning) is expected to occur due to the riparian reserve prescriptions and project design criteria/mitigation measures in place. There is a plan to remove vegetation off FS road 1720197, which crosses Crow Creek, but the removal of a few tree branches at the stream crossing, is expected to have negligible effects to stream shade and not cause water temperature in Crow Creek to increase for either the short or long-term.

Sedimentation
Increases in sedimentation to the stream channels in the project area are of a concern since it is the municipal watershed for the city of The Dalles. The proposed activities with the greatest potential of producing sediment to the stream channels in the project are from downhill fire line construction for underburns, ash created after underburning, roadside ditch cleaning near stream channel road crossings for road maintenance, and removing logs by winch cabling which includes skyline corridors. Recent research has found that stream buffers provide effective protection against sediment delivery from logging activity. Rashin and others (2006) looked at 21 harvest sites that had a variety of treatments ranging from no buffers to buffers up to 66 meters 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 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." The Proposed Action design criteria would provide protection from additional sediment inputs to the stream channels. Therefore, increases of fine sediment to the stream channel are not expected to occur and if it does occur it is expected to be negligible to any of the stream channels within or downstream of the proposed project area. Additional information on sediment issues can be found in both 3.5 Water Quality and 3.4 Soil Productivity sections of the Preliminary Assessment.

No short or long-term indirect effects from sedimentation to the streams by road maintenance activities are expected to occur, due to project design criteria/mitigation measures in place for the road maintenance work (i.e. Spot rock placement of about 50 cubic yards of 3 inch minus rock

on multiple roads throughout the project area). No Short-term indirect effects from increased fine sediment to the stream channels from fire line construction, underburning and/or slash pile burning (including Jackpot burning) winch pulling logs (including skyline and helicopter yarding) are expected to occur due to the design criteria/mitigation measures in place.

Large Woody Debris
Loss of existing LWD to the stream channel would not occur due to the Proposed Action design criteria. The Proposed Action design criteria would also allow for future LWD to stay within the Range of Natural Various (RNV), which is 39 to 144 pieces per mile for stream channels in the Mill Creek Watershed (Mill Creek Watershed Analysis does not identify a RNV for ecological conditions therefore, the adjacent Miles Creeks Watershed RNV conditions, which has common geological and ecological features as Mill Creek Watershed would be used as a surrogate for the RNV conditions in Mill Creek Watershed). The Proposed Action design criteria should allow for higher quality (larger trees) LWD to be available in the future for both the stream and floodplain due to the reduction of competition between smaller subdominant understory trees to existing dominate overstory trees in the riparian reserves. Therefore, levels of existing and future LWD are expected to move towards being within the RNV for LWD in South Fork Mill Creek, Alder, and Crow Creeks.

Existing levels of both instream LWD and pools would be retained for both the short and long-term. Short and long-term LWD recruitment of small, medium, and large size class diameter LWD is expected to occur even with implementing the Proposed Action, due to the riparian reserve vegetation prescription and the project design criteria/mitigation measures in place.

Pools
The proposed activities with the greatest potential of reducing pool quality and quantity to the stream channels in the project are those activities which increase fine sediment to the stream channel, which are: downhill fire line construction for underburns, ash created after underburning, roadside ditch cleaning near stream channel road crossings for road maintenance, removing logs by winch cabling which includes skyline corridors, as well as removing trees within the riparian reserve that would have the potential of falling into the stream channel and creating and maintaining a pool(s).

The Proposed Action design criteria would provide protection from additional sediment inputs to the stream channels, which could reduce pool quality and LWD, would remain within RNV for South Fork Mill, Alder, and Crow Creeks. Therefore, pool habitats are not expected to change from existing levels South Fork Mill, Alder, and Crow Creeks, or their tributaries.

Interrelated or Interdependent Actions of the Proposed Action Alternative

The interrelated or interdependent actions of the Proposed Action are road maintenance of the primary haul routes in the planning area. The majority of the work would be accomplished with standard road maintenance specifications: brushing, drainage maintenance, and routine blading. Snow plowing could occur on haul routes outside the The Dalles Watershed (FS road systems 1700 and 4400). The FS road systems 1700 and 4400, which are being proposed for log hauling are on improve level II gravel roads with no fish bearing stream crossings or they are on paved

level II roads, which have fish bearing stream crossings. Fine sedimentation is the primary concern with road maintenance and snow plowing to the stream channel and aquatic organisms. The Proposed Action design criteria would reduce the amount of fine sediment from entering the streams during implementation of the road maintenance and snow plowing. No sedimentation to streams are expected to occur from snow plowing on the haul routes being proposed. Additional information on sediment issues can be found in both 3.5 Water Quality and 3.4 Soil Productivity sections of the Preliminary Assessment.

Essential Fish Habitat

The proposed HFRA action in the The Dalles Watershed Phase II would have a **NE** "No Effect" determination for federally listed as threatened Middle Columbia River DPS steelhead trout and their critical habitat. The no effect determination is based on steelhead trout and or their critical habitat not being present within the project area or its area of influence. A **NAA** determination for EFH for Chinook and coho salmon is warranted because EFH is not present in the project area or its area of influence. Forest Service Region 6 sensitive interior redband trout, R6 sensitive Survey and Manage, Barren Juga, purple-lipped Juga, and Scott's Apatanian Caddisfly would have a **NI** determination. The no impact determination is based on that interior redband trout and the three aquatic mollusk and insect R6 survey and manage species are not present within the project area or its area of influence. Forest Service Region 6 sensitive Columbia duskysnail is located in the project area, but is warranted to have a **NI** determination, due to the riparian reserve vegetation prescriptions and the proposed design criteria/mitigations that would be in place.

Table 3.6-5: List of Proposed, Endangered, Threatened, or Sensitive (PETS) Fish and Aquatic Mollusk Species Found on the Mt. Hood National Forest and Addressed under the Biological Evaluation

	Date of Listing & Critical Habitat	Suitable Habitat Present	Species Present	Effects of Alternatives	
Endangered Species Act Listing by ESU/DPS ***Threatened***				***No Action***	***Proposed Action***
Lower Columbia River steelhead & CH (*Oncorhynchus mykiss*)	1/06 9/05	No	No	NE	NE
Lower Columbia River chinook & CH (*Oncorhynchus tshawytscha)*	6/05 9/05	No	No	NE	NE
Columbia River Bull Trout* (*Salvelinus confluentus*)	6/98	No	No	NE	NE
Middle Columbia River steelhead & CH (*Oncorhynchus mykiss*)	1/06 9/05	No	No	NE	NE
Upper Willamette River chinook & CH (*Oncorhynchus tshawytscha)*	6/05 9/05	No	No	NE	NE
Lower Columbia River coho* *(Oncorhynchus kisutch)*	6/05	No	No	NE	NE
Essential Fish Habitat For Chinook and Coho Salmon	9/00	No	NA	NAA	NAA
Regional Forester's Special Status Species List					
Interior Redband Trout *(Oncorhynchus mykiss spp.)*	7/04	Yes	No	NI	NI
Columbia duskysnail *(Colligyrus sp. nov. 1)*	1/08	Yes	Yes	NI	NI
Barren Juga *(Juga hemphilli hemphilli)*	1/08	Yes	No	NI	NI
Purple-lipped Juga *(Juga hemphilli maupinensis)*	1/08	No	No	NI	NI
Scott's Apatanian Caddisfly *(Allomyia scotti)*	1/08	No	No	Ni	NI

*****critical habitat is not designated for these species on Federal lands

Endangered Species Act Abbreviations/ Acronyms:		**Essential Fish Habitat Abbreviations/ Acronyms:**	
NE	No Effect	NAA	Not Adversely Affected
NLAA	May Affect, Not Likely to Adversely Affect	AE	Adverse Effects
LAA	May Affect, Likely to Adversely Affect		
LOBA	May Affect, Likely to Only Beneficially Affect		
Regional Forester's Special Status Species List Abbreviations/ Acronyms:			
Unk	Species presence unknown but suspected		
NI	No Impact		
MIIH	May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species		

Cumulative Effects

There would be no cumulative effects to aquatic species and their habitat from the Proposed Action due to there being no direct or indirect effects for either the short or long-term from implementing the Proposed Action to aquatic species and their habitat. Refer to Table 3.0-1 for a list of all activities that were considered in this cumulative effects analysis.

3.6.4 Consistency Determination

The proposed activities are consistent with the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act (1996), the Northwest Forest Plan Standards and guidelines for Aquatic Conservation Strategy 9 objectives and following Mt. Hood National Forest Land Resource Management Plan standards and guidelines:

- FM-1: Design fuel treatment and fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management activities could be damaging to long-term ecosystem function.
- FM-4: Design prescribed burn projects and prescriptions to contribute to attainment of Aquatic Conservation Strategy objectives.
- TM-1c.: Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and mange stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.
- RF-3c.: closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to ACS objectives and considering short-term and long-term transportation needs.
- FW-138: Impacts on habitat for the management indicator species group (salmonids) shall be determined for each project affecting fisheries, in terms of habitat quality, quantity, and distribution.
- FW-087: Existing aquatic habitat complexity shall be maintained or increased.
- FW-088: Pool habitat shall be maintained at natural levels or enhanced.
- FW-092: At least 90% of potential and naturally occurring in-channel large woody debris (LWD) shall be maintained. Retention of multi-piece accumulations of LWD and fallen trees with attached root wads should be emphasized.
- FW-109: Summer water temperatures shall be maintained to protect existing on and off Forest beneficial water uses (State Water Quality Standards, Oregon Administrative Rules, Chapter 340-410.
- FW-113 and 114: State water quality standards for turbidity shall be met. No more than a 10% cumulative increase in natural in-stream turbidity should be allowed to result from forest management activities (Oregon Administrative Rules 340, Div. 41).

3.7 Wildlife Resources

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 Barlow Ranger District. The analysis and conclusions of the evaluation are summarized below. Reference material is contained in the full Biological Evaluation.

Wildlife Species in the Project Area

Two species of wildlife classified as threatened, endangered or proposed may be found on or adjacent to the Barlow Ranger District. There are eighteen Forest Service Region 6 sensitive species, seven special status species , and seven Management Indicator species that may also be found on the District. The status of threatened, endangered, and proposed species; Forest Service Region 6 sensitive species; special status species; and Management Indicator species in the project area are listed in Table 3.7-1. Species that are not present in the project area, and species who's habitat is not within the project boundary will not be discussed further in this section.

Table 3.7-1: The Status of Threatened, Endangered, and Proposed Species; Forest Service Region 6 Sensitive Species; Special Status Species; and Management Indicator Species on the District.

Species	Habitat	Presence
Federally Threatened, Endangered or Proposed		
Northern spotted owl *(Strix occidentalis caurina)*	Y	Y
Canada lynx *(Lynx canadensis)*	N	-
R6 Sensitive Species		
Bald eagle *(Haliatus leucocephalus)*	N	-
Oregon Slender salamander *(Batrachoseps wrighti)*	Y	Y
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)*	N	-
Pacific fisher *(Martes pennanti)*	N	-
Horned grebe *(Podiceps auritus)*	N	-
Bufflehead *(Bucephala albeola)*	N	-
Harlequin duck *(Histrionicus histrionicus)*	N	-
Gray flycatcher *(Empidonax wrightii)*	N	-
Peregrine falcon *(Falco peregrinus anatum)*	N	-
Johnson's hairstreak *(Callophyrs johnsoni)*	N	-
Mardon skipper *(Polites mardon)*	N	-

Species	Habitat	Presence
Special Status Species		
Great gray owl *(Strix nebulosa)*	N	-
Larch Mountain salamander *(Plethodon larselii)*	N	N
Dalles sideband *(Monadenia fidelis minor)*	Y	Y
Crater Lake tightcoil *(Pristiloma arcticum crateris)*	N	N
Evening fieldslug *(Deroceras hesperium)*	N	N
Puget Oregonian *(Cryptomastix devia)*	Y	N
Columbia Oregonian *(Cryptomastix hendersoni)*	Y	N
Management Indicator Species		
Mule Deer (*Odocoileus hemionus*) and Elk (*Cervus elaphus nelsoni*)	Y	Y
Pileated Woodpecker *(Dryocopus pileatus)*	Y	Y
Pine Marten *(Martes americana)*	Y	Y
Wild Turkey *(Meleagris gallopavo)*	Y	Y
Western Gray Squirrel *(Sciurus griseus griseus)*	Y	Y
Snag and Down Log Associated Species	Y	Y
Neotropical Migratory Birds	Y	Y

(Y = Yes, N = No)

Threatened, endangered and proposed species (Northern spotted owl)

Existing Condition

The northern spotted owl (spotted owl) is listed as a threatened species under the Endangered Species Act and is a Management Indicator Species under the National Forest Management Act.

Habitat

Spotted owls generally rely on older forested habitats that contain the structures and characteristics required for nesting, roosting, foraging, and dispersal. These characteristics of older forests include a multi-layered, multi-species canopy dominated by large overstory trees; moderate to high canopy closure; a high incidence of trees with large cavities and other types of deformities; numerous large snags; an abundance of large, dead wood on the ground; and open space within and below the upper canopy for spotted owls to fly (Thomas et al. 1990). Forested stands with high canopy closure also provide thermal cover, as well as protection from predation.

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

Snags and down woody debris are an important component of spotted owl habitat. Few large remnant snags and down wood remain in the project area. Most of the snags and down wood that does exist within the project area is small in diameter.

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.

Management and Population Trends

The Recovery Plan for the Northern Spotted Owl (USFWS 2008) 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 (USDI 2008). Active management to reduce wildfire and insect outbreak risks would 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 *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 spotted owl over the past 14 years were expected, they concluded that the accelerating downward trends on some study areas in Washington where little timber harvest was taking place suggest that something other than timber harvest is responsible for the decline. Since the decline appear to be across the range of the spotted owl, it is likely that these same declines apply to the owls in The Dalles Watershed.

Methodology

Disturbance

The U.S. Fish and Wildlife Service (USFWS) has concluded that noise, smoke, and human presence can result in a disruption of breeding, feeding, or sheltering behavior of the spotted owl such that it creates the potential for injury to individuals (i.e. incidental take in the form of harassment). For a significant disruption of spotted owl behavior to occur as a result of

disturbance caused by the Proposed Action, the disturbance and spotted owl(s) must be in close proximity to one another. Human presence on the ground is not expected to cause a significant disruption of behavior because spotted owls do not seem to be startled in those situations.

A spotted owl that may be disturbed at a roost site is presumably capable of moving away from the disturbance without a substantial disruption of its behavior. Since spotted owls forage primarily at night, projects that occur during the day are not likely to disrupt its foraging behavior. The potential for effects is mainly associated with breeding behavior at active nest sites.

In the late breeding period, potential effects from disturbance decline because juvenile spotted owls are increasingly more capable of moving as the nesting season progresses. To ensure that more than 86 percent of juvenile spotted owls in the Oregon Eastern Cascades Physiographic Province are able to move away from disturbance without increasing their risk of predation or harm, the critical breeding period is considered to be March 1 through July 15th. After July 15th, it is estimated that most fledgling spotted owls are capable of sustained flight and can move away from most harmful disturbances.

The USFWS has based disruption distances on interpretation of the best available information. The Proposed Action for this project that generate noise above ambient levels would be helicopters, heavy equipment, and chainsaw use. Disruption distances of 0.25 miles for helicopters, 35 yards for heavy equipment, and 65 yards for chainsaws have been set by the USFWS.

Analysis Area

Since there are few recent surveys for spotted owls that show the locations of active nest sites on the Forest, historical spotted owl information is used. Historical nest sites are used because studies show that nests are used for many years and when a site has been found to be unoccupied during surveys, it can be subsequently utilized by a different pair of owls years later. In addition to historic sites, predicted nest sites would be used to analyze the effects of the proposed project on spotted owls. The predicted sites are used for areas with incomplete or no spotted owl survey information. The purpose of using predicted sites is to estimate spotted owl numbers and distribution within unsurveyed habitat for purposes of assessing the effects of a proposed project on spotted owls. These predicted sites are based on factors known to influence the carrying capacity of a given area for spotted owls.

While it is usually the alteration or removal of suitable habitat that potentially results in adverse impacts to a territorial pair of spotted owls, the loss or degradation of dispersal habitat may also result in short-term impacts. The USFWS has guidelines for how much removal of suitable habitat would result in take but there are no such guidelines for dispersal habitat.

For the Willamette Province the home range is a 1.2 mile radius circle (2,955 acres) centered on a historic nest site. The proposed treatment units are within the home range of 6 pairs of owls. Incidental take would be presumed to occur when suitable habitat is removed from a home range and if suitable habitat is less than 40 percent of the home range. A core area has been defined as the area within a home range that receives disproportionately high use (503 acres or 0.5 mile

radius circle from the historic nest). Incidental take would be presumed to occur when suitable habitat is removed from a core area and if suitable habitat is less than 50 percent of the core area.

There are 6 spotted owl home ranges that overlap treatment units. Currently, 2 of the home ranges are above the threshold levels of 40 percent, and the remaining 4 territories are below 40 percent suitable habitat (Table 3.7-2). Three of the spotted owl core areas are above the 50 percent threshold and the remaining 3 core areas are below 50 percent suitable habitat.

Table 3.7-2: Percent of Suitable Habitat in Core Area and Home Range

Owl Pair Number	% Suitable Habitat in Home Range	% Suitable Habitat in Core Area
1078P89	70	73
1180P94	46	62
1031T96	24	21
6101P90	19	32
6030P95	17	18
6038P90	33	67

Approximately 658 acres of the treatment units are providing dispersal-only habitat for spotted owls and 660 acres are providing suitable nesting habitat. The Natural Resource Area provides an additional 203 acres of suitable nesting habitat. The remainder of the project area is considered non-habitat for spotted owls. These stands are still young, generally less than 40 years old and are less than 11 inches in diameter and are considered too small to support dispersing spotted owls.

Effects Analysis / Environmental Consequences

No Action – Direct and Indirect Effects

No short-term effects to the spotted owl would occur with this alternative. In the short term, the units that are providing dispersal habitat would continue to function as dispersal habitat and snag levels would remain essentially unchanged. In 20-30 years, the stands would start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood which would improve the quality of the dispersal habitat. The stands that are currently considered non-habitat for the owls would likely become dispersal habitat. Some of the stands that are currently providing dispersal habitat may eventually develop nesting habitat characteristics and become suitable spotted owl habitat. It could take as long as 60 to 100 years for these stands to develop into suitable habitat. Habitat that is currently providing suitable habitat would likely remain suitable with no action. With no action there would be no sound related disturbance to owls.

Proposed Action – Direct and Indirect Effects

The proposed treatments would include a thinning prescription that would improve the growth rate of the stand. Larger trees would eventually be provided in the second-growth stands in a faster timeframe than they would with no thinning. This would increase the rate that dispersal and suitable habitat would be available for spotted owl.

The proposed treatments would also impact or remove dispersal and nesting habitat. The proposed harvest treatments would temporarily impact approximately 351 acres of dispersal habitat. This degradation of habitat would occur as a result of opening up the canopy cover to 40 percent or greater; as well as the loss of some down wood, shrubs, and snags which provide habitat for prey species. Although the dispersal habitat within these units would be reduced in quality, they would still function as dispersal habitat. It is estimated that these units would again provide quality dispersal habitat approximately 10 to 15 years after harvest.

The proposed harvest treatments would temporally remove 434 acres of dispersal habitat. Even though some snags and down wood would be retained, portions of these stands would be reduced below 40 percent canopy cover which is the threshold for maintaining dispersal habitat. These units would regain dispersal habitat attributes in approximately 10 to 15 years after harvest as trees and understory grow and canopy cover increases.

The proposed harvest treatments would temporarily degrade approximately 351 acres of suitable habitat. This impact to habitat would occur as a result of opening up the canopy cover to 60 percent or above; as well as the loss of some down wood, understory, and snags which provide habitat for prey species. Although the suitable habitat within these units would be reduced in quality, they would still function as nesting habitat. It is estimated that these units would again provide quality nesting habitat approximately 15 to 20 years after harvest.

The proposed harvest treatments would temporarily remove 224 acres of suitable habitat. Even though some snags and down wood would be retained, portions of these stands would be reduced below 60 percent canopy cover which is the threshold for suitable habitat. These units would regain suitable habitat attributes in approximately 30 to 50 years after harvest as trees and understory grow and canopy cover increases.

Many of the units are within the 1.2 mile radius (~3000 acres) home range of historic nest sites. Spotted owls need a minimum of 40 percent suitable habitat within their home range to provide the resources necessary to meet essential life functions (Thomas et al. 1990, Courtney et al. 2004). As the amount of suitable habitat in an owl's home range decreases, so does site occupancy, reproduction, and survival (Courtney et al. 2004). In addition to impacts in the home range, two of the treatment units and the jackpot burning acres are within the 0.5 mile core area of historic nest sites. Spotted owls need a minimum of 50 percent suitable habitat within their core area.

The proposed treatments would not reduce the acres of suitable habitat below threshold levels in 2 home ranges (P94 and P89) that are currently above 40 percent suitable habitat. It is anticipated that these sites would continue to provide enough habitat to maintain occupancy and reproduction after the proposed treatments. The remaining 4 home ranges are currently below 40 percent suitable habitat and treatments would further reduce the amount of suitable habitat available to those territories. Since some of the home ranges are currently well below threshold levels (Table 3.7-2), it is likely that these sites are currently not able to maintain occupancy and reproduction. Site 6038P90 is currently slightly below the threshold level at 33 percent suitable habitat. The proposed treatments would further reduce the amount of habitat. Reducing the amount of suitable habitat in this territory may prevent this nesting pair from being able to

successfully nest and produce young. Because this pair has a sufficient amount of suitable habitat in the core area, this may off-set the impacts of reducing the amount of habitat in the home range.

The loss of dispersal habitat would affect the ability of owls to move through these stands. Since many units are within the home range of a pair of owls, the impacts to habitat or reduction in quality of habitat could reduce the birds nesting and foraging ability or shift the core area of a nesting pair away from the thinned stands. The removal of suitable nesting habitat is **likely to adversely affect** northern spotted owl. The degradation of suitable or dispersal habitat, and the removal of dispersal habitat **may affect, but are not likely to adversely affect**, northern spotted owls.

Sound disturbance caused by thinning activity would not adversely affect the breeding behavior of spotted owls during their critical breeding period because no heavy equipment or chainsaw use would occur within the 35-65 yard disruption distances during the critical breeding period of March 1 to July 15. Some activities would take place between March 1 and July 15, but they would be beyond the disruption distance from a spotted owl nest site. Therefore, all the proposed projects **may affect, but are not likely to adversely affect**, nesting northern spotted owls due to disturbance.

Cumulative Effects

The cumulative effects to spotted owls and suitable habitat from past, present, and future projects, including The Dalles Watershed Fuel Break, North Fork Mill Creek Stewardship sales, and the Dog River Pipeline replacement, would reduce the amount of suitable habitat, reducing the ability of some owl pairs to maintain territories and successfully produce young within the watershed.

The cumulative effects to spotted owls and dispersal habitat from past timber harvest, pre-commercial thinning, and hazard tree removal would be minor, mainly because dispersal habitat is not the limiting factor for owls in the area. In this analysis area, the more likely limiting factor for spotted owls is the lack of spotted owl suitable habitat and lack of connectivity between these suitable habitat blocks. In the long term, thinning treatments in dispersal habitat would accelerate the development of suitable spotted owl habitat.

Recovery Action 7 from the Spotted Owl Recovery Plan (USDI 2008) 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 proposed treatments would promote tree species such as ponderosa pine and Douglas fir that are more resilient to fire. Thinned stands that retain and promote fire resistant tree species would provide habitat that is more resilient to the effects of fire and would therefore benefit spotted owl in the long-term. Spotted owls would continue to persist in the watershed because active management to reduce the risk of wildfire and insect outbreaks is expected to offset the risks of habitat loss.

Consistency Determination

The effects to northern spotted owls for this project were consulted on with the U.S. Fish and Wildlife Service through formal consultation on FY 2011-2012 activities within the Willamette province that have the potential to adversely affect spotted owls due to habitat modification and disturbance (FWS reference: 13420-2010-F-0157). The conclusion by the US Fish and Wildlife Service is that these projects are not likely to jeopardize the continued existence of the spotted owl or result in the destruction or adverse modification of spotted owl critical habitat. This consultation was updated in May 2011 to incorporate some additional units that were may affect, but not likely to adversely affect (NLAA) for spotted owls (FWS reference: 13420-2011-I-0135).

These two consultation documents cover the actions that are proposed outside the Research Natural Area on National Forest System lands. In addition, a third consultation process is underway to address the proposed treatments within the Research Natural Area and on City of The Dalles lands within the interior of the watershed. Also, the consultation would include the proposed treatment units that were initially classified as non-owl habitat but after a field review, these units were determined to be suitable or dispersal habitat. A stand-alone consultation is required for these units and will be completed in 2011 prior to signing the Decision Notice for this project.

Known spotted owl activity centers within the project area would be protected (ROD Standards and Guidelines pp C-10). One hundred acres of the best spotted owl habitat would be retained as close to the nest site or owl activity center as possible for all known (as of January 1, 1994) spotted owl activity centers located on federal lands.

Portions of the watershed are within a Northern Spotted Owl Habitat Area (A8 of the Forest Plan Forest Plan) of which approximately 20 acres of treatments are proposed. Treatment methods would be consistent with A8-025 and 026 in which uneven aged silvicultural techniques would be employed to meet limited fuel reduction goals and also enhance habitat characteristics.

This project is consistent with guidelines in the Northern Spotted Owl Recovery Plan for habitat management in dry forests. Recovery Action 7 includes direction to manage lands in east-side Provinces outside of the high-quality habitat patches to restore ecological processes and functions to reduce the potential for significant losses by stand-replacement fires, insects, and disease.

Region 6 Sensitive Species (Oregon Slender Salamander)

Existing Condition

This species is currently found from the north Oregon Cascade Range and foothills, occurring west of the crest from the Columbia River to Highway 58, and occurring east of the crest from the Columbia River to the Warm Springs Indian Reservation. It occurs across a north-south range of close to 145 miles, from approximately 80 feet in elevation (at the northern end of its range in the Columbia gorge) to around 5,600 feet at the southern end of its range on the west side of the Cascade Range crest. There are 740 site records, which collapse to 407 sites when locations within 650 feet of each other are combined.

This terrestrial salamander is highly associated with down wood in forests. In the western Cascades, four habitat characteristics have a significant positive association with Oregon slender salamanders: canopy closure, snags, west and east aspects, and decayed logs in the 20 to 30 inch diameter class. While it may be found in all seral stages when down wood is present, studies west of the Cascade Range have shown abundances are higher in late-successional forests. Habitat associations east of the Cascades are not as well known. The species uses a variety of ground cover ranging from sloughed bark to down logs, and occur in younger and older forests.

Methodology and Analysis Points

Surveys on the Forest for this species were completed in 2009. Oregon slender salamander were found at a total of 7 of the 23 sites visited. It is not known why detection rates were so low. Access to sites was restricted due to heavy snow and many sites were beginning to dry by the time surveys were conducted which may account for the low number of occupied sites. In 2010, surveys for mollusk species were conducted in The Dalles Watershed. Oregon slender salamander were detected within several treatment units during these surveys.

Effects Analysis / Environmental Consequences

No Action – Direct and Indirect Effects
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.

Proposed Action – Direct and Indirect Effects
The proposed project would remove approximately 224 acres of habitat for Oregon slender salamander. Fuels treatments would remove down wood and reduce canopy closure on these acres, which would eliminate suitable habitat for this species. This alternative **may impact individuals, but is not likely to impact populations, nor contribute to a potential loss of viability of this species**. The Surveyor's Ridge LSR is within the watershed and would provide suitable habitat with 240 linear feet of down logs per acre. In addition to the LSR, 436 acres of the treatment units would be maintained in suitable habitat for Oregon slender salamander. All sites found during the 2010 surveys would be protected by a buffer before treatment activities.

Cumulative Effects
The cumulative effects to Oregon slender salamander from past, present, and future projects, including The Dalles Watershed Fuel Break, North Fork Mill Creek Stewardship sales, and the Dog River Pipeline replacement, would reduce the amount of suitable habitat for this species. In the long term, thinning treatments would accelerate the development of suitable habitat. The Surveyor's Ridge LSR is within the watershed and would provide suitable habitat with 240 linear feet of down logs per acre. In addition to the LSR, 436 acres of the treatment units would be maintained in suitable habitat for Oregon slender salamander. All sites found during the 2010 surveys would be protected by a buffer before treatment activities.

Consistency Determination

Surveys were conducted in the project area in 2010 for Special Status Species in compliance with the species survey requirements and management provisions found in the Record of

Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines 2001.

Special Status Species (Dalles Sideband, Puget Oregonian and Columbia Oregonian)

Existing Condition

Dalles Sideband

This species has been found in moist talus habitat (especially around seeps and springs), and in forested areas in upland sites near, but outside of, riparian corridors. Mollusks which inhabit rocky habitats also utilize the surrounding forest areas during moist, cool conditions. In some forested sites, the species has been found associated with down wood where no rock substrates occur. Down wood may provide temporary refugia used during dispersal in the wet season, while rock substrates provide more stable refugia during summer and winter. This species was found in the project area during 2010 surveys and the known sites would be buffered prior to project implementation.

Puget Oregonian

This snail is found in moist, conifer forest habitats. Although often occurring within riparian areas, and possibly confined to the riparian zone in some dry landscapes or less densely forested areas, it is not generally a riparian obligate. *C. devia* is usually absent from riparian zones prone to regular or occasional flooding. It is associated with bigleaf maples growing among conifers (usually Douglas-fir, western hemlock and western redcedar), or in groves of maples and other hardwoods such as black cottonwood and red alder. This species is often found on or under hardwood logs or other woody material, maple leaf litter, or under the lowest fronds of swordfern plants (*Polystichum munitum*) that are growing near or under the maple crowns. Maples on flat or gentle slopes are more suitable habitat than steeper slopes, perhaps because they offer more stable environments. Large diameter, older bigleaf maples provide a deep leaf litter layer and are highly suitable habitat for this species, although they may also be found under smaller diameter maples, particularly when they occur in patches or are frequently interspersed within upland conifer stands. Young Puget Oregonian may be found among or under mosses, or in leaf litter or under swordfern fronds with adult animals. Surveys were conducted for this species in the project area but no individuals were found.

Columbia Oregonian

This species was originally known from the margins of a few seeps and spring-fed streams, at low elevation at the east end of the Columbia River Gorge, where this snail finds shelter under rocks and herbaceous vegetation along sun-lit margins of streams where there are few or no trees, presumably feeding on algae, microorganisms and herbaceous vegetation. In contrast, new mid-elevation records are from mature hemlock forests at several upland locations, at 792 and 1000 m (2600 and 3280 feet) elevation, where most snails were found associated with woody debris under a relatively closed canopy. Surveys were conducted for this species in the project area but no individuals were found.

Methodology and Analysis Points

Surveys were conducted in the project area in 2010 for Special Status Species in compliance with the applicable species survey requirements and management provisions found in the Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines 2001.

Effects Analysis / Environmental Consequences

No Action – Direct and Indirect Effects
There would be no impact to mollusk species with the No Action alternative because no activities would take place in suitable habitat and no habitat would be altered or removed.

Proposed Action – Direct and Indirect Effects
This project would impact habitat for mollusks by reducing snags and down wood on 224 acres. All sites found during 2010 surveys would be protected by a buffer before treatments. In addition, the 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 maintained in the Surveyor's Ridge. The Proposed Action **may impact individuals, but is not likely to impact populations, nor contribute to a potential loss of viability of these species**.

Cumulative Effects
The cumulative effects to mollusk species from past, present, and future projects, including The Dalles Watershed Fuel Break, North Fork Mill Creek Stewardship sales, and the Dog River Pipeline replacement, would reduce the amount of suitable habitat for these species. In the long term, thinning treatments would accelerate the development of suitable habitat. The Surveyor's Ridge LSR is within the watershed and would provide suitable habitat with 240 linear feet of down logs per acre. In addition to the LSR, 436 acres of the treatment units would be maintained in suitable habitat for Mollusks. Although all the treatment units are outside of the LSR, the LSR would contribute to habitat requirements for these species within the watershed. All sites found during the 2010 surveys would be protected by a buffer before treatment activities.

Consistency Determination

Surveys were conducted in the project area in 2010 for Special Status Species in compliance with the species survey requirements and management provisions found in the Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines 2001.

Management Indicator Species

Existing Condition

Mule Deer and Elk
Deer and Elk were selected as management indicator species because they are economically

important game animals. Deer and elk utilize early-successional habitat for foraging and were originally thought to require mature and old growth forest for thermal cover.

The Forest Plan Standards and Guidelines have minimum requirements for optimal and thermal cover habitat components, but no specific level for forage. During the 1980s and 1990s wildlife managers considered thermal cover to be important to deer and elk survival and production. Over time, wildlife managers have questioned if elk required thermal cover. Currently, there is not much support from the elk research community for the necessity of thermal cover for elk. John Cook indicated at the Elk Modeling Workshop (April 2010) that telemetry data indicated that elk were negatively associated with cover. Cook indicated that openings are far more valuable for elk than cover. With the reduction in regeneration timber harvest, the Forest now has abundant optimal and thermal cover but openings for forage are becoming scarce. There are approximately 69,226 acres of early-seral habitat on the Forest. This level is declining over time since plantations have grown dense with trees that shade out forage.

Based on State and global rankings, deer and elk are common, widespread and abundant. The Oregon Department of Fish and Wildlife (ODFW) considers them a game species. The intent of having deer and elk as MIS species is due to their economic importance as game animals.

Deer and elk populations on the Forest are stable with a future anticipated trend of declines from a reduced amount of early-successional habitat due to reductions in harvest, differences in harvest methods, and low levels of wildfires. This is general consensus among biologist on the Forest and ODFW. There is limited data to support this because dense cover makes surveys too difficult to be reliable. At this time, there is no concern for viability of the species by ODFW. If viability becomes a concern, ODFW would close or limit the hunting season.

The project area supports elk and deer for most of the year. Elk cows and calves are in the western portion of the watershed from early spring though late fall. The eastern portion is in winter range and a number of elk and deer spend the winter there depending on snow accumulation. Deer are less likely to be there during periods of heavy snowfall as they are less able to move through deep snow. Forage is widely available in the watershed, but is generally of low quality.

High road densities lead to harassment of elk herds. Harassed elk move more often than elk left alone and use of habitat decreases as road density increases (Witmer 1985). It is also recognized that elk within or moving through areas of high open-road densities move longer distances; often several miles per day. There are no open roads in the project area. This area is closed to the public since it is a municipal watershed. Therefore, the open road density in the project area is below the Forest Plan standards for the land allocations in the watershed.

Thermal cover for elk is defined as a stand of coniferous trees at least 40 feet tall with an average crown closure of 70 percent or more. Optimal cover is found mainly in multi-storied mature and old-growth stands. Both of these habitat types are within the project area.

Pileated Woodpecker

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

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

There are 405,092 acres of pileated woodpecker habitat on the Mt Hood National Forest based on GIS data for habitat 80 years and older. By dividing the acres of pileated woodpecker habitat by the average home range with overlap of 970 acres there are 418 potential home ranges on the Mt Hood National Forest. With an average clutch size of 4 (Marshall, D.B. et al. 2003), this would indicate that the summer population of pileated woodpeckers could be as high as 2508 birds including adults and fledglings. Given the amount of habitat available in The Dalles Watershed, there may be 2 or 3 home ranges in the project area.

American Marten

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

The Forest has approximately 21,553 acres of habitat that have a 30 percent or higher probability of supporting American marten. A home range of 173 acres was used in determining the number of home ranges on the Forest. There are approximately 63-125 home ranges for martens on the Forest. The original Forest Plan analysis for marten overestimated habitat at 231 home ranges. The current model is closer to predicting the actual population because it is supported by tracking information provided by Cascadia Wild (winter tracking data and camera stations). Home ranges may contain two adults and up to three young. The estimated population on the Forest is 310-625 martens.

The project area has a total of 234 acres in 5 different treatment units within B5 American Marten Habitat Area. The goal for this type of habitat is to provide mature or old growth forest habitat blocks of sufficient quality, quantity, and distribution to sustain viable populations of pileated woodpecker and pine martin. At least 160 acres of mature and/or old growth forest habitat shall be maintained within each 320 acre Management Area. The secondary goal is to maintain a healthy forest condition through a variety of timber management practices. Thinning may occur within the

non-mature/old growth habitat component, i.e. stands less than 100 years of age and canopy closure within the forest canopy shall be at least 50 percent within thinning activity areas.

The open road density standard for B5 is 2.0 miles per square mile. This area is closed to the public since it is a municipal watershed. Therefore, the open road density in the project area is below the Forest Plan standards for this land allocation in the watershed.

Wild Turkey

The wild turkey is a management indicator species for the ponderosa pine-Oregon white oak association of the Forest. Two subspecies of wild turkeys (Merriam's and Rio Grande) 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 and nest on the ground hidden by grass or shrubs. Turkeys roost in large diameter (> 20 inch dbh) ponderosa pine and Douglas fir generally on slopes greater than 30 percent. Turkeys are present within The Dalles Watershed and there is nesting, roosting, and foraging habitat within the project area.

Western Gray Squirrel

The western gray squirrel is also a management indicator species for the ponderosa pine-Oregon white oak association of the Forest. Western gray squirrels need a mix of mast-producing trees to provide food, cover, and nesting sites in their habitat. The ecological range of the western gray squirrel includes a variety of habitat types within mixed conifer-oak forests. Gray squirrel have been documented in the project area and there is wintering and nesting habitat available in the watershed.

Gray squirrels require various age classes of oaks, including old live and dead trees, to provide both food and cover, and different age categories of conifers are important for year-round cover and seasonally important food (Patton, 1984). Generally, the squirrels require trees of a size sufficient to produce an interconnected canopy for aerial travel (Rodrick, 1986). Gray squirrels usually build winter and rearing nests in conifers and temporary or summer nests in deciduous trees.

Gray squirrels require a variety of food sources of which, the hypogeous fungi appear to be the most important as it makes up a major portion of the squirrels diet year round and the spread of these fungi play an important role in the health of the forests in which they live. Coniferous trees depend on the fungi for the uptake of non-mobile minerals from the soil. Pine and fir seeds are also eaten all year and almost exclusively in the late summer and early fall. Acorns are eaten from late fall through winter.

Methodology

The National Forest Management Act requires the Forest Service to manage wildlife habitat to "maintain viable populations of existing native and desired non-native vertebrate species in the planning area." The National Forest Management Act requires the Forest Service to identify Management Indicator Species through the planning process, and to establish objectives to maintain and improve the habitat of indicator species. The primary assumption of this process is that indicator species represent the habitat needs of other species because they have similar

habitat requirements. Spotted owls, for example, indicate the needs of a variety of animals that use old growth forest. This analysis focuses on certain key species and does not specifically address common species except to the extent that they are represented by these management indicator species.

Management Indicator Species for this portion of the Forest include northern spotted owl, pileated woodpecker, American marten, deer, and elk (Table 3.7-3).

Table 3.7-3: Management Indicator Species for the Project Area.

Management Indicator Species	Habitat Description	Habitat Present in Analysis Area	Species Present in Analysis Area
Northern Spotted Owl	Old Growth	Yes	Documented
Deer	Early Forest Succession Mature/Old Growth	Yes	Documented
Elk	Early Forest Succession Mature/Old Growth	Yes	Documented
Pileated Woodpecker	Mature/Over Mature	Yes	Documented
American Marten	Mature/Over Mature	Yes	Suspected
Gray Squirrel	Old Growth Ponderosa Pine Pine/Oak	Yes	Not Suspected
Wild Turkey	Old Growth Ponderosa Pine Pine/Oak	Yes	Not Suspected

With the selection of some of these species there was a special emphasis on mature, over mature, and old growth habitat. The selection was done at a time when timber harvest was planned to replace many older stands with younger more rapidly growing stands: it was suspected that the mature and over mature stands would decline and the species associated with this habitat could be lost. Several species were selected to represent all of the species that required this type of habitat. A Forest-wide analysis for Management Indicator Species has been conducted: the report is incorporated by reference and is available in the project record located in Dufur, Oregon.

Effects Analysis / Environmental Consequences

Mule Deer and Elk

<u>No Action – Direct and Indirect Effects</u>
Disturbance from human presence and activities within the planning area would remain the same as the current levels. Stand structural development would remain unchanged over the short-term within the planning area for deer and elk. No forage habitat would be created and thermal and hiding cover for deer and elk would remain the same. In the long-term, forage habitat would be reduced within the watershed as open areas are overgrown with tree species.

Proposed Action – Direct and Indirect Effects

Variable density thinning would benefit 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 skips within treatment units would maintain patches for hiding and thermal cover. Forage habitat for deer and elk would be created in areas of heavy thinning. 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 as open areas are overgrown with tree species. 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 proposed treatments would temporarily remove the thermal cover from the stands. This habitat would be downgraded to non-cover for deer and elk and would have a temporary increase in forage. The increase in forage would be due to increased sunlight reaching the forest floor as a result of opening the canopy. The forage created by treatments is predicted to be low to moderate in quality. Canopy closure is expected to eventually increase to the point in which most forage benefits are lost within 15 to 20 years. Consequently forage conditions would return to pre-treatment levels and most of the lost thermal cover characteristics in the stands would be regained.

Portions of the stands would include the creation of heavy thins, gaps, and gap-like features such as landings, and skid trails. These gaps and heavy thins would no longer be providing thermal cover. However, opening the canopy to this degree allows abundant sunlight to reach the forest floor, promoting the development of understory vegetation. Usually this vegetation consists of shrubs and sometimes grasses which are highly palatable to deer and elk. The areas treated in gaps could lose much of their forage qualities in approximately 20 years and return to providing thermal cover in about 40 years. The skips and stream protection buffers would maintain their forest structure and continue to provide thermal cover.

The loss of thermal cover and increase in forage in the proposed units could alter distribution of deer and elk use of the project area. While there would be a loss of low-moderate quality thermal cover, there would also be an increase in forage in these same stands. Some of this gained forage would not occur close enough to cover for it to be fully utilized by deer and elk.

Deer are a species that can readily adapt to these changes. Elk are more selective and not as adaptive. Only small impacts are predicted to the deer populations in the area. Elk do not appear to use this habitat extensively in the winter, so only small impacts are predicted to the elk population as well. Although there is the possibility that herd sizes would be reduced to a small degree, these effects are not predicted to last long and would be partially off-set by the increase in forage.

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 per square mile on B10 winter range. New temporary road construction and old existing temporary roads would be reopened and some would be reconstructed to access treatment units. These roads would not be open to the public and the only disturbance occurring as a result of these roads would be their use required to accomplish the project activities. After treatments, the roads that were opened would be closed

and open-road density would return to the current level. There would be no increase in the long-term harassment of deer and elk with this alternative; the effects would be short-term only. There would be no increase in the permanent roads open to the public, and therefore no increase in open-road density with this alternative.

The Mt. Hood Forest Plan Standard and Guide FW-208 recommends 2.5 mile per square mile of open roads on summer range and 1.5 miles per square mile on B10 winter range. Open road densities in the project area would be below the Forest Plan Standards and Guidelines for summer range and B10 winter range since there would be no open roads within the watershed.

Cumulative Effects

Projects that impact deer and elk forage and cover include past timber harvest, The Dalles Watershed Fuel Break, North Fork Mill Creek, and pre-commercial thinning. The Dalles Watershed Fuel Break and the North Fork Mill Creek project areas combined would have 48% forage and 52% cover post treatment. 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 and cover decreasing after the Proposed Action treatments. This would move the forage to cover ratio towards the optimum ratio.

Other projects that have the potential to impact deer and elk include OHV use, trail construction, grazing, and pre-commercial thinning. Pre-commercial thinning may temporarily increase forage and OHV use and trail construction and subsequent use can contribute to the disturbance of deer and elk on wintering and calving grounds. Grazing can cause competition for forage with cattle, reducing the overall amount of forage available for deer and elk.

American Marten and Pileated Woodpecker

No Action – Direct and Indirect Effects

There would be no impact to American marten or pileated with the No Action alternative because no activities would take place in suitable habitat and no habitat would be altered or removed.

Proposed Action – Direct and Indirect Effects

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 and the Surveyor's Ridge LSR.

The proposed project would reduce snags and down wood below the 30 percent level. This would impact these species negatively by removing habitat required for nesting/denning and foraging. Adequate snags and down wood would be provided within Surveyor's Ridge LSR. The area within the Surveyor's Ridge LSR would have 240 linear feet of down logs per acre and 2.25 snags per acre (Surveyor's Ridge LSR Plan, 100% biological potential) post treatment. In addition to the LSR, 436 acres of the treatment units would be maintained in suitable habitat for American marten and pileated woodpecker. The remaining treatment units would not meet Mt.

Hood Forest Plan standards FW-215 (60% biological potential for snags should be maintained) and FW-219 (6 logs per acre should be retained).

There are a total of 234 acres in 5 different treatment units within American marten habitat areas (B5) designated in the Mt. Hood Forest Plan. All activities within this management area would meet the Forest Plan Standards (B5-010). At least 160 acres of mature and/or old growth forest habitat would be maintained within the 320 acre Management Area. Thinning would occur within the stands less than 100 years of age and canopy closure would be at least 50 percent within thinning activity areas (B5-020, 021). The project would meet the Forest Plan Standards (B-037, at least 24 snags > 24" shall be maintained within the 160 acre Management Area. Forest Plan Standards B-038 and B-039 would not be met; at least 6 logs per acre shall be maintained (B-038); logs shall be at least 20 inches in diameter at the small end and at least 20 feet in length (B-039) since these conditions do not currently exist in the treatment units.

The open road density standard for B5 is 2.0 miles per square mile. Open road densities in the project area would be below the Forest Plan Standards and Guidelines for B5 since there would be no open roads within the watershed.

Cumulative Effects

The cumulative effects to American marten and pileated woodpecker from past, present, and future projects include The Dalles Watershed Fuel Break, North Fork Mill Creek Stewardship sales, and the Dog River Pipeline replacement. These projects would reduce the amount of suitable habitat for these species. In the long term, some of the thinning treatments would accelerate the development of suitable habitat. The Surveyor's Ridge LSR within the watershed would provide suitable habitat with 240 linear feet of down logs per acre. In addition to the LSR, 436 acres of the treatment units would be maintained in suitable habitat for American marten and pileated woodpecker. Although all the treatment units are outside of the LSR, the LSR would contribute to habitat requirements for these species within the watershed.

Wild Turkey and Western Gray Squirrel

No Action – Direct and Indirect Effects

There would be no impact to wild turkey and gray squirrel with the No Action alternative because no activities would take place in suitable habitat and no habitat would be altered or removed.

Proposed Action –Direct and Indirect Effects

Forage does not appear to be the limiting factor for wild turkeys and gray squirrels within the project area. Adequate forage would be available within most of the units post treatment, and in the stands adjacent to the treatment units. Some roost and nest trees would be removed within the project area which would negatively impact these species, however the majority of large ponderosa pine and Douglas fir trees would be maintained. These large trees would still provide roost sites and forage for turkeys and gray squirrels. Turkey roost sites would be minimally impacted by this project as they are generally found on slopes greater than 30 percent. The majority of the treatment units are located on slopes less than 30 percent. Gray squirrel nest sites would be negatively impacted by treatments because tree canopies need to connect for squirrels

to utilize the stands.

Cumulative Effects
Cumulative effects to American marten and gray squirrel from past, present, and future projects, include The Dalles Watershed Fuel Break, North Fork Mill Creek Stewardship sales, and the Dog River Pipeline replacement. These projects would reduce the amount of forage and nesting habitat for these species. Gray squirrels would be negatively impacted by these projects because they would reduce canopy closures. This species requires tree canopy overlap in order to be able to move through the canopy and utilize the stand. Most of these projects would continue to provide forage habitat for both species. Most turkey roost sites would be maintained since the majority of these projects are on slopes less than 30 percent.

Consistency Determination

General
This analysis is consistent with The National Forest Management Act which requires the Forest Service to manage wildlife habitat to "maintain viable populations of existing native and desired non-native vertebrate species in the planning area." The National Forest Management Act requires the Forest Service to identify Management Indicator Species through the planning process, and to establish objectives to maintain and improve the habitat of indicator species. A Forest wide analysis was completed and is incorporated by reference.

American Marten
B5 Land Use Allocation: All activities within this management area would meet the Forest Plan Standard for B5-010: at least 160 acres of mature and/or old growth forest habitat would be maintained within the 320 acre Management Area. The project would meet the Forest Plan Standard B-037, : at least 24 snags > 24" shall be maintained within the 160 acre Management Area. Forest Plan Standards B-038 and B-039 would not be met; at least 6 logs per acre shall be maintained (B-038); logs shall be at least 20 inches in diameter at the small end and at least 20 feet in length (B-039) since these conditions do not currently exist in the treatment units.

Snag and Down Log Associated Species

Existing Condition

Some of the proposed harvest units consist of young second-growth stands that have undergone a regeneration harvest 40 to 60 years ago. As a result of this, few remnant or legacy snags or large down wood remain in the units. When they are found in these units, they are scattered and few in numbers. Most of the snags and down wood in these units are usually less than 12 inches in diameter.

Many wildlife species evolved to use large snags and logs that were historically abundant on the landscape. The loss of large snags and logs from managed stands affects biodiversity. Approximately 65 percent of the analysis area has been harvested in the past.

Based on snag and down woody debris surveys conducted in similar stands, the following assumptions can be made for the young second-growth stands in the project area. The percent

ground cover of wood ≥ 3 inches diameter would likely be less than 5 percent; much less in many cases. The number of snags ≥ 10 inches diameter would be less than 2.5 per acre, and in many cases less than 2 per acre.

In the remainder of the project area, the amount of snags and down wood varies greatly. The Surveyors Ridge Late Successional Reserve (LSR) provides snags and down wood at a much higher level than most of the watershed. The ability of the LSR to provide large snags has been reduce by overstocked stands that are experiencing mortality before the trees are able to grow large enough to provide snags in the over 21 inch size class. Outside of the LSR and young stands, snag levels vary greatly depending on the past harvest activities and the tree species composition.

Methodology

The watershed as a whole would be analyzed for historic and current snag levels as stand level analysis does not provide a meaningful measure to snag and down wood dependent species. Management for snags and down wood would be compared to unharvested conditions rather focusing on specific wildlife species requirements.

DecAID Advisor

DecAID is a planning tool intended to help advise and guide managers as they conserve and manage snags, partially dead trees and down wood for biodiversity (Mellen et al. 2003). It also can help managers decide on snag and down wood sizes and levels needed to help meet wildlife management objectives. This tool is not a wildlife population simulator nor is it an analysis of wildlife population viability.

A critical consideration in the use and interpretation of the DecAID tool is that of scales of space and time. DecAID is best applied at scales of subwatersheds, watersheds, subbasins, physiographic provinces, or large administrative units such as Ranger Districts or National Forests. DecAID is not intended to predict occurrence of wildlife at the scale of individual forest stands or specific locations. It is intended to be a broader planning aid not a species or stand specific prediction tool.

Modeling biological potential of wildlife species has been used in the past. DecAID was developed to avoid some pitfalls associated with that approach. There is not a direct relationship between the statistical summaries presented in DecAID and past calculations or models of biological potential.

Refer to the DecAID web site listed in the References section for more detail and for definition of terms. This advisory tool focuses on several key themes prevalent in recent literature:

- Decayed wood elements consist of more than just snags and down wood, such as live trees with dead tops or stem decay.
- Decayed wood provides habitat and resources for a wider array of organisms and their ecological functions than previously thought.
- Wood decay is an ecological process important to far more organisms than just terrestrial

vertebrates.

Snags and Down Wood Levels Compared to DecAID Data
The project area is located within the habitat type identified in DecAID as the Eastside Mixed Conifer Forests of Eastern Cascades and Blue Mountains in the vegetation condition of "large trees."

For this forest type, the DecAID advisor identifies the 30 percent tolerance level for snags as 5.3 snags per acre greater than 10 inches of which 3.6 per acre are greater than 20 inches in diameter. It identifies the 30 percent tolerance level for down wood as 2 percent cover of down wood (including all decay classes) with sizes of logs averaging 5 to 8 inches in diameter. Most of the proposed units contain snag and down wood numbers below the 30 percent tolerance level.

Effects Analysis / Environmental Consequences

No Action – Direct and Indirect Effects
Under the No Action alternative, in the short term, most units would have few snags and down wood. It is presumed that there would continue to be low numbers of snags per acre ≥10 inches diameter in the units. Most snags present would be smaller than this. In terms of the tolerance levels for snags and down wood within the applicable habitat type and structural condition identified in the DecAID advisor, most of the proposed harvest units would remain below the 30% tolerance level (5.3 snags/acres for trees ≥ 10 inches in diameter).

In the short term, the project area would provide low amounts of down wood cover. Most areas would be below 2 percent cover of down wood and therefore be below the 30 percent tolerance level for wildlife habitat. However, some of the harvest units would likely have at least 2 percent of down wood comprised of class 1-4 and therefore would meet the 30 percent tolerance level for down wood conditions, as indicated by DecAID inventory data from unharvested plots.

In the next 20 to 30 years these stands would begin to experience increased stand density and start to become increasingly more susceptible to insects and diseases. These natural processes would recruit new snags and down logs, mainly from the smaller and suppressed trees. Trees would take more than 30 years to reach the 20 inch size class (USDA 2009).

Proposed Action – Direct and Indirect Effects
Some snags are difficult to retain during logging because of their potential instability and danger. It is likely that some snags would need to be cut down during treatment activities because of safety considerations and that some downed logs would be degraded through the process of logging. Snags that are left standing after treatments would be more prone to wind damage and snow breakage than they would have been without thinning. There would likely be some loss of the remaining snags within 10 years after treatments. These would become down wood.

Skips in treatment areas where trees would be left on the landscape would include trees that are defective or have the elements of decay as described in the DecAID advisor. Hollow structures are created in living trees by heartrot decay organisms over many years. These hollow structures in living trees provide especially valuable habitat for a variety of wildlife. Trees with deformities

such as forked tops, broken tops, damaged and loose bark or brooms caused by mistletoe or rust can also provide important habitat for a number of wildlife species. Snags or green trees that fall down after thinning or burning treatments would contribute snags and down wood to the stand.

Implementation of the Proposed Action alternative would reduce the amount of small snag recruitment that would have occurred through the process of stress and mortality in the next 20 to 30 years. Some of the snags and downed logs that might have formed from the death of intermediate and suppressed trees would be removed by thinning activities. As a result the attainment of moderate-sized snags and down wood would be delayed because of the reduction in density of the stands which would reduce the levels of suppression mortality. Although some trees with elements of wood decay would be left to provide habitat for snag-dependent species; fewer new snags, trees with elements of wood decay, or down wood would be recruited for the short to mid-term. With thinning, small trees would take less than 30 years to reach the 20 inch size class but they would be healthy and less likely to die and become snags (USDA 2009). In the long term, trees would be larger compared to no action, and some would eventually die and become large snags and some would eventually fall naturally to create large coarse woody debris.

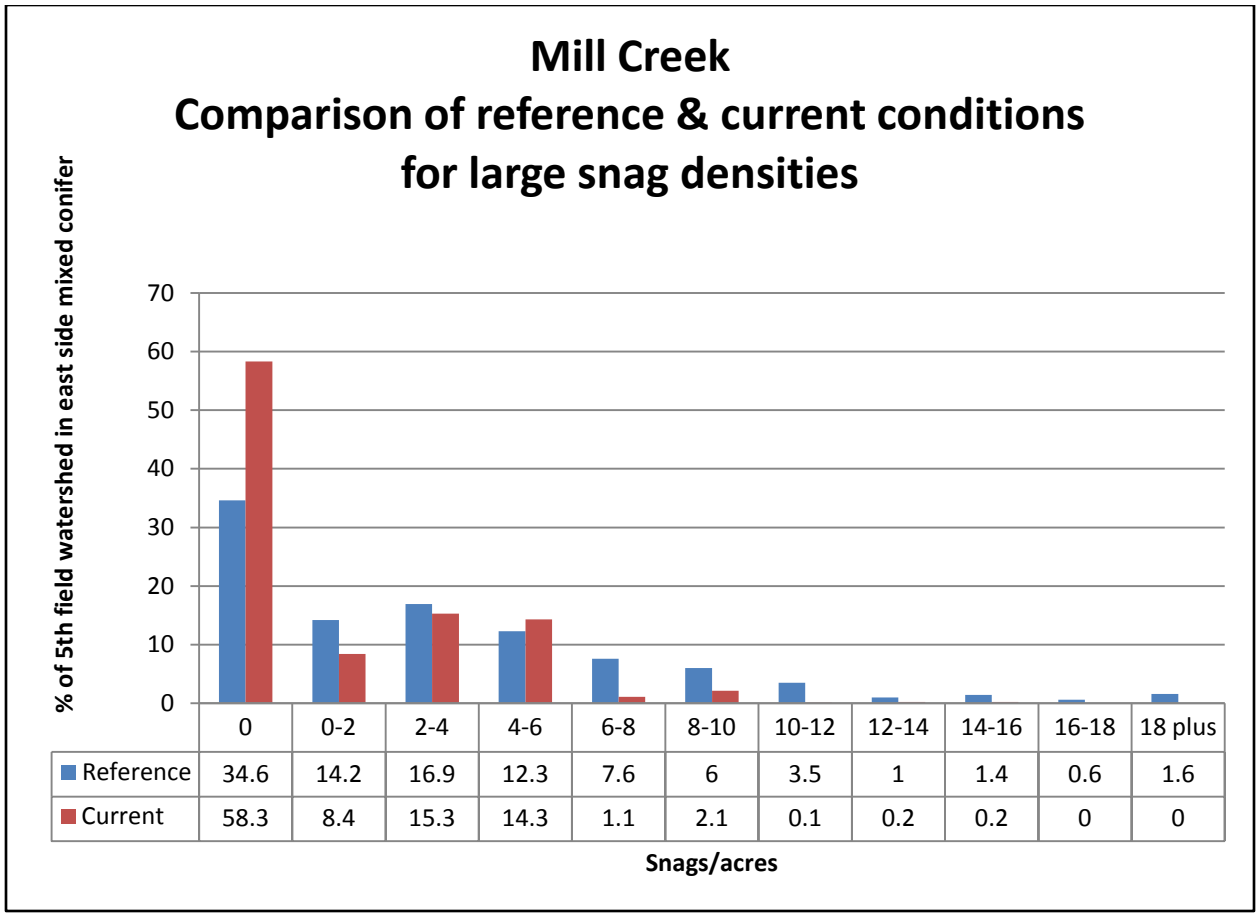
Under the Proposed Action, skips, streamside protection buffers, and the Surveyor's Ridge LSR would provide short and mid-term recruitment of snags and down wood similar to the level described for the No Action Alternative. The area within the Surveyor's Ridge LSR would have 240 linear feet of down logs per acre and 2.25 snags per acre (Surveyor's Ridge LSR Plan, 100% biological potential) post treatment. Most treatment units would not meet Mt. Hood Forest Plan standards FW-215 (60% biological potential for snags should be maintained) and FW-219 (6 logs per acre should be retained).

Snags and wildlife trees described are combined for the purpose of determining DecAID levels. Due to the low number of snags and trees with elements of wood decay in the project area, most units would have snag and defective tree densities and sizes below the 30% tolerance level pre and post treatment. The project would remove some snags and existing coarse woody debris.

Cumulative Effects

Past harvest on approximately 65% of the analysis area has reduced the abundance of large snags, although there are large snags in the mature forests within the project boundary. The current condition for large snags in the watershed is comparable to historic conditions for 2-4 and 4-6 snags per acre, but is lacking the 6-8, 8-10, snags per acre and high density patches of large snags (Figure 3.7-1). There is also a much greater percentage of the watershed with zero snags per acre than the reference condition. Implementation of this project would result in the loss of some large diameter snags but there are few snags greater than 20 inches diameter in the plantations. There would be a slight reduction in the percentage of biological potential being provided for species dependent on snags and down wood.

Other projects in the watershed that remove trees, such as The Dalles Watershed Fuel Break, North Fork Mill Creek Stewardship sales, the Dog River Pipeline replacement, and hazard tree removal have the potential to reduce snags and down wood on the landscape.



	0	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18 plus
Reference	34.6	14.2	16.9	12.3	7.6	6	3.5	1	1.4	0.6	1.6
Current	58.3	8.4	15.3	14.3	1.1	2.1	0.1	0.2	0.2	0	0

Figure 3.7-1: Comparison of Current and Reference Condition for Snag Densities

An analysis of snag recruitment for future deadwood on the landscape was conducted in Section 3.3, Vegetation Resources.

Consistency Determination

The area within the Surveyor's Ridge LSR would have 240 linear feet of down logs per acre and 2.25 snags per acre (Surveyor's Ridge LSR Plan, 100% biological potential) post treatment. Most treatment units would not meet Mt. Hood Forest Plan standards FW-215 (60% biological potential for snags should be maintained) and FW-219 (6 logs per acre should be retained).

Neotropical Migratory Birds

Existing Condition

Close to 30 species of migratory birds occur within the District, some of which are present within the project area during the breeding season. Some species favor habitat with late-successional characteristics such as the hermit thrush and brown creeper, while others favor early-successional habitat such as the Nashville warbler. White-headed woodpeckers and pygmy nuthatches require open stands of large ponderosa pine.

Methodology

Conservation strategies for land birds of the east slope of the Cascade Mountains in Oregon and Washington and a conservation strategy for land birds in coniferous forests in western Oregon and Washington were prepared in June 2000 and March 1999 respectively by Bob Altman of American Bird Conservancy for the Oregon-Washington Partners in Flight. The strategies are designed to achieve functioning ecosystems for land birds by addressing the habitat requirements of "focal species." By managing for a group of species representative of important components of a functioning ecosystem, it is assumed that many other species and elements of biodiversity would be maintained. The Mill Creeks Watershed contains elements of both these physiographic regions.

Table 3.7-4 displays the focal species potentially positively or negatively affected by changes in habitat in the eastern slope of the Cascade Mountains region, and the forest conditions and habitat attributes they represent.

Table 3.7-4: Focal Migratory Bird Species

Forest Conditions	Habitat Attribute	Focal Species
Ponderosa Pine	Old forest, large patches	White-headed woodpecker
Ponderosa Pine	Large trees	Pygmy nuthatch
Ponderosa Pine	Open understory, regeneration	Chipping sparrow
Ponderosa Pine	Burned old-forest	Lewis' woodpecker
Mixed Conifer	Large trees	Brown Creeper*
Mixed Conifer	Open understory, regeneration	Williamson's sapsucker
Mixed Conifer	Grassy openings, dense thickets	Flammulated owl
Mixed Conifer	Multi-layered, structural diverse	Hermit thrush
Mixed Conifer	Fire edges and openings	Olive-sided flycatcher*
Oak-Pine Woodland	Early-seral, dense understory	Nashville warbler
Oak-Pine Woodland	Large oaks with cavities	Ash-throated flycatcher
Oak-Pine Woodland	Large pine trees/snags	Lewis' woodpecker
Lodgepole Pine	Mature/old-growth	Black-backed woodpecker
Whitebark Pine	Mature/old-growth	Clark's nutcracker
Montane Meadows	Wet and dry	Sandhill crane
Aspen	Large trees/snags, regeneration	Red-naped sapsucker
Subalpine fir	Patchy presence	Blue grouse*

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

Effects Analysis / Environmental Consequences

No Action – Direct and Indirect Effects
There would be no alteration of habitat with this alternative and therefore no impacts to these species.

Proposed Action – Direct and Indirect Effects
Research has demonstrated that thinning enhances habitat for a number of migratory species and provides habitat for some species that are rare or absent in un-thinned stands (Hagar and Friesen 2009). However, some species of migratory birds have been shown to decline following thinning. The effects of thinning would most likely have a combination of positive, neutral, and negative impacts on migratory bird use within the stands depending on which species are present.

The Nashville warbler and Williamson's sapsucker would benefit from thinning because their habitat type includes open understory conditions. The hermit thrush and brown creeper would be negatively impacted by thinning since their habitat type includes multi-layered, structurally diverse forest conditions and Hagar and Frieson (2009) found that hermit thrushes in particular showed a marked decrease in numbers up to 12 years after thinning. More structurally diverse conditions are expected to return and provide habitat for these species as these stands develop over the next 20 to 30 years.

Species that would benefit from heavy thinning to open historic ponderosa pine stands include white-headed wood pecker and pygmy nuthatch. Both species require open ponderosa stands with large trees for nesting.

Cumulative Effects

Other projects that have the potential to impact migratory birds include, grazing, pre-commercial thinning, The Dalles Watershed Fuelbreak, hazard tree removal, North Fork Mill Creek, and the Dog River Pipeline. Pre-commercial thinning, The Dalles Watershed Fuelbreak, The Dog River Pipeline, and North Fork Mill Creek would create open habitat that would be beneficial for early seral species like the Nashville warbler and Williamson's sapsucker. The hermit thrush and brown creeper would be negatively impacted by thinning since their habitat includes structurally diverse forest conditions and these projects would remove this habitat. The North Fork Mill Creek project would benefit white-headed woodpeckers and pygmy nuthatch where prescriptions restore open ponderosa pine stands.

Grazing can have a negative impact on migratory birds. Species that are most likely to be affected by cattle grazing are those that are found in early-seral habitats that nest on the ground or in shrubs, like the chipping sparrow. The nests of these species can be destroyed by trampling or their nesting habitat can be removed when grazed or trampled by cattle.

3.8 Botany Resources

A Botany 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 Barlow Ranger District. The analysis and conclusions of the evaluation are summarized below. Reference material is contained in the full Biological Evaluation.

3.8.1 Methodology and Analysis Points

Management proposals were investigated to determine whether potential Proposed Endangered Threatened Endangered or Sensitive PETS species habitat may exist within or adjacent to the project area. Sources used include the Oregon Natural Heritage Database of Rare Species, the Mount Hood National Forest sensitive species plant database, Mount Hood National Forest botany survey database, Inter-agency Geographic Biotic Observations (GeoBob), the Oregon Flora Plant Atlas, the Forest Service national inventory database (NRIS TESP-IS), scientific literature, aerial photos, topographic maps, and knowledge provided by individuals familiar with the area.

Multiple surveys were conducted within the project area for botanical species in the Regional Forester's Special Status Species List (Revised January 2008), the 2001 Survey and Manage Record of Decision. They are documented in NRIS (US Forest Service NRIS TESP-IS National Data Base). The first documented survey was in 1996 with 3 other surveys conducted in the late 1990s. Approximately 10 survey visits were made throughout the project analysis area in the spring and summer of 2010. One Region 6 sensitive plant species, *Arabis sparsifolra* var. *atroriubens* sicklepod rockcress is documented in and adjacent to the project area. All the documentedsicklepod rockcress sites within the project area were visited at least once. All survey protocols within the 2001 Survey and Manage Record of Decision were followed.

Surveys targeted all botany species with management direction and attempted to identify all plants and lichens found.

3.8.2 Existing Condition

The spatial extent of analysis is the entire project area and peripheral areas on the north side of Mill Creek ridge that could be affected by proposed activities.

Sensitive species

Arabis sparsiflora var. *atrorubens*, sicklepod rockcress, is documented in the project area on non-forested areas on ridges and in dry openings dominated by brush and grass. No plants were found, however the timing of the surveys may have been such that they were difficult to locate. A district biological technician (personal communication) indicated that they had located the plant earlier in the year. Another site near the project area was visited to see the plant and to improve subsequent survey efficiencies. That population looked to be in good condition and was an example of good habitat for the species; however it seemed to bloom later because of the site and elevation.

Botrychium minganense, Mingan moonwort, is documented in the upper reaches of the Mill Creek watershed west of the project area. Virginia grape-fern was found along Crow Creek, upstream of the reservoir which prompted a more intense search. It is a more common species that grows in habitat similar to that of Mingan moonwort. No individuals of Mingan moonwort were found. This is can be a very difficult species to find because it is very small easily obscured by other vegetation. While surveyors do find Mingan moonwort the reality is it can easily be missed. The project area is distant from the known populations and considerably lower in elevation. Based on professional judgment Mingan moonwort is most likely not present.

Special Status Species

No special status species were found and none were documented in or adjacent to the project area. No other species of concern or their habitat were found in botany surveys of the analysis area.

3.8.3 Effects Analysis / Environmental Consequences

No Action – Direct and Indirect Effects

There are no effects anticipated from the No-Action alternative. Current populations would remain undisturbed by project activities but natural processes affecting the sicklepod rockcress would continue that may result in a natural decline, increase or extirpation of the species at any of the population sites. The species is likely to persist within the project area. Natural processes may include but are not limited to, fire, browsing and climate change.

Proposed Action – Direct and Indirect Effects

Arabis sparsiflora var. *atrorubens*
There should be no impacts as a result of harvest activities or mechanical fuel reduction work to the *Arabis sparsiflora* var. *atrorubens*, sicklepod rockcress documented sites. The use of fire may have an impact. The species is a biennial that typically flowers and dies in its second year. Site visits have demonstrated that the number of plants present at a site vary from year to year. There is anecdotal evidence that some disturbance increases seed germination. An absence of plants at a documented site is not proof that the species is absent since there is almost certainly seed in the soil. As an example at one site, outside the project area, about three previous searches did not find any plants but a plant was found in a 2011. A light fire may stimulate seed germination. A fall burn is assumed to be preferable to a spring burn because the plants are either dead or becoming dormant. The species occurs in and is presumed to be adapted to areas prone to occasional fire and other disturbance.

No indirect effects are anticipated. Direct effects are unpredictable because of the uncertainties involved with fire such as fire intensity, duration and timing of a burn. Immediate direct effects could be loss of some individual plants either mechanically (trampling or line construction) or from the burn. Long term direct effects could actually be a temporary population increase in some localities due to moderate disturbance.

The botany Biological Evaluation determination is "May Impact Individuals or Habitat (**MIIH**), but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species."

Botrychium minganense
Habitat was found for Mingan moonwort along Crow Creek but no individuals were found and are likely not present. No disturbance is expected in that riparian zone from any Proposed Action. No effects are anticipated. The botany Biological Evaluation determination is "No Impact **(NI)**".

Cumulative Effects

As there are little to no direct or indirect effects to sensitive plants or other botanical management species there can be no cumulative effects. Some of the key recent and planned projects considered in cumulative effects include The Dalles Watershed Fuelbreak, North Fork Mill Creek Restoration and Five Mile Underburn. Refer to Table 3.0-1 for a list of all activities that were considered in this cumulative effects analysis.

3.8.4 Consistency Determination

The Proposed Action and the No Action alternatives are consistent with U.S. Department of Agriculture Directives, the Forest Service Manual and the Forest Plan.

Forest Plan direction

FW-174, pg. Four-69. "Threatened, endangered and sensitive plants and animals shall be identified and managed …" One sensitive plant species is identified in the area. Management consists of protection and monitoring the sensitive plant sites. The sites have been monitored in the past and will be in the future independent of this project.

FW-175, pg. Four-69. "Habitat for threatened, endangered and sensitive plants and animals shall be protected and/or improved." The habitat for sicklepod rockress would be protected from actions that could reduce the suitability of habitat for the species.

2001 Survey and Manage Record of Decision

The Proposed Action and no action alternatives are consistent with 2001 Survey and Manage Record of Decision.

There are no Special Status botanical species known or suspected to occur in proposed activity units. All botany surveys included consideration of botanical species in table C-3 of the 2001 Survey and Manage Record of Decision.

3.9 Invasive Plant Species

3.9.1 Methodology

Invasive plant management direction is found in the 2005 Record of Decision (ROD) for Preventing and Managing Invasive Plants (USDA 2005) as well as the ROD for the Final Environmental Impact Statement (FEIS) for Site-Specific Invasive Plant Treatments for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area (March 2008). Both of these RODs amended the Mt. Hood National Forest Plan (1990). The ROD for the FEIS for Site-Specific Invasive Plant Treatments for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area provides more site-specific guidance for managing invasive plants on this Forest. It identified 208 areas to be treated manually, mechanically, or with herbicides and provided an early detection/rapid response (EDDR) strategy for treating new infestations quickly.

Non-native plants are species that have been introduced either intentionally or unintentionally to areas where they do not naturally occur. Most invasive non-native plants in the Pacific Northwest originate from Europe and Asia. The predators and diseases that control these plant species in their native habitats are not present in the habitats where they have been introduced. Unchecked by predators or disease, such plants may become invasive and dominate a site, displacing native plants and altering a site's biological and ecological integrity. For example, invasive plants can reduce biological diversity, displace entire native plant communities, decrease and degrade wildlife habitat, alter fire regimes, change hydrology, disrupt mycorrhizal associations, alter nutrient dynamics, and increase soil erosion. Invasive plants can also poison livestock and reduce the quality of recreational experiences.

The need to be more proactive in the treatment of noxious weeds over the entire Barlow Ranger District has become evident by examining several case studies on this district pertaining to weed treatments that have had varying levels of success. In the early 1990s a population of Yellow toadflax (*Linaria vulgaris*) was found along the 44 road during monitoring. It was eradicated with an active noxious weed program using manual treatments (hand pulling) and to this day has not been documented there since (D.Fissell, 2007). Scotch broom (*Cytisus scoparius*) has been documented on the old Bear Springs District in the 1980s, (T.Gibbs, 1988) and similar manual treatment was done with this species to reduce its occurrence. Recent follow up treatment monitoring supports this claim (D.Fissell, 2010), and indicates this noxious weed is not growing in size. In the 1980s, Houndstongue (*Cynoglossum officinale*) was documented near the Keeps Mill seed orchard (2120 road) when the only active control at that time was hand pulling and this infestation was small, only a few plants (T.Gibbs, 1988). Houndstongue now has expanded its range westward, now totaling over 214 acres (M. Keys, 2009). However, since 1998 when the ability to utilize herbicides was approved for the Barlow District, the effectiveness of keeping houndstongue from spreading west of the 43 road seems to have been a success since monitoring indicates and supports this at this time (D.Fissell, 2008). Eliminating Diffuse knapweed (*Centaurea diffusa)* from along major traveled roads such as the 48 and 44 has been due to the use of herbicides, (M. Keys, 2009).

Noxious weed treatments within The Dalles Watershed have basically been nonexistent since

access to this area is restricted and the use of herbicides or vegetation treatments within a municipal watershed can be very limited if allowed. Once the need arises for some type of EDRR because monitoring indicates this or the need for some type of follow up treatment due to management activities, the ability to be proactive and treat an area can make all the difference.

3.9.2 Existing Condition

Invasive non-native plants occur throughout the planning area; most notable are noxious weeds and some non-native grass species as listed in Table 3.9-1 below. These plant species can inhabit and negatively alter native plant communities and ecosystems.

The noxious weeds listed in Table 1 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 3.9-1: Oregon State Noxious Weed List for this planning area

"A" rated weeds	**"B" rated weeds**	**"T" rated weeds**
None	Diffuse knapweed (*Centaurea diffusa*)*	Spotted knapweed (*Centaurea maculosa)*
	Spotted knapweed (*Centaurea maculosa)*	
	Yellow toadflax (*Linaria vulgaris*)	
	St. Johnswort (*Hypericum perforatum*)	

* These species are currently being treated with herbicides on the Barlow and Hood River Ranger Districts adjacent to this planning area.

Noxious Weed Control Classification Definitions: as per the "Noxious Weed Policy and Classification System 2010, for the Oregon Department of Agriculture".

"A" Designated Weed - is 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 eradication or intensive control when and where found.

"B" Designated Weed – is a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.

Recommended action: Limited to intensive control at the state, county or regional level as determined on a specific, case-by-case basis. Where implementation of a fully-integrated statewide management plan is not feasible, biological control (when available) shall be the primary control method.

"T" Designated Weed – is a priority noxious weed designated by the Oregon State Weed Board as a target for which the ODA will develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

In addition to these noxious weeds, several non-native grass species were 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 would take a long time and would 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. 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 disturbance's from timber sales, recreation, and livestock grazing (north of this planning area). The creation of bare ground from these activities is where these species can gain a foot hold. These species are, Cheatgrass (*Bromus tectorum*), Barren brome (*Bromus sterilus*), Bulbous bluegrass (*Poa bulbosa*), and Voodoo grass (*Ventenata dubia*).

The current noxious weed treatment program adjacent to this planning area involves the use of herbicides along the 1720, 1700, 1700-660, 4400 4430 4440, and 4460 roads. The species of concern for treatment has been Diffuse knapweed, Yellow toadflax, St. Johnswort and some isolated Scotch broom plants. This treatment has proven effective in reducing the infestation along these roads. The treatments were monitored this last season, and determined that they would need treating this upcoming field season (2011), and are identified as such.

Field surveys were conducted inside The Dalles Watershed boundaries, along the 1720-190, 196, 197, 1720-170, and the 1721-012, 014. All of these roads had Diffuse knapweed growing along them. Some roads were more densely populated (1720-190) with knapweed than other roads (1721-012), but all of these roads did have at least one occurrence of knapweed. The 1720-190, and 1720-192 roads were also treated with herbicides last summer (2010) and monitored for effectiveness. It has not been determined yet whether a follow-up treatment will occur this 2011 field season.

3.9.3 Effects Analysis / Environmental Consequences

No Action – Direct and Indirect Effects

There would be no new ground disturbances within the planning area other than what is already occurring. The projects associated with this hazardous fuels reduction project such as; vegetation treatments, temporary road, skid trail and landing construction, prescribed fire, plus the design/mitigation measures would not be implemented, thus there would not be an 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.

Proposed Action – Direct and Indirect Effects

The activity of mechanical fuels reduction which would consist of tree thinning from below, machine and hand piling, hand thinning, pruning by hand, machine mastication, manual brush removal, temporary road building, and landing construction would cause a reduction in tree canopy and stems, which would provide favorable light conditions for invasive species establishment. Harvest activities (yarding material), deep ripping, and grapple piling, can expose and compact soils which would provide a seedbed for invasive species establishment. Prescribed burning (underburning) would be used in combination with pile burning and could potentially create soil conditions favorable for invasive species to become established.

The Proposed Action would increase the cost for the Barlow Ranger District to implement their current weed management program, since this activity would add additional acres needing monitoring and possible new treatment sites to the District's existing weed treatment program.

The Proposed Action could potentially increase the need for treatment and potentially the increased use of herbicides. There are stringent standards and guidelines in place whenever herbicides are utilized on the Mt. Hood NF per the Region 6 Invasive Plant EIS/ROD (2005) and the Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon EIS (2008).

Many actions have and would contribute to the risk of weed spread on this district. Conceivably 3,659 acres over the entire projected timeline for this project could become more susceptible to an invasive plant/noxious weed establishment opportunity from the activities involved with this project. These new populations could then be a source of seed to areas outside of this planning area.

The Proposed Action could potentially increase the spread of non-native grass species that are known to occur within 1 mile of this planning area in the short term. These non-natives are opportunistic and the creation of bare ground could provide for this. The general public won't have access to this entire planning area, so this vector for seed dispersal would be reduced.

There are three situations that could create the potential or contribute to the risk of invasive species establishment and/or spread.. The first would be the creation of bare ground from the activity of yarding by tractor of any merchantable timber, the machine piling of residual fuels for burning by a grapple piler/excavator, and the mowing/mastication of vegetation by a tractor, dozer or excavator. The second would be noxious weed seed introduction from the equipment used to do this work along with any other equipment used for rehabilitation work, such as reclaiming temporary roads, skid trails, and landings. The third source could potentially come from the use of contaminated seed used to re-vegetate or treat any area identified for rehabilitation for erosion control measures.

It is still not clear whether seeding after the activity of fire has positive, neutral, or negative effects on nonnative plant invasions during the recovery process after fire, and this is an area of needed research. The practice of seeding with nonnative grasses to reduce erosion after fire can

have some negative consequences. Native plant cover was reduced by 47% in areas that were seeded with nonnative grasses and a legume, versus areas that remained unseeded in an eastern Cascades forest (Schoennagel and Waller 1999). In addition to providing nonnative competition, the artificial seeding disrupted the natural recolonization by native species.

Cumulative Effects

The potential analysis area for invasive plants/noxious weeds is as far as humans, wildlife, or vehicles range from the proposed activity area. The focus of this analysis is the role of activities on the Barlow Ranger District (north of 44 road) and the Surveyors Ridge area of the Hood River Ranger District and its cumulative contribution to the introduction and spread of invasive plants/noxious weeds when added to the effects of this proposal.

Assumptions include: the U.S. Forest Service has only a slight influence on movement of humans, wildlife, or vehicles in or out of the planning area. Once a small infestation is detected, the rate of spread can be controlled. Monitoring, mitigation and an active treatment program can control the rate of spread. Herbicides have shown to be the most cost effective method for controlling the spread of noxious weeds.

Past, present, and reasonably foreseeable future activities occurring within this general area, which were considered for cumulative effects are listed in Table 3.0-1.

All of these projects (past activities) have and would (present/future activities) to a certain degree present potential opportunities for noxious weeds/ invasive species to become established or spread by their activities. The exception is the site-specific invasive species treatment project. This project would actively be reducing the populations of noxious weeds/ invasive species.

Past and current ground disturbing activities in the surrounding area outside The Dalles Watershed boundaries such as timber harvesting, road construction/ maintenance, trail construction/ maintenance, dispersed recreation, wildlife (deer/elk), Forest Service contractors, and fire suppression activities have all contributed to the establishment and spread of invasive species/noxious weeds. The recreational and economic land uses (hunting, hiking, off-road vehicle use/OHV, 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 outside of this planning area.

3.9.4 Consistency Determination

The Dalles Watershed Phase II Project has a MODERATE risk of introducing or spreading known populations of noxious weeds. Weed control measures are identified under the Project Design Criteria/Mitigation Measures 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 (Project Design Criteria/ Mitigation Measures – PDC) that would be undertaken during project implementation (FSM

2081.03, 11/29/95). The identification of PDC is also consistent with the Region 6 Invasive Plant EIS/ROD (2005) and the Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon EIS/ROD (2008).

Aggressive non-native plants or noxious weeds can invade and displace native plant communities causing long-lasting management problems. Noxious weeds can displace native vegetation, increase fire hazards, reduce the quality of recreational experiences, poison livestock, and replace both wildlife and livestock forage. By simplifying complex plant communities, weeds reduce biological diversity and threaten rare habitats.

In addition to noxious weeds, which are designated by the State, there is a group of non-native plants that are also aggressive though are not officially termed "noxious". These species populate areas throughout the district, and would be discussed where deemed appropriate.

The overall goal is to "retain native vegetation consistent with site capability and integrated resource management objectives to suppress invasive plants and prevent their establishment and growth." This objective is intended to result in adequate protection of growing conditions for maintenance of native vegetation.

3.9.5 Noxious Weed Risk Assessment

Factors considered in determining the level of risk for the introduction or spread of noxious weeds are:

___ 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 five or more of vectors* # 1 - 8 in the immediate project area.
3. Project operation activities not able to avoid weed populations.

_X_ 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 four of vectors* # 1 - 8 present in the immediate project area.
3. Project operation activities not able to avoid weed populations.

___ LOW

Has to be one of the following factors:

1. No more than three 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
3. Project operation activities are able to avoid weed populations.

* 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)
8. Forest Service/contractor project vehicles

The Dalles Watershed Phase II Project was given a Moderate risk ranking. After inventory and field inspection of the proposed planning area, Diffuse knapweed (*Centaurea diffusa*), has been documented along portions of roads 1720-190, 1720-191, and the 1720-192 as described above in the Existing Condition section. The project design criteria/mitigation measures identified in Section 2.2.3 would be adequate for reducing the risk of spread or establishment of any new noxious weed sites, but is not an absolute certainty.

3.10 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 focus on key parameters or indicators that make up elements of the nine Aquatic Conservation Strategy objectives, to determine if the project would restore, maintain, or degrade these indicators. Once this determination is made, the indicators are examined together with the Range of Natural Variability to ascertain whether the project is consistent with the objectives. A description of the range of natural variability of the "important physical and biological components" (ROD B-10) is necessary for determining whether a project "meets" or "does not prevent attainment" of the Aquatic Conservation Strategy objectives (ROD B-10). The Dalles Watershed Analysis doesn't contain a description of the range of natural variability, but the Miles Creek Watershed Analysis, located adjacent to the project area does. Conditions in the Miles Creek Watershed Analysis area are similar to the project area. In general, the watershed analysis range of natural variability for aquatic, riparian and hydrologic processes is tied to conforming to "legislation, agreements, and land management plans" such as the Forest Plan and the Northwest Forest Plan.

The following table displays specific indicators that comprise the Aquatic Conservation Strategy (ACS) objectives and the effects section that covers this indicator in the Preliminary Assessment.

Table 3.10-1: ACS Objective Indicators in the Preliminary Assessment

Indicators	Analysis Found in the Effects Section of the Preliminary Assessment
Water Temperature	Water Quality
Sediment	Soils, Water Quality, Fisheries

Indicators	Analysis Found in the Effects Section of the Preliminary Assessment
Chem. Contam.	Water Quality, Fisheries
Physical Barriers	Water Quality, Fisheries
Substrate	Fisheries
Large Woody Debris	Fisheries
Pool Frequency	Fisheries
Pool Quality	Fisheries
Off-Channel Habitat	Fisheries
Refugia	Fisheries
Width/Depth Ratio	Fisheries
Streambank Condition	Water Quality, Fisheries
Floodplain Connectivity	Water Quality, Fisheries
Peak/base Flows	Water Quality
Drainage Network Increase	Water Quality
Riparian Reserves	Water Quality, Fisheries

A description of the range of natural variability of the "important physical and biological components" (ROD B-10) is necessary for determining whether a project "meets" or "does not prevent attainment" of the Aquatic Conservation Strategy objectives (ROD B-10). The Dalles Watershed Analysis doesn't contain a description of the range of natural variability, but the Miles Creek Watershed Analysis, located adjacent to the project area does. Conditions in the Miles Creek Watershed Analysis area are similar to the project area. In general, the watershed analysis range of natural variability for aquatic, riparian and hydrologic processes is tied to conforming to "legislation, agreements, and land management plans" such as the Forest Plan and the Northwest Forest Plan.

The following table 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).

Table 3.10-2: ACS Objective Indicators for Each Alternative

	Effects of the Actions					
	No Action			Proposed Action		
Indicators	Restore[1]	Maintain[2]	Degrade[3]	Restore[1]	Maintain[2]	Degrade[3]
Water Quality: Temperature		X			X	
Sediment		X			X	
Chemical Contamination		X			X	
Habitat Access: Physical Barriers		X			X	
Habitat Elements: Substrate		X			X	
Large Woody Debris		X			X	
Pool Frequency		X			X	
Pool Quality		X			X	
Off-channel Habitat		X			X	
Refugia		X			X	
Channel Conditions and Dynamics: Width/Depth Ratio		X			X	
Streambank Condition		X			X	
Floodplain Connectivity		X			X	
Flow/Hydrology: Peak/Base Flows		X			X	
Drainage Network Increase		X			X	
Watershed Conditions: Riparian Reserves		X		X (slight improvement)		

[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.

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 may be seen at the 7th field sub-watershed scale but not at any larger scale.

Indicators other than those described in the bullet above would be maintained as outlined in the effects analysis above.

The following is a summary the Aquatic Conservation Strategy objectives (ROD B-10) and how the Proposed Action 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 streams or wetlands are proposed.

2. Maintain Spatial And Temporal Connectivity Within And Between Watersheds: The project would maintain the spatial and temporal connectivity within and between watersheds since no new road crossings of streams or wetlands are proposed.

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 (Section 3.4), Water Quality (Section 3.5), and Aquatic Species and Associated Habitat (Section 3.6) sections in Chapter 3.

5. Maintain Sediment Regimes: This project would maintain this objective through mitigation measures and design criteria such as establishment of undisturbed vegetative buffers next to perennial and intermittent streams, having no new road crossings of streams or wetlands and protection provided by Riparian Reserves would minimize sediment introduction.

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 25% Management Plan Standard and Guide which shouldn't result in any peak flow increase.

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, having no new road crossings of streams or wetlands and maintaining the Watershed Impact Area well below the 25% Management Plan Standard and Guide

would protect the integrity of the floodplains while minimizing the potential for increased peak flows. 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.

3.11 Recreation and Visual Quality

3.11.1 Methodology and Analysis Points

The intent of this report is to analyze how the recreation related resources would be affected by the management actions proposed by the USDA Forest Service. The area used in this analyze is The Dalles Watershed Phase II project boundary determined by using Geographic Information System (GIS) data maintained by the Mount Hood National Forest. Professional judgment was incorporated in determining the project's potential effects. On the ground analysis was obtained by walk through surveys including visual assessments from known recreation resources (e.g. trails and campgrounds). Surveys were conducted during the 2011 field season by district recreation personnel. Forest Service standards are applied in the trail design features to ensure that National Forest System Trails (NFST) would be appropriately reconstructed where necessary after the completion of the project. Design standards for Forest Service Trails are found in Forest Service Handbook 2309.18 and vary depending on designed use and trail class.

Issues relevant to the recreational resource include:

1. FS System Trails and Associated Trail Visual Quality Objectives
2. Developed Recreation Facilities (Including Campgrounds)
3. Dispersed Recreation Opportunities

These indicators were chosen as directed by National Policy and Forest Plan Direction. The National Environmental Policy Act (NEPA) requires integrated use of the natural and social sciences in all planning and decision-making that affects the human environment. The human environment includes the natural and physical environment and the relationship of people to the environment (40 CFR 1508.14).

Indicators Measures
Indicator Measures are intended to address how each action individually (direct and indirect effects) and each alternative as the sum total of its Proposed Actions (cumulative effects) respond to the Forest Plan.

1. FS System Trails and Associated Trail Visual Quality Objectives

    - Would the proposed activities affect Forest Service System Trails?
    - Would Trail Visual Quality objectives as outlined in Forest Wide Standards and Guidelines be met?

2. Developed Recreation Facilities (Including Campgrounds)

    - Would the proposed activities have affects on Developed Recreation Facilities?
    - Does the Project Comply with LMP standards for Developed Recreation Facilities?

3. Dispersed Recreation Opportunities

    - Would the proposed activities affect Dispersed Recreation Opportunities?
    - Does the Project comply with LMP standards for ROS?

3.11.2 Existing Condition

The treatment units total approximately 3,660 acres of which only 3.5 acres (Jackpot Burning) occur outside of The Dalles Municipal Watershed (DMWS). This is important to note as very few recreational resources are located near or within the project area seeing that DMWS is closed to all public access. Recreational use within the watershed consists of a limited amount of deer and elk special hunting tags (around 15 a year) that are issued for public access.

FS System Trails and Associated Trail Visual Quality Objectives

There are two Forest Service System Trails that either pass through the project boundary or exist directly adjacent to the project boundary. They are North Section Line Trail (#451) and Surveyors Ridge Trail (#668).

The North Section Line Trail (#451)
The North Section Line Trail (#451) runs through the northwestern portion of the project boundary. It is approximately 4.6 miles in length and provides a continuous link with the Surveyors Ridge Trail (#688). The recreation opportunity spectrum (ROS) is defined as Roaded Natural (RN) characterized by a natural appearing environment with moderate evidence of human activity. Resource modification and utilization practices are evident. The trail is considered developed or trail class 3 (TC3) meaning that the trail tread is continuous and obvious. The trail is primarily used by equestrians.

The North Section Line Trail receives its greatest visitations numbers from the nearby community of Hood River and as far as Portland. Visitation is highest during early season spring with increased use during fall. Local visitation also occurs during week days and usually peaks between late afternoon and early dusk because of the short driving distance from the local area.

Trail maintenance efforts are done by local volunteers to provide sustainable recreation in a forest setting. A walk through Survey was completed and the trail is currently meeting all trail management objectives.

The North Section Line Trail (#451) Visual Quality Objectives
The North Section Line Trail is classified as Level II VQO (Visual Quality Objective) rating in the Forest Plan. A walk through survey of the North Section Line Trail was completed and an estimated 80% of the trail currently does not meet Partial Retention prescription for near foreground requirements (i.e., the first 660 feet each side of the trail, unless screened by topography) due to past management activities including the construction of The Dalles Watershed Fuel Break.

It should be noted that all of the North Section Line Trail within the proposed treatment area is either within the C1 (Timber Emphasis) allocation or the B6 (Special Emphasis Watersheds). The trail is outside of the Dalles Municipal Watershed for its entire length.

Surveyors Ridge Trail (#688)
The Surveyors Ridge Trail runs parallel to the western boundary of the project area for approximately ¼ of a mile. It is adjacent to the project area and is located approximately 150 feet from Forest Road 1700 (the western project boundary). The trail is approximately 13 miles in length provides a critical link between the Surveyor's Ridge Trail Head on 17630 Road, the North Section Line Trail and the Dog River Trail. The trail is considered trail class (TC2) meaning that the tread is continuous and discernible, but narrow and rough. This trail has historical been primarily utilized by equestrians, but in recent times (within 10 year) the trails has become predominantly used by Mountain Bikers. The Trail is currently maintained by both Forest Service Employees and volunteer groups. It is in good repair meeting all trail management objectives.

Surveyors Ridge Trail (#688) Visual Quality Objectives
The Surveyors Ridge is also classified as Level II VQO (Visual Quality Objective) rating in the Forest Plan. A walk through survey of the Surveyors Ridge Trail was completed and is currently meeting all visual quality objectives.

Developed Recreation Facilities (Including Campgrounds)

No developed recreation facilities exist within the project area. The two facilities within closest vicinity to the project area are Gibson Prairie Horse Camp and Knebal Springs Campground. They are both approximately a mile from the project boundary.

Gibson Prairie Horse Camp is currently maintained by Forest Service employees. In the past the Back Country Horsemen (BCH) and the Oregon Equestrian Trails (OET) groups have rebuilt and expanded the facilities to include an outhouse and corrals.

Knebal Springs is current under a Special Use Permit for Campground and Related Granger-Thye (GT) Concessions and is currently managed by Lost Lake Resort, Inc. It has 8 developed campsites and a vault toilet.

Dispersed Recreation Opportunities

The vast majority (Over 99%) of the management actions associated with this project are within the boundaries of The Dalles Municipal Watershed. The watershed is closed year round to all public access and dispersed recreation. A limited number of special hunting tags (around 15) authorize a very small amount of hunting related activities.

Dispersed Recreation Opportunities include the use of north section line trail, berry picking, driving for pleasure, dispersed camping along roadways and hunting.

3.11.3 Effects Analysis/Environmental Consequences

No Action – Direct and Indirect Effects

The recreational use of the project areas within The Dalles Municipal Watershed would continue to be very minimal and restricted to the appropriate level of limited hunting tags. The remainder of the project area would continue to be used and enjoyed at its current use levels. Essentially, no direct or indirect effects would occur unless wildfires were to become an issue within the project area.

FS System Trails and Associated Trail Visual Quality Objectives

If no action is taken to address the purpose and need or project objectives, and a wildfire were to start in the project area, it would likely be of high severity. Wildfire could result in temporary closure of both The North Section Line Trail (#451) and Surveyors Ridge Trail (#688) for health and safety of the public. If a large stand replacing fire was to occur, visual quality objectives could be greatly altered from those currently outlined in the Forest Wide Standards and Guidelines.

Developed Recreation Facilities (Including Campgrounds)

Both Gibson Prairie Horse Camp and Knebal Springs would continue to be used, as well as dispersed camps along the roadways.

Dispersed Recreation Opportunities

Dispersed use would continue to be extremely limited within the project area due to the closure of public access within The Dalles Municipal Watershed. This alternative would continue current management practices and policies. Recreation opportunities would remain relatively unchanged and would not be impacted through vegetation management activities.

Proposed Action– Direct and Indirect Effects

The limited amount of hunters authorized access to The Dalles Municipal Watershed and recreational user of the remainder of the treatment area (approximately 3.5 acres) could be affected by the proposed management activities. There would be an increase in traffic on the forest roads used to access the area that would include fuels reduction vehicles. Helicopter removal of tree with tops and limbs attached would occur throughout the project area with

potentially direct flight paths over those authorized to use of the watershed area. Smoke from burning activities would occur throughout the project area.

FS System Trails and Associated Trail Visual Quality Objectives

The North Section Line Trail
Areas with fuel removal activities (including skyline support wires) could be temporarily closed to public use. Closures could be implemented through the use of signs, travel barriers, or temporary gates. These actions would be short term in duration and would not affect access management under the Travel Management Rule. Noise and smoke from equipment working on the project would be noticeable to recreational users while the work was occurring. Smoke from prescribed burning could impact recreational users in the vicinity of and downwind from burning activities. In the event of wildfire occurring within the project area, these impacts would be far outweighed by the reduction in the risk of catastrophic fire over the long term. Project design criteria / mitigation measures would minimize these direct effects. Please see The Dalles Watershed Phase II Project Design Criteria/Mitigation Measures found in Section 2.2.3. The Proposed Action would not change the current recreation opportunity spectrum. However, resource modification and utilization practices would be evident. The trail would continue to be managed as developed or trail class 3 (TC3).

The North Section Line Trail (#451) Visual Quality Objectives
The North Section Line Trail is 4.6 miles in length of which 2.1 miles could be affected by the proposed management activities associated with the Proposed Action. Only actions within unit 127 (Sapling Thin) would occur directly adjacent to the trail for approximately 150 feet. The following table illustrates the proposed treatment units, the length of trail that could be affected and the treatment types that would occur within 660 ft of the trail:

Table 3.11-1: Length of North Section Line Trail within 660 ft of Proposed Treatment Units

Unit	Length Along Trail in Feet*	Treatment Type
5	1,960	Fuels Reduction Thinning (natural stands)
7	1,950	Fuels Reduction Thinning (natural stands)
53	3,050	Fuels Reduction Thinning (natural stands)
54	1,350	Fuels Reduction Thinning (natural stands)
127	1,850	Sapling Thin
129	950	Sapling Thin
132	450	Sapling Thin
Total Length of Trail within 660 Feet of Treatment Units.	2.1 Miles	

The prescribed VQO for Level II trails of Partial Retention in the foreground would be consistent with VQOs in units 53, 54, 129 and 132. These units are situated on slopes below the trail and would not be visible from the trail prism. In Unit 5, 7 and 127 activities would be limited within

near foreground and would meet VQO of Partial Retention. As long as the landings in cable harvest units are not constructed within 660 feet of the trail or are screened by topography the units should meet partial retention criteria within one year. The Proposed Action meets Standards FW-588 and FW-559.

In addition to the design criteria and mitigation measures, experience with harvest on the East side of the Mt Hood has shown that leaving small islands of trees and shrubs interspersed along the trails aids significantly in preserving visual quality. This would be achieved through the use of variable density thinning with what is known as skips (no treatment) and gaps (heavy treatment) as outlined in the Proposed Action. Impacts from potential wildfire to VQO would be reduced.

Surveyors Ridge Trail (#688)
At this closest point, the Surveyors Ridge Trail would be approximately 1000 ft from any management actives related to the Proposed Action. There would be no direct affects to the trails tread surface. Indirectly, Noise and smoke from equipment working on the project would be noticeable to recreational users during the short time period work was occurring. The trail would continue to be managed as moderately developed or trail class 2. Impacts from potential wildfire affecting the use of the trail would be reduced

Surveyors Ridge Trail (#688) Visual Quality Objectives
The trail would continue to meet Level II VQO (Visual Quality Objective) as outlined in the Forest Plan. The Proposed Action meets Standards FW-588 and FW-559. Impacts from potential wildfire to VQO would be reduced.

Developed Recreation Facilities (Including Campgrounds)

Gibson Prairie Horse Camp would be located over a mile away from the nearest management activities associated with the Proposed Action. Smoke from prescribed burning (occurring approximately a mile away) could impact recreational users in the vicinity of and downwind from burning activities. Recreational users could be displaced to other campground on the Forest.

Knebal Springs would be located approximately ¾ of a mile from any management activities associated with the Proposed Action. Smoke from prescribed burning (occurring approximately a mile away) could impact recreational users in the vicinity of and downwind from burning activities. The concessionaire (Lost Lake Resort, Inc.) would be kept aware of the Proposed Actions. Several additional campgrounds are currently being managed by Lost Lake Resort, Inc. and displaced users of Knebal Springs Campground could be directed to other developed camping and day use opportunities on the Forest if needed. Impacts from potential wildfire to the existing facilities would be reduced.

Dispersed Recreation Opportunities

Dispersed Recreation Opportunities include the recreational trail use, berry picking, driving for pleasure, dispersed camping along roadways and hunting could be affected by noise and smoke from the Proposed Action. In the short term, the minimal dispersed recreational use occurring

within the project area could be displaced. Impacts from potential wildfire to the Dispersed Recreation Opportunities would be reduced.

Cumulative Effects

Refer to Table 3.0-1 for a list of all activities that were considered in this cumulative effects analysis for recreation and visual quality resources.

FS System Trails and Associated Trail Visual Quality Objectives

The North Section Line Trail (#451)
Maintenance activities associated with The Dalles Watershed Fuel break could overlap in time with activities proposed under this project. The increase in smoke and noise from vehicles would be apparent to trail users. Actions connected with The Dalles Watershed Fuel Break construction would cumulatively reduce the risk of wildfires impacting The North Section Line Trail.

The North Section Line Trail (#451) Visual Quality Objectives
As stated in the existing condition, A walk through survey of the North Section Line Trail was completed and an estimated 80% of the trail currently does not meet Partial Retention prescription for near foreground requirements (i.e., the first 660 feet each side of the trail, unless screened by topography) due to past management activities including the construction of The Dalles Watershed Fuel Break. Although this project would have minimal impact to the trail visual quality objectives The North Section Line Trail would still cumulatively not meet Partial Retention Prescription for near foreground requirements.

Surveyors Ridge Trail (#688)
Actions connected with The Dalles Watershed Fuel Break construction would cumulatively reduce the risk of wildfires impacting The Surveyors Ridge Trail.

Surveyors Ridge Trail (#688) Visual Quality Objectives
There would be no cumulative effects to the Trail Visual Quality Objectives (VQO) as there would be no direct or indirect effects to the surveyors Ridge VQO's from this project.

Developed Recreation Facilities (Including Campgrounds)

Actions connected with The Dalles Watershed Fuel Break and North Fork Mill Would cumulatively reduce the risk of wildfires impacting both the Gibson Prairie Horse Camp and Knebal Springs Campground.

Dispersed Recreation Opportunities

Actions connected with The Dalles Watershed Fuel Break construction would cumulatively reduce the risk of wildfires impacting the minimal dispersed recreation opportunities available within the project area.

3.11.4 Consistency Determination

The Proposed Action would meet the goals and objectives of the Mt. Hood National Forest Land and Resource Management Plan (Forest Plan). Design standards for Forest Service Trails are found in Forest Service Handbook 2309.18 and vary depending on designed use and trail class. The Mt Hood Forest Plan classifies trails in three Visual Quality Objective (VQO) levels. Forest Wide Standards and Guidelines are available on page Four-115 and 116. The Forest Plan also defines the VQO by distance zone for all levels of trails on page Four-116. Standards FW-588 and FW-559 further define that trails located in C1 Timber emphasis management areas may temporarily deviate from the prescribed standard in the foreground, but no more that 20% of the trail length within the C1 management area should deviate from the prescribed VQO. The Proposed Action would meet the goals and objectives outlined for both Forest Service Trail Standards and Trail Visual Quality Objectives.

The Proposed Action would continue to provide a broad range of developed and dispersed recreation opportunities in balance with existing and future demand. No ROS class would be compromised in any alternative.

No Special Area designation would be substantially affected.

3.12 Heritage Resources

3.12.1 Methodology and Analysis Points

The analysis area for heritage resources in this Preliminary Assessment is the proposed treatment boundaries. The National Historic Preservation Act and the National Environmental Protection Act both require consideration be given to the potential effect of federal undertakings on historic resources, (including historic and protohistoric cultural resource sites). The guidelines for assessing effects and for consultation are provided in 36 CFR 800. To implement these guidelines, in 2004, Region 6 of the Forest Service entered a Programmatic Agreement (PA) with the Oregon State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP).

In accordance with the 2004 agreement, the proposed underburning activities of the project were determined to fall within the category of undertakings that may be excluded from case-by-case review based on inspection or monitoring (Stipulation III.b(17); Prescribed burns where burning, line construction, or mop-up would not impact historic properties that consist of wooden structures or other fire-sensitive features, or where special and proven protective measures are taken to preserve such features from fire effects.). The proposed underburning was documented in Heritage Resource Report 2011/060601/0004 (Dryden 2011).

The remaining activities of the project, including commercial thinning, jackpot underburning, mastication, and non-commercial thinning involve heavy machinery and ground disturbance and required surveys. Heritage Resource surveys were conducted for those activities requiring inspection and documented in Heritage Resource Report 2011/060601/0003 (Dryden 2011).

3.12.2 Existing Condition

The analysis area for heritage resources in this Preliminary Assessment is the boundaries of the proposed treatments. The project area contains multiple historic features including the remains of a wagon, two sites with cordwood stacks, the remains of two homesteads, one partially-standing log cabin, the remains of a flume, a peeled cedar tree, the remains of a historic camp, a rock alignment and trees with insulators, blazed trees with a peeled cedar tree, and a house. Additionally, one protohistoric lithic isolate is also located within the project area.

3.12.3 Effects Analysis/Environmental Consequences

No Action – Direct and Indirect Effects

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

Proposed Action – Direct and Indirect Effects

Historic camp remains 661EA0066 lie within a unit scheduled for thinning, followed by burning. A 30-foot buffer for the exclusion of heavy machinery and tree harvest would be placed around the perimeter of the site. Any trees harvested in the vicinity of the site would be felled directionally away from the buffer. The site contains combustible materials; a hand line or wet line would be constructed around the site buffer to exclude the site from burning activities.

The historic wagon remains 661EA0069 lie within a unit scheduled for thinning, followed by burning. The wagon remains could not be located for this project; previous attempts to locate the remains were also unsuccessful. Barlow Ranger District files indicate that the wagon was removed at some time in the past, and the site was no longer treated as a Heritage Resource. No protective measures are required or recommended for Heritage Resources that cannot be located.

A series of historic blazed trees 661EA0068 (35WS133) and one peeled cedar tree lie within a unit scheduled for thinning, followed by burning. A 30-foot buffer for the exclusion of heavy machinery and tree harvest would be placed around the perimeter of the site. Any trees harvested in the vicinity of the site would be felled directionally away from the buffer. The site contains combustible materials; surface duff would be scraped from the base of trees with blazes or peels to exclude them from burning activities.

Historic cabin remains 661EA0115 lie within a unit scheduled for thinning, followed by burning. A 30-foot buffer for the exclusion of heavy machinery and tree harvest would be placed around the perimeter of the site. Any trees harvested in the vicinity of the site would be felled directionally away from the buffer. The site contains combustible materials; a hand line or wet line would be constructed around the site buffer to exclude the site from burning activities.

Historic cordwood stacks 661EA0116 lie within a unit scheduled for thinning, followed by burning. A 30-foot buffer for the exclusion of heavy machinery and tree harvest would be placed around the perimeter of the site. Any trees harvested in the vicinity of the site would be felled

directionally away from the buffer. The site contains combustible materials; a hand line or wet line would be constructed around the site buffer to exclude the site from burning activities.

Historic wagon road and stacked cordwood site 661EA0118 lies within a unit scheduled for thinning, followed by burning. A 30-foot buffer for the exclusion of heavy machinery and tree harvest would be placed around the perimeter of the site. Any trees harvested in the vicinity of the site would be felled directionally away from the buffer. The site contains combustible materials; a hand line or wet line would be constructed around the site buffer to exclude the site from burning activities.

Historic rock alignment and tree insulator site 661EA0119 lies within units scheduled for underburning and jackpot underburning. The site contains combustible materials; surface duff would be scraped from the base of trees with blazes or peels to exclude them from burning activities.

Historic flume remains 661EA0120 lie within a unit scheduled for and jackpot underburning. The site contains combustible materials; a hand line or wet line would be constructed around the site buffer to exclude the site from burning activities.

Peeled cedar tree site 661NA0135 lies within a unit scheduled for thinning, followed by burning. A 30-foot buffer for the exclusion of heavy machinery and tree harvest would be placed around the perimeter of the site. Any trees harvested in the vicinity of the site would be felled directionally away from the buffer. The site contains combustible materials; surface duff would be scraped from the base of trees with blazes or peels to exclude them from burning activities.

Historic homestead site 661EA0260 lies within a unit scheduled for underburning. The site does not contain any combustible remains. Prescribed burning over the site would have no effect.

Lithic isolate 661NA0299 is situated within a unit scheduled for thinning. The isolate was determined to be ineligible for inclusion on the National Register of Historic Places. No protective measures are required or recommended for ineligible isolated finds.

Historic log cabin site 661EA0364 lies in an area scheduled for underburning. A 30-foot buffer would be flagged around the site. The site contains combustible materials; a hand line or wet line would be constructed around the site buffer to exclude the site from burning activities.

Historic dwelling site 661EA0365 lies in an area scheduled for underburning. A 30-foot buffer would be flagged around the site. The site contains combustible materials; a hand line or wet line would be constructed around the site buffer to exclude the site from burning activities.

Cumulative Effects

Given the project design criteria / mitigation measures the Proposed Action would result in no direct or indirect effects to heritage resources and as such there can be no cumulative effects. All projects shown in Table 3.0-1 were considered for the accuracy of this determination; heritage resources are generally avoided for federal undertakings with no cumulative effects.

3.12.4 Consistency Determination

The protective measures would adequately protect the known heritage resources. The site protection measures were developed on the Mt. Hood National Forest to be consistent with the National Historic Preservation Act and adapted for use across the forest. The Oregon State Historic Preservation Officer has concurred that the previous use of these methods would result in no effect to heritage resources. Contracts would contain provisions for the protection of sites found during project activities. Based on the proposed protective measures, the project meets the criteria in the Programmatic Agreement for "Historic Properties Avoided" determination (Stipulation III (B) 2).

This action is consistent with Forest Plan goal to protect important cultural and historic resources. Heritage Resource Inventories were conducted in compliance with the 2004 PA during the project planning stage (FW-602 and FW-606), and the potential effects to heritage resources from the proposed projects were assessed (FW-609). Unless evaluated as insignificant, all heritage resources were treated as though eligible for the National Register of Historic Places (FS-600), and were protected from adverse impacts (FW-615).

3.13 Transportation System

3.13.1 Methodology

A Roads Analysis has been developed at the Forest scale (USDA 2003). Road management decisions are informed by this Forest-level analysis, and are focused by project-level specific information.

Across the Forest, funding for road maintenance is lower than the level needed to properly maintain the approximate 3000 miles of open roads on the Forest. The Forest-wide Roads Analysis identified, for approximately half of the current road system, the need to change maintenance levels to lower standards, to store roads in a maintenance level one category or decommission. This discussion relates to system roads. There are also temporary roads constructed and closed by loggers that do not result in the expenditure of road maintenance funds.

In addition to the forest wide roads analysis a project level roads analysis is also performed on most projects. This project specific analysis helps ensure that the future road system can be one that is safe, environmentally sound, affordable and efficient.

As all roads within The Dalles Municipal Watershed are closed to the public and are necessary for administrative access by the City of The Dalles no modifications to the roads system were considered in this project. Road use and associated reconstruction/maintenance needs are identified in section 2.2.2.

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 Operating 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.

3.13.2 Existing Condition

The system roads within the project area total approximately 33.8 miles in which the majority are closed to the general public. This equates to an approximate road density of 2.6 miles per square mile within the project boundary. These roads provide access for administrative, limited public and commercial use. One of the primary users is The City of The Dalles, which utilizes the system to patrol and maintain improvements within the Municipal Watershed.
Road surfaces are comprised of asphalt, gravel, and native materials. Drainage features consist of ditch to culverts or insloped / outsloped surface to drain dips / berms. Limited road maintenance dollars have resulted in a backlog of road maintenance (Deferred 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.

For a complete list of roads that fall within the project area and their related maintenance needs please refer to section 2.2.2.

3.13.3 Effects Analysis / Environmental Consequences

No Action – Direct and Indirect Effects

The No Action alternative would not involve log hauling, road construction, road reconstruction, road closures, or timber sale related road maintenance. This alternative would not change the use pattern of roads, correct existing road erosion problems, or correct ineffective road closures. Individual Danger Trees would continue to be removed as they are identified. These trees would continue to be available for the fire wood program.

Proposed Action – Direct and Indirect Effects

The Proposed Action would involve log haul. The roads within the project area 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 of haul. Soil moisture in the base and subgrade material must be below its plastic limit to meet this design parameter.

Given the existing conditions and life expectancy of roads, Winter Haul would not protect the integrity of existing roads. A cost analysis to reconstruct main haul roads to withstand Winter Haul is economically prohibitive and beyond the financial capability of this project or any road maintenance or reconstruction funding source available.

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.

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 would produce five times or more stress on the travelway than it would produce during optimum moisture conditions for the base and subgrade.

As commercial haul would be limited to periods when the subgrade moisture is below its plastic limit and outside freeze/thaw cycles, damage to road surfaces would be limited. These conditions are typically associated the Normal Operating Season as it pertains to log haul.

Cumulative Effects

Projects considered in this analysis are listed in Table 3.0-1 at the beginning of Chapter 3. Given the project design criteria / mitigation measures (see section 2.2.3) the Proposed Action would result in little direct or indirect negative effects to the transportation system. However, the incremental effects of individual projects such as The Dalles Watershed Phase II and administrative use would eventually necessitate the reconstruction of any system road. The costs associated with road reconstruction are substantially higher than could be supported by traditional district level projects and would require additional funding sources to be completed. Refer to the Forest-wide Roads Analysis (USDA 2003) for a discussion of the transportation system as a whole.

3.14 Climate Change

3.14.1 Existing Condition

A growing body of scientific evidence and climate modeling indicate that climate change is occurring. While there are no specific projections for the project area, the situation would likely be one where the summers are drier and the snow melts earlier in the spring (Bare 2005) (Mote

2003), (Mote 2005), (Dale 2001). There are some who believe that climate change is not occurring or that it is not human caused. This document is not intended to present arguments on any of these theories as they are well documented elsewhere.

This project was not specifically designed to mitigate or respond to potential climate change. This section addresses aspects of the project that may affect carbon emission or sequestration and how the project may impact the forest's ability to deal with climate change. This analysis will not attempt to quantify carbon emission or sequestration.

3.14.2 Effects Analysis / Environmental Consequences

No Action – Direct, Indirect and Cumulative Effects

As no vegetative manipulation would occur and no burning would take place the current carbon sequestration rates would remain unchanged and no additional carbon would be released into the atmosphere. The No Action alternative would allow current high density stands and fuel loadings to persist on the landscape increasing the susceptibility of the area to wildfire, which could release a considerable amount of carbon into the atmosphere.

Proposed Action – Direct, Indirect and Cumulative Effects

This project is not likely to have direct localized effects on climate. By its very nature, the discussion of a project's effect on climate change is indirect and cumulative because the effects occur at a different time and place, and because the scale of the discussion is global. Since it is not reasonable to measure a project's global impact, the discussion here focuses on key elements of forest management discussed in the scientific literature.

For this proposal, the following actions have the potential to affect carbon emissions or sequestration:

- Thinning to enhance the health of the residual stand would result in trees that are better able to withstand stresses such as dry summer conditions (Millar 2007) (Spittlehouse 2003).

- Variable density thinning with skips and gaps and the retention of minor species would result in stands that are resilient and better able to respond to whatever changes come in the future (Millar 2007).

- Fossil fuel would be used by equipment such as saws, tractors, skyline yarders and log trucks. It would be possible for some of this equipment to use biofuels if available and priced competitively.

- Logging debris at landings would be burned on site or transferred to a bio-energy facility to use in generating power. Residual and/or natural fuel accumulations would be burned through underburning, pile burning, and jackpot burning. All of these activities would release carbon into the atmosphere.

- Utilizing trees to create long-lived wood products would sequester carbon. (IPCC 2007) (FAO 2007) (Stavins 2005) (Upton 2007).

To summarize, the Proposed Action would result in some carbon emissions and some carbon sequestration. The benefits to forest health and resiliency with the Proposed Action would allow stands to better respond and adapt to the future climate variation or change.

3.15 Environmental Justice and Civil Rights

On February 11, 1994, President Clinton issued the Executive Order on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Order 12898). This order directs agencies to identify and address disproportionately high and adverse human health or environmental effects of projects on certain populations. In accordance with this order, the proposed activities have been reviewed to determine if they would result in disproportionately high and adverse human and environmental effects on minorities and low-income populations.

The communities of Mt. Hood/Parkdale, Odell and Hood River are 5 to 20 miles to the west / northwest of the project area. The communities of Dufur and The Dalles are less than 20 miles to the east / northeast of the project area. Other communities that may have an interest in the proposal would include Maupin, Madras, Redmond, and Bend to the south and Sandy, Gresham and Portland to the West.

The Dalles Watershed Phase II 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 restricted as the watershed is closed to all public access. Therefore, it is anticipated that this proposal would not have any negative effects on special forest product gatherers.

3.16 Other Required Disclosures

Floodplains and Wetlands

There would be no significant impacts to floodplains or wetlands from this project. Floodplains are extremely limited in this area due to the steep nature of the landscape. The impacts to wetland are discussed in section 3.5, Water Quality. Due to the project design criteria/mitigation measures which are aimed at minimizing the impacts to wetlands, there would be minimal direct and indirect effects.

Air Quality

Section 3.2, Air Quality and Smoke Management describe the impacts associated with prescribed burning on air quality. Prescribe burning would have a two to three day impact on local airshed/air quality. This would include underburning and burning of landing piles. 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. 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.

Consumers, Civil Rights, Minority Groups, Women, and Environmental Justice

Executive Order No. 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs Federal agencies to address effects accruing in a disproportionate way to minority and low income populations. No disproportionate impacts to consumers, civil rights, minority groups, and women are expected from this project. Commercial thinning and mechanical fuels reduction work would be implemented by contracts with private businesses. Project contracting for the project's activities would use approved management direction to protect the rights of these private companies. Section 3.14 contains more information on Environmental Justice.

Treaty Resources and Reserved Indian Rights

No impacts on American Indian social, economic, or subsistence rights are anticipated. No impacts are anticipated related to the American Indian Religious Freedom Act. The Confederated Tribe of Warm Springs was contacted in reference to this Proposed Action. More information on consultation with the tribes is available in Chapter 4.

Prime Farmlands, Rangelands, and Forestlands

None of the alternatives would have an adverse impact to the productivity of farmland, rangeland, or forestland.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that are forever lost and cannot be reversed. Irretrievable commitments of resources are considered to be those that are lost for a period of time and, in time, can be replaced. The use of rock for road surfacing is an irreversible resource commitment.