CHAPTER 3 – ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives.

This Environmental Assessment hereby incorporates by reference the project record (40 CFR 1502.21). The project record contains specialist reports and other technical documentation used to support the analysis and conclusions in this environmental assessment. Specialist reports were completed for wildlife, hydrology, fisheries, soils, botany, heritage resources, noxious weeds, recreation and range management. Separate biological evaluations and/or biological assessments were completed for botanical species, aquatic species and terrestrial wildlife species as part of the consultation process with the National Marine Fisheries Service (NMFS) and the US Fish & Wildlife Service (USFWS). The project record is located at the Hood River Ranger District in Mt. Hood, Oregon.

Fire/ Fuels Management

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

Existing Condition

Historical Fire Regimes
Fire suppression efforts of the past 100 years have altered stand composition and structure and increased tree and brush densities. In the eastern portion of the watershed, where frequent fire return intervals of low and moderate intensity would have been expected, vegetation would normally consist of well-spaced fire tolerant species such as ponderosa pine, white oak, and dry-climate Douglas-fir. The shade-tolerant, thin-barked species such as grand fir, lodgepole pine, and juniper would be thinned out regularly by fire.

The western area of the watershed, predominately west of Crow Creek Reservoir, but more specifically west of Forest Road 1721, is characterized by a fire regime of mixed severity (areas of low, surface fire) as well as high, stand-replacing fires. These areas are primarily within the Surveyor's Ridge Late Successional Reserve, but also include north facing slopes and riparian areas at the higher elevations, within the moist grand fir, mixed conifer zones. Historical fire return intervals in these areas are in the 50 years or less (moist Douglas-fir), to the 50-100 year fire return interval of the mixed conifer zone (grand fir, western hemlock, white pine, etc.). These species typically have a low to moderate fire tolerance, as low intensity, high frequency fires do not occur, due to higher moisture amounts and greater fuel loadings.

The fire regime concept is a generalized way of characterizing the historic role fire played in an ecosystem, describing fire effects and vegetative conditions that likely contributed to historic fire behavior (i.e., flame length, fire size, and crowning/scorching potential). The fire regime concept does not provide a means to judge the role of fire as either beneficial or detrimental.

Three historic fire regimes (Agee 1993) are thought to have existed in The Dalles Watershed analysis area: Fire Regime I, II and III. The Fire Regime III zones on the Mt. Hood National Forest, have been further refined based on earlier analysis work using Fire Groups (historic fire classification), and they are classified as Fire Regime IIIA (<50 year fire return interval, mixed severity), Fire Regime IIIB (50-100 year fire return interval, mixed severity), and Fire Regime IIIC (100-200 year fire return interval, mixed severity). Based on fire's historical role in the plant communities, and field observations of stands within the project area, a much smaller portion of the landscape historically contained fuels that were highly susceptible to stand-replacement fire.

Stand development within the ponderosa pine/oak vegetation types was historically associated with frequent, light surface fire (<35 year fire-free intervals) from lighting ignitions as well as Native American burning. This scenario is referred to as the Low Severity Fire Regime (Fire Regime 1). Historically, stand development within the mixed conifer plant associations were associated with both crown fire and mixed severity surface fires with a relatively short return (5-50 year fire-free intervals). This scenario is similar to the Moderate Severity Fire Regime (Fire Regime 3) described by Agee (1993). Currently, much of the area within the mixed conifer and pine-oak types would likely contribute to high severity fire. Meadows, shrub-scablands, and non-forest areas, are classified as Fire Regime 2, moderate severity for the grass fuel type.

Fire history on non-National Forest System lands within the planning area was not collected although several large fires that have occurred in or near the watershed in the past 40 years (and one in 1908) were generally wind driven from the west, and mixed to high severity events. The Sheldon Ridge Fire (2002: 12,500 acres) burned to the north of the watershed; the School Marm and Brown Creek Fires (1967: 9,618 acres) burned from inside the watershed in an easterly direction, and the Dog River Fire (1908) occurred in the Dog River drainage of the watershed, which is southwest of the project area. The 2004 Dalles Watershed Assessment (Wasco County Soil and Water Conservation District) references three other fires (> 10 acres) within the watershed near the Mill Creek Butte area, but no other data is given.

Condition Class

A current method of quantifying the stand structure or fire in ecosystem, and it relative condition compared to historical, non-suppression, of a given area. See the following table for definitions of the three levels.

Table 3-1. Condition Class Attributes

Condition Class	Attributes	Example Management Options
Condition Class 1	• Fire regimes are within or near an historical range. • The risk of losing key ecosystem components is • low • Fire frequencies have departed from historical frequencies (either increased or decreased) by no more than one return interval. • Vegetation attributes (species composition and structure) are intact and functioning within an historical range.	Where appropriate, these areas can be maintained within the historical fire regime by treatments such as fire use.

Condition Class	Attributes	Example Management Options
Condition Class 2	• Fire regimes have been moderately altered from their historical range. • The risk of losing key ecosystem components has increased to moderate. • Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval. This change results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. • Vegetation attributes have been moderately altered from their historic ranges.	Where appropriate, these areas may need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime.
Condition Class 3	• Fire regimes have been significantly altered from their historical range. • The risk of losing key ecosystem components is high. • Fire frequencies have departed (either increased or decreased) by multiple return intervals. This change results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. • Vegetation attributes have been significantly altered from their historic ranges.	Where appropriate, these areas need high levels of restoration treatments, such as hand or mechanical treatments. These treatments may be necessary before fire is used to restore the historical fire regime.

Currently, almost 90 percent of the watershed is in condition class 3, either from lack of fire within fire adapted ecosystems, or stand condtions considered "out of whack" either from past management practices or lack of management within these areas. Current estimated amounts of the watershed and condition class are in the following table.

Table 3-2. Condition Class in the Project Area

Condition Class	Percent of Area (approx.)
Condition Class 1	4.9%
Condition Class 2	5.3%
Condition Class 3	89.8%

The Dalles Watershed fuelbreak is not a stand treatment project, and is not intended to modify the condition class at the watershed level. Municipal watersheds are part of the areas to be treated as part of the Healthy Forest Restoration Act, and therefore do not need to show a change in the condition class at the landscape level to be treated. Future treatments within the watershed may provide for a substantial change in condition class, and would be analyzed in more detail at that time.

Current Fire Risk and Fire Hazard

The probability of fire in the future can be estimated by combining fire risk and fuel hazard. Fire risk is the chance that a fire would occur. It is normally obtained through fire history analysis (average number of fires for a given area). Fire hazard is the fuel, topography, and weather conditions that affect fire spread and intensity. Fuel is the only parameter that can be directly manipulated to reduce or increase the amount of fire spread and intensity.

Fire Risk

Most fires within this planning area have been quickly suppressed at less than 10 acres with the majority of the fires less than one acre. Between 1985 and 2004, a total of three wildfires have occurred inside The Dalles Watershed, and another 24 within the planning area, but outside of the watershed. See fire ignitions map in Appendix A. Based on historical averages, a wildfire ignition is expected to occur within the Dalles Watershed once every six or seven years, and one or two fires every year within the larger planning area. Prior to 1985, the historical records show a reference to the School Marm Fire (1967) and the Dog River Fire (1908). Records of other fires prior to 1985 are currently unavailable.

Table 3-3 gives an average of fires that have occurred per year within and outside the municipal watershed. Most fires within the larger planning area have occurred outside the watershed boundaries, fairly evenly distributed from the north, west, and south directions. Due to larger tracts of private agricultural lands to the east, fires have been limited by the reduced public access. Fires within the watershed boundaries over the past 20 years have been limited to three events, primarily due to the restricted public access, and a possible change in weather patterns that has limited lightning occurrence within the watershed (along with a higher overall fuel moisture content). This analysis does not include the larger fires before 1985, showing the potential for large fire occurrence (greater than 1000 acres), roughly every 40-60 years. It also does not include any Oregon State fire data, although there is an historic potential for an ignition to occur on state lands and move onto federal jurisdiction, from a northerly or easterly direction (as was the case for the Sheldon Ridge, School Marm, and Browns Creek Fires).

The Bluegrass Ridge Fire (part of the Mt. Hood Complex in 2006) brought to the forefront a concern that a large fire started within the Oregon State Highway 35 corridor could spread into The Dalles Municipal Watershed. Shortly after the Bluegrass Ridge Fire started, a long-term risk assessment was performed, and it was determined that there was a 63 percent chance that this large fire could initially enter the watershed either by pre-heating the west aspect of the valley, or spotting across the highway to Surveyor's Ridge. Initial concerns were also raised based on multiple ignitions within the Badger Creek Wilderness (five miles south of the watershed) during the same fire event, but the same long-term assessment noted only a four percent chance of any of these ignitions reaching the watershed (Evers 2006).

Table 3-3. Number of Fires / Year within the Planning Area (1985-2004)

South Fork Mill Creek Watershed	Fires per year
Inside the watershed boundary	0.15
Outside the watershed boundary	1.2

Although difficult to quantify, human-caused fire risk outside the watershed boundaries will likely increase in the future in and around the planning area due to an increase in population, possible greater off-road vehicle (OHV) use in the Gibson Prairie area (proposed forest OHV area), and general higher public use of the National Forests. Based on the difficulty of quantifying future risk, it is assumed that all fire risk, for the purposes of this analysis, will remain about the same in the future.

Fire/Fuel Hazard

As stated previously, fuel loadings and ladder fuels have increased over time within the planning area. Current fuel profiles generally reflect a moderate to high susceptibility to stand-replacement fire. A stand replacement fire would burn with severity that reduces basal area by at least 50 percent or more depending on fuel loadings and stand density. The effects of this are detailed in Table 3-4.

Table 3-4. Fire Hazard Characteristics

	Low Susceptibility	Moderate Susceptibility	High Susceptibility
Fire Behavior Characteristics	Low intensity surface fire; crown fire unlikely < 4 ft FL <100 BTU	Severe surface fire; torching, spotting likely; potential for crown fire 4-8 ft. FL 100-500 BTU	Probable crown fire and severe surface fire; extreme fire behavior likely >8 ft FL >500 BTU
Representative Fuel Model (FM) Descriptions	FM1, GR1, FM8, & FM 2/9 treated; non-vegetated areas	FM 5, FM 9, & FM10 if on E, NE, N or NW aspects or < 30% slopes	FM 5, FM 9, FMTU5, FMTL9, FM 10, & FM11 if on SE, S SW, or W aspects or slopes > 30%
Initial Attack Considerations	Direct attack probable with hand crews	Direct attack not possible with hand crews; mechanized equipment use probable	Direct attack not feasible with ground/air resources, flanking attack with air/mechanized support effective longterm
Stand Level Effects	Short-term effects; low intensity mosaic created; <20% overstory mortality	Torching within stand creates patches or mortality and mosaic within stand; 20-60% overstory mortality	Greater than 70% of stand burned; >70% overstory mortality
Landscape Level Effects	Minimal long-term effects on soils, watershed, and productivity	Possible long-term effects on soils, watershed, and productivity, greater effects if in riparian areas	Probable long-term effects on soils, watershed, and productivity, especially in riparian areas and water quality issues
Visual Effects on Landscape	Visual effects not readily apparent	Initial visual impression is of a cleaning of ground fuels and reprod; new openings in canopy and new snags	Initial visual impression is destruction of all fuels/vegetation
Burning Conditions and Fire Effects	Severe summer weather could increase fire size	Severe summer weather could produce active crown fire	Normal summer weather could produce severe intensity fires, active crown fire

Acronyms: FL = flame lengths; BTU = British thermal unit; FM = fuel model; GR = grass 1; FMTU = fuel model timber understory; FMTL = fuel model timber litter

Fuel models consider fuel size classes (primarily zero to three-inch material), and estimate behavior, based on fuel group (grasses, brush, timber, slash), fuel loading, the quantity of fuels

(generally measured in tons per acre), and the distribution among the fuel particle size classes. Fuel load and depth are important properties for predicting whether a fire will be ignited, and its rate of spread and intensity. Fire behavior for this planning area can be characterized by assigning one of the standardized NFFL fuel models (including new models developed by Scott & Burgan 2005) as described by Anderson (1982). These fuel models display varying levels of flame lengths and rates of spread for given weather and fuel conditions. The majority of the planning area can be described by five different fuel models; 2, 5, 9, 10, and 11. A full description of these fuel models and associated fire behavior characteristics can be found in "Aids to Determining Fuel Models for Estimating Fire Behavior" (Anderson, Hal E.; April 1982: GTR INT-122), also in “Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel’s Surface Fire Spread Model” (Scott, Joe H. & Burgan, Robert E.; June 2005: RMRS-GTR-153). A more detailed discussion is in the fuels report in the project file.

The predicted fire behavior characteristics for fuel models in the planning area are estimated based on the 97th percentile fire weather for the area, and were determined using the weather observations from Pollywog Remote Automated Weather Station (RAWS) located within the watershed. These weather observations were recorded at 2:00 PM each afternoon during the fire season (June 1 to Oct. 15) from 1985 to 2004. Further observations were used at the 50th percentile to represent an “average” weather day during fire season. Winds were adjusted based on onsite experiences, as the Pollywog RAWS is currently sheltered from direct wind measurements due to overstory build up in the past 10 years.

The fire behavior predictions were computed using the BEHAVE program (fire behavior prediction computer program) and the data can be found in the fuels report in the project file. BEHAVE Plus runs were done to show potential fire behavior characteristics. Predictions are characterized by flame lengths measured in feet. Fires with flame lengths of less than four feet can generally be attacked at the head or on the flanks from personnel using hand tools. Fires with flame lengths of less than four feet are generally characterized by low to moderate intensity fires. Fires with flame lengths of greater than four feet are too intense for direct attack on the head by personnel using hand tools. Hand fireline will not generally hold these types of fires. Equipment such as dozers, engines, and air tankers are required for any degree of success in preventing fire spread.

The fire behavior predictions indicate that a direct attack of a surface fire in areas with heavier fuel loadings by personnel with hand tools would be ineffective. Direct attack with engines, dozers, and air tankers would be effective if the fire stayed in the surface fuels and did not produce spot fires out ahead of the main fire. The first resources to arrive at the fire would most likely be engines and due to limited access to some areas, they may not be able to utilize the engines immediately or directly. Air tankers, if available, would take over 30 minutes to arrive on scene, as would the dozers.

Manual calculations for the “probability of ignition” was completed and it was estimated that nine out of every 10 embers thrown outside the fire perimeter would produce a spot fire provided it landed in a receptive fuel bed (details of these calculations can be found in the fuels report in the project file). Based on fire spread rates, flame lengths, and spotting potential, the planning area has a very high fire hazard rating that could easily produce fire behavior that would exceed suppression control capabilities.

The desired future condition would be to reduce the fuel profiles to a level that would produce fire behavior with flame lengths under four feet, allowing direct attack by personnel utilizing hand tools. Maintain well-spaced over story stands with little or no ladder fuels that will not allow fires to climb into aerial fuels.

Current fire hazard within the analysis area is mostly due to understory brush, stand structure, and fuel loadings. Numerous stands are overstocked and have decadent, needle draped brush in the understory. These stands will support a stand replacement fire currently and will continue to be a significant fire hazard in the future without appropriate treatment. Actions that will help to reduce the current risk of stand-replacing events include:

- Emphasize removal of trees 1-12" diameter at breast height, as well as brush to increase crown base height under residual, treated stands;
- Design and locate units to break up large, continuous blocks of highly susceptible fuels, thus creating a fuelbreak for the watershed;
- Use commercial and pre-commercial thinning, whipfelling and fuels treatments to change hazard to low or moderate susceptibility;
- Ensure that adequate fuels treatments are prescribed and carried out after harvest;
- Use prescribed fire to reduce natural and/or activity created fuels in harvest;
- Use hand and/or mechanical equipment to reduce all (natural and activity) accumulated fuels;
- Provide long-term road access to areas of moderate or high hazard to improve wildfire suppression capabilities; and,
- Provide opportunities for future maintenance burning in areas that were historically low intensity/high frequency (low) fire regime.

Effects Analysis

Alternative 1—No Action Alternative

Direct and Indirect Effects

The "no action" alternative proposes no fuel reduction treatments; however, fire suppression efforts would continue to occur. Fire risk would stay approximately the same under this alternative. In the short term, (one to five years) the fire hazard would remain constant, with a high risk rating. In the future, dead or dying trees would fall down, increasing the fuel loading and therefore fire hazard. Natural fuels (pine needles and other dead vegetation) would continue to accumulate. Natural processes of decay are not likely to remove the down and dead woody debris before the next fire cycle. As the available fuel increases, so would the potential for a large stand-replacing wildfire event.

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

When large amounts of dead and down debris increase and there is an increase in ladder fuels, a fire would burn very hot and exhibit extreme fire behavior. Such fire behavior could result in loss of productivity and biodiversity in the stands, surface soils could be severely damaged, and could take many years to restore the ecosystem, as well as the water quality needed for the City of The Dalles. Soil erosion could occur in some of the planning area following an intense post-fire precipitation event. Increased fire intensity also means loss of snags and downed logs important for habitat (see soil productivity, watershed resources and wildlife section for a further discussion of effects).

Alternative 2—Proposed Action
Direct and Indirect Effects
Natural and activity fuels would be treated in the action alternative. Treatment methods would consist of handpiling, pile burning, underburning, mowing and harvesting. The treatments would be used over a large area to reduce the fuel loadings and modify the fuel profiles of the unit. Under this alternative, approximately 588 acres are proposed for underburning after mechanical treatment (thinning/mowing/piling/pile burning), approximately 567 acres of mechanical treatments with no underburning (pile and burn activity/residual fuels only), about 121 acres are proposed for underburning with no prior mechanical treatment (units near the RNA), and approximately 119 acres of handpiling that is unsuitable for mechanical treatment (such as riparian areas or cable units).

Treatments would reduce overall fuel loadings, thereby decreasing the flame length and rate of spread in the event of a fire start in these areas, allowing suppression forces to safely and effectively contain and control a fire in the area of the Dalles Watershed. The proposed action would reduce fire hazard to some extent by breaking up the continuity of the surface and ladder fuels, thus reducing the risk of a crown fire.

Mechanical treatment would reduce surface fuel height, thus reducing the potential for crown fire initiation in those areas, allowing for the second entry of fire (underburning) into those areas to reduce the fuel loadings (tons/acre) and reduce the fire hazard to a moderate/low category. Thinning would reduce the ladder fuel component in stands that are overstocked, allowing for suppression forces to contain and control future fire starts more efficiently and safely, thus reducing the risk to private land and resources within the watershed.

Hand piling, burning and underburning would reduce fuel loadings, fuel bed depth, and understory vegetation (ladder fuels) within the fuelbreak boundary. Mowing would reduce fuel bed depths and understory vegetation, but would not decrease fuel loadings. Underburning after the mowing would reduce the fuel loading and maintain manageable fuel conditions for future maintenance.

Scorching of tree crowns is possible where landing piles are located close to residual leave trees. This scorching could result in tree mortality or reduced vigor. Trees killed by scorch can be left as future snags for wildlife benefits if not felled for public safety.

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

Effects from mowing and mastication on units are possible damage to residual trees due to scraping while the machine is maneuvering through units. Soil compaction may occur if soil moistures are too high, or if numerous passes are made over the same area. Soil moistures and equipment use would be monitored to ensure detrimental soil damage does not occur.

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

Seedlings, saplings, brush and grasses would be consumed or killed during the underburning. Sprouting of the grasses and brush may occur if soil moistures and seed sources are receptive. Both manzanita and ceonouthus respond well to fire. Generally the tops are killed by fire but resprouting occurs from the root collars. After a fire, there would generally be an increase of plants, as these shrubs return to stabilize soil, fix nitrogen in the soil, and provide shading for new seedlings/saplings. Over time, these shrubs are generally shaded out, as the stand increases in tree height and increased shading. The fire threat from these shrubs is during the time of frost kill or drought conditions when the plants live fuel moistures drop, and they react more as a dead fuel.

In the units to be underburned, firelines would need to be constructed to serve as control lines during burning operations. This has the potential to channel water, which may cause erosion. The construction of water bars in the firelines would serve to reduce erosion risk. The erosion potential would decrease over time as normal needle cast and other litter starts to cover up the firelines. This process usually starts within one year and the lines should be completely covered in approximately three to five years.

Air Quality/Smoke Management

Existing Condition

Air quality is of particular concern on the Mt. Hood National Forest Airsheds. An airshed is defined as a geographical area that, because of topography, meteorology, and climate, share the same air (Boutcher 94; Forest Plan, Glossary-1). Portions of the Mt. Hood Wilderness are federally designated as a Class I Airshed (Forest Plan, FW-046, and FW-047) and located three miles west of The Dalles Watershed fuelbreak planning area. The Badger Creek Wilderness, a Class II Airshed is four miles south of The Dalles Watershed Fuelbreak planning area (but is adjacent to the Dog River section of the watershed along Surveyor's Ridge). Management

activities shall comply with all applicable air quality laws and regulations, including the Clean Air Act and the Oregon State Implementation Plan (MHFP, FW-040). Also, in compliance with the Clean Air Act, the Forest Service is operating under the Oregon Administrative Rule (OAR) 629-43-043.

Smoke management is the management of fuel treatments from forest activities so that there are no effects or reduced effects to local areas surrounding the project. This primarily deals with impacts to people or air quality. All Forest Wide Standards and Guidelines for Air Quality FW-039 through FW-053 (MHFP, p IV 51-52) would be followed to minimize the risk of smoke affecting air quality in local communities. All prescribed burning activities would comply with Forest Service Manual direction (FSM 5100, Chapter 5140).

All planned ignitions are conducted according to the operational guidance for the Oregon Smoke Management Program (OSMP). The Environmental Protection Agency has approved the OSMP as meeting the requirements of the Clean Air Act, as amended. The OSMP, which is administered by the Oregon State Forester, regulates the amount of forestry related burning that 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 material to be burned, and the atmospheric conditions available to promote mixing and transportation of smoke away from sensitive areas. For each activity requiring prescribed fire, the Forest Service requires a written, site-specific prescribed burning plan approved by the appropriate Forest Service responsible official. The purpose of the plan is to ensure that resource management objectives are clearly defined and that the site, environment, or human health is not harmed. The plan contains a risk assessment to quantify the chance of fire escaping and develops a contingency plan for actions taken to prevent escape and if it does, quickly contain the escape. The plan would be implemented to minimize the possibility of any prescribed burning affecting Class I or other "smoke sensitive" areas in accordance with the OSMP.

The particulate matter (PM) 10 microns and PM 2.5 microns have been established as primary air quality parameters because of potential adverse human health effects. These small particulates 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.

Smoke sensitive areas near The Dalles Watershed fuelbreak planning area also include the communities of the Hood River Valley, The Dalles, Dufur, and areas within the Columbia River Gorge National Scenic Area. Burning can only be conducted when actual and predicted atmospheric conditions would minimize the possibility of smoke affecting these areas. The general public can obtain information about any proposed burns in the immediate area from local ranger districts, advertisements in local newspapers, radio, or television, and avoid areas being approved by the EPA.

The tables below displays an estimate of the amount of wildfire acres, underburning, and piles to be burned by the different treatments, and the estimated amounts of PM 10 & PM 2.5 to be released into the atmosphere from burning. The estimated amounts of particulate matter (PM)

that would be created by the smoke from the proposed burning can be found in the fuels report in the project file.

Table 3-5. Acres of Wildfire versus Activities Proposed

Fuels Treatment	No-action	Action
Burn Hand Piles	0	3600 piles*
Burn Landing Piles	0	70**
Underburn Acres	0	710 acres
Wildfire ***	100+ acres	<50 acres***

* Hand piles = 30 piles/acre (average)
** Landing piles = 1 pile/20 acres (average)
***Based on historical fire sizes from 1908 to present, roughly every 40-60 years

Table 3-6. Comparison of Particulate Matter (10) Release from Wildfire versus Activities Proposed

Tons PM 10*	No-action	Action
Burn Hand Piles	0	7.91 tons
Burn Landing Piles	0	2.76 tons
Underburn Acres	0	74.07 tons
Wildfire	43.41 tons	21.71 tons
Total tons PM10	**43.41 tons**	**106.45 tons**

*Figures in Tons PM 10 includes PM 2.5

Table 3-7. Comparison of Particulate Matter (2.5) Release from Wildfire versus Activities Proposed

Tons PM 2.5	No-action	Action
Burn Hand Piles	0	6.89 tons
Burn Landing Piles	0	2.40 tons
Underburn Acres	0	67.85 tons
Wildfire	40.10 tons	20.05
Total tons PM2.5	**40.10 tons**	**97.19 tons**

The values in the previous tables are only estimates for comparison purposes. The values are calculated from the FASTRACS (Fuels Analysis, Smoke Tracking, and Report Computer System) computer program. The actual amount of particulate matter released is dependent on many variables (weather, fuel moisture, firing method, etc.). Information for the wildfire particulate matter determined using FOFEM5 (First Order Fire Effects Module, version 5), based on projected smoke emissions per acre for a very dry, summer event. Wildfires with less or more acres would have a corresponding change in the amount of particulates generated by the event.

If historical fires sizes were to be followed, the acreage would be closer to 1000 acres and potentially up to 10,000 acres. Totals for tons of particulate would increase from 43.41 tons to 434.1 tons and 4, 341 tons of particulate material respectively. These amounts are 4 and 40 times the amount if the fuelbreak is created and the proposed actions implemented.

While the amount from a moderate wildfire is less than the overall for the fuels treatments with a smaller wildfire, the amount of particulate matter that is produced can be dispersed over a longer time period with less direct effect than a wildfire event. All numbers for the treatments assumed all acres/piles were treated in one burn period day of 16 hours, which is generally not possible due to limitations of weather, terrain, personnel, equipment, etc. Most of the smoke producing treatments would occur over a two to four year time span, thus limiting the amount of particulates produced by the treatment method.

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

Alternative 1—No Action
Direct and Indirect Effects
Air quality would remain unaffected, until a large fire event occurred. The Dalles and/or Hood River Valley would be impacted by such an event, with very high particulate matter imparted into the local air sheds, with potential health risks.

Alternative 2—The Proposed Action
Direct and Indirect Effects
Burning of piled natural and activity fuels, as well as underburning would occur. Typically, machine piling occurs in the fall and during periods of inclement weather (wet season). The primary impact from pile burning (machine or hand) is limited and temporary, and would most likely impact hunters in the area.

Underburning could occur in the spring or fall depending on available windows of opportunity to meet desired outcomes (parameters for successfully meeting objectives). Underburning can produce more smoke than pile burning, which may have a greater impact on local air quality.

All burning would be scheduled in conjunction with the State of Oregon to comply with the Oregon Smoke Implementation Plan to minimize the adverse effects to air quality. Underburning would be conducted when smoke dispersion conditions are favorable to minimize the potential for adverse effects. Provisions for public safety would be taken prior to any burning activities. Some provisions include issuing public notice before implementing burning activities; and, avoiding smoke intrusions into populated areas, public roads, highways and Class I Airsheds. To avoid impacting these areas, units would be burned when smoke management forecasts predict mixing heights and transport winds that would carry smoke away from or over these areas. If intrusions occur, no additional areas that could contribute to the intrusion would be ignited and extinguishing burning material may be necessary. Signs would be posted on roads that are near burning operations when visibility could be affected. If visibility on state or federal highways is reduced to less than 750 feet, traffic flaggers and pilot cars would be used, as required.

Health risks are considered greater for those individuals in close proximity to the burning site, due to overexposure to particulate matter. However, due to the distance involved and the season

in which pile burning or underburning would occur, there would be negligible effects to individuals due to their limited exposure.

Cumulative Effects of the Proposed Action
Cumulative effects of smoke from adjoining private, state and national forest lands could mix with smoke from the planning area and impact populated areas such as The Dalles, Mosier, Mt. Hood-Parkdale, Hood River, Dufur, Tygh Valley/Wamic, and Maupin. Smoke would be monitored from viewpoints and/or aircraft to lessen the probability of smoke intrusions into public areas.

Vegetation Resources

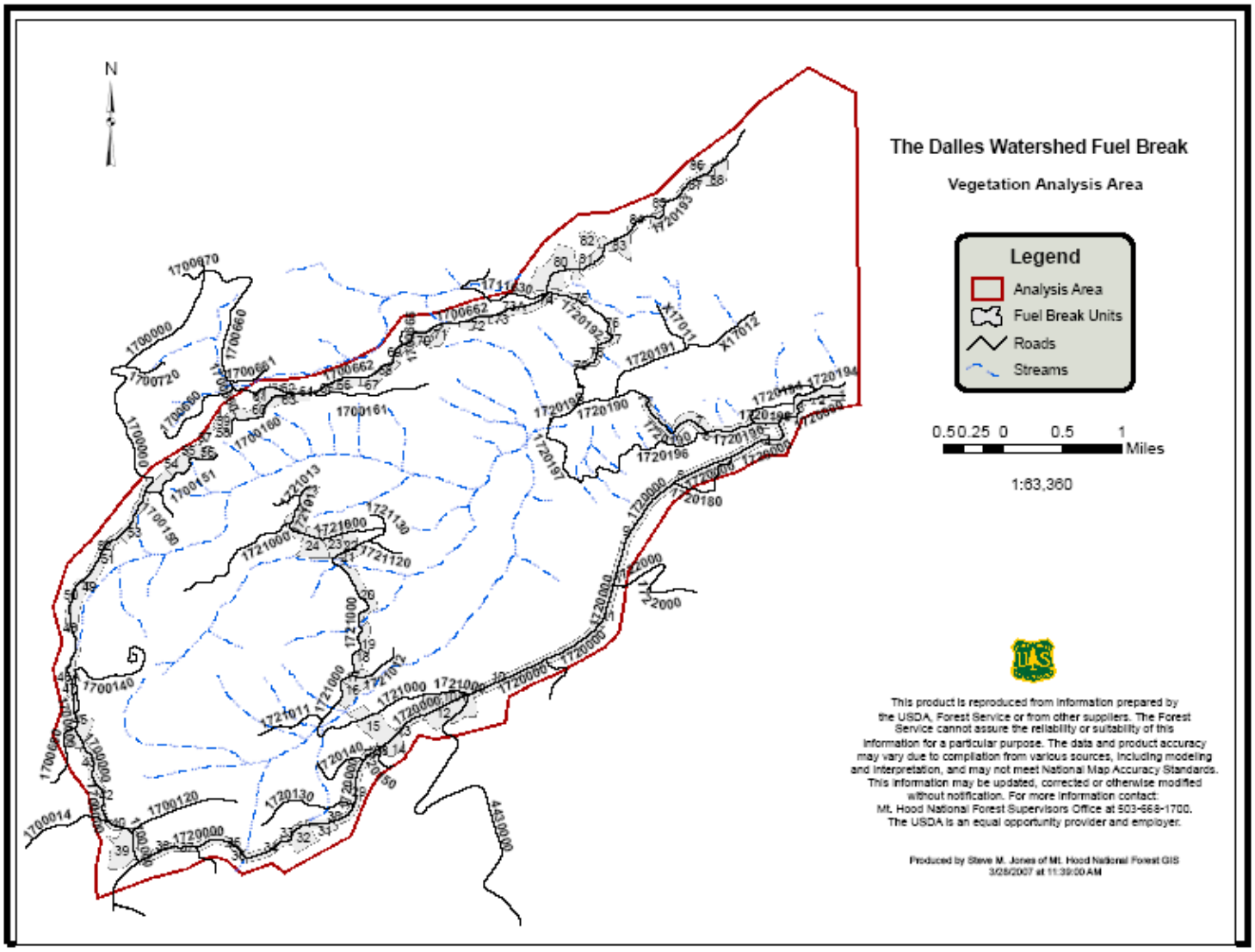
A more detailed silvicultural report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below.

Existing Condition

Information on the vegetative conditions of the larger landscape within which The Dalles Watershed Fuelbreak Project lies is provided largely by an analysis conducted in the recent past by the Mt. Hood National Forest: the Mill Creek Watershed Assessment (2000). Refer to Map 3-1 and Map 1 in the Silvicultural Report (project record exhibit R-1) for 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 fuelbreak proposal are discussed in this EA. For the complete analysis of vegetation conditions and ecological processes at the landscape scale, refer to the Mill Creek Watershed Assessment (2000). The Silvicultural Report for the fuelbreak project proposal (project record exhibit R-1) provides an additional summary of this landscape information as related to the fuelbreak project.

The analysis area boundary for disclosing effects at this more site-specific level is the South Fork Mill Creek watershed or the Project Area (refer to Figure 3-1), which includes all stands that were evaluated for possible treatment actions. The Silvicultural Report (project record exhibit R-1) provides detailed documentation of individual stand conditions and the selection process. Information sources included stand records and field surveys conducted in the 1980s and 1990s, as well as field reviews conducted in the year 2006 (on file at the Hood River Ranger District office).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The Dalles Watershed Fuel Break
Vegetation Analysis Area
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Figure 3.1

Landscape Scale

The Mill Creek Watershed Analysis describes the landscape of the east slope of Mt. Hood. Three climate zones are included in the watershed. Open, grass covered slopes and forests of ponderosa pine and Oregon white oak dominate the lower elevations and drier sites. Grand fir and Douglas-fir are major components on cooler, moister northerly aspects and mid-elevation sites. Grand fir, lodgepole pine and white pine are predominant at the higher elevations in the drainage.

Typically, across this landscape the fir and Douglas-fir dominated forests are dense single or multi-storied stands. The drier sites where ponderosa pine is more common may be less densely stocked, and are typically in a multi-storied condition. Douglas-fir is often a major component in the mid and lower canopies except on the driest sites, where ponderosa pine is prevalent, along with Oregon white oak. The lodgepole pine stands at mid to upper elevations in this landscape are often mixed with other species (Douglas-fir, grand fir) and most commonly form dense, single-storied canopies. The analyses completed at the larger landscape scale (refer to the 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 1800s, 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.

Some level of 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 a 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 assessment referenced above and under the section on "Influence of Major Ecological Processes and Disturbances" later in this chapter.

The lower slopes of the Cascade Range (where the fuelbreak 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 forests of the dry southerly aspects would tend to be more frequent and often slop over onto the north 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 might move into tree crowns and be carried quickly along due to the dense canopy on these northerly slopes, resulting in a stand-replacing fire.

Figure 3.2. Continuous fuel bed and fuel ladders in South Fork Mill Creek.

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

Site Specific, or Project Area Scale

All proposed treatments in the fuelbreak project occur within the upper end of the South Fork Mill Creek watershed. Douglas-fir dominated forests growing on warm, dry to moist grand fir habitats cover the upper slopes of Mill Creek. These forests are of concern because of their importance to the water quality in the watershed for the City of The Dalles and the dramatic change in condition that these areas have experienced over the past 100 years. There is an estimated total of 1,183 acres of this (Fire Group 2, 3 and 4) Douglas-fir and grand fir forest type in the upper reaches of Mill Creek. Near the national forest boundary in the northeast corner of the project area, the hot, dry pine-oak and Douglas-fir type covers 2,064 acres.

Tree density within these Douglas-fir stands is relatively high compared to what most commonly existed historically on these sites (refer also to discussion under “Fire and Fuels” in this chapter). It is important to understand that this dense Douglas-fir forest type is not in itself a condition that was ever experienced in the past. Certainly there were pockets of forest on similar sites across the historical

landscape that by chance escaped one or more fires, and very likely could have developed the dense canopy and/or multi-storied conditions that we see in the South Mill Creek project area.

Figure 3.3. Dense multi-storied stand in South Fork Mill Creek.

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

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

Stands proposed for the fuelbreak treatment were classified by species composition, structure, density, age and health. The following table describes the stand groups for proposed treatment units.

Table 3-8. Existing Site and Vegetative Condition of Treatment Stands within The Dalles Watershed Fuelbreak Project Area.

Unit	Stand Group	Acres	Forest Type: Vegetation Composition	Forest Structure; Density, Size & Age Classes	Vegetation Condition	Other
7, 8, 28, 33, 81	**A**	25 Cable 106 Tractor	GF, DF, WH, NF, WL, WRC LP, minor amts ponderosa pine, Undergrowth low shrubs and grass (ninebark, mtn 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 8-15" dbh range. These trees are typically 70-110 yrs old. Remnant groups and scattered individual old overstory DF & PP (+-200 yrs, 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 ponderosa pine were removed 30-50+ yrs ago. Very light downed fuels.

Unit	Stand Group	Acres	Forest Type: Vegetation Composition	Forest Structure; Density, Size & Age Classes	Vegetation Condition	Other
9, 10, 10A, 16, 19, 20, 21, 23, 27, 28A, 30, 36, 37, 40, 43, 45, 46A, 47, 48, 50, 51, 52, 53, 56, 58, 60, 62, 63, 65, 68, 70, 72, 73, 75, 76, 78, 84, 85, 88	**B**	96 Cable	GF, DF, WH, NF, WL, WRC LP, minor amts PP, Undergrowth low shrubs and grass (ninebark, mtn maple, pinegrass), shrubs suppressed and decadent. 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 9-16" dbh range. These trees are typically 70-110 yrs old. Remnant groups and scattered individual old overstory DF & PP (+-200 yrs, 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. Younger age classes (<100 yrs) mostly in good condition, though some stressed due to overstocking in clumps. Root rot pockets common, infecting grand fir and DF. 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 yrs), removing much of the overstory PP and DF.
		434 Tractor				

Unit	Stand Group	Acres	Forest Type: Vegetation Composition	Forest Structure; Density, Size & Age Classes	Vegetation Condition	Other
1, 4, 77, 79, 87	**C**	44 Tractor 12 Non-commer-cial	PP, OWO, DF, GF Idaho fescue and bluebunch wheatgrass dominate, with dry site forbs.	Very open, dry forest with scattered and small groups of 7-15" dbh trees, est. 40-60 tpa overall, and nearly all are about 80-100 yrs old. Few to no snags and light amount of downed wood.	DF and GF encroaching in pine oak stands.	Shallow soils along dry ridgelines. Low to moderate amount of downed wood through most of area, though some heavy pockets.
2, 3, 5, 6, 11, 12, 13, 14, 15, 18, 22, 24, 26, 29, 31, 32, 39, 41, 44, 49, 54, 55, 57, 59, 61, 66, 67, 69, 71, 74, 82	**D**	539 Non-commer-cial	DF, PP, LP, WL, WP, GF, WH. 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	Mistletoe infection in remnant overstory DF and PP. Brush providing competition in some stands.	

Unit	Stand Group	Acres	Forest Type: Vegetation Composition	Forest Structure; Density, Size & Age Classes	Vegetation Condition	Other
34, 38, 40A, 42, 46, 46A 64, 73A	**E**	18	As above.	As in D above but lighter stocking of 100-200 tpa, or less.		
80, 83, 86	**F**	121	Bunchgrass meadow with individual PP/DF/OWO			

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

Influence of Major Ecological Processes and Disturbances

Ecological processes and disturbances directly affect the diversity of plant and animal communities within an area over space and time. The better this interrelationship is understood, the better we will be able to assess the integrity and sustainability of our ecosystems and plan our actions to maintain healthy, properly functioning ecosystems into the future. Ecological processes and disturbances include nutrient and biomass cycling, forest succession (the change in vegetation over time), weather events (i.e. windstorms), insects, pathogens, fire, and human influences (i.e. timber harvest).

Over the last century, there have been broad changes in vegetative conditions in the Cascade Range, as summarized in the landscape analyses referenced earlier. The primary or most obvious disturbances or factors of change, influencing vegetation in the fuelbreak project area include fire, insects, diseases and timber harvest. A brief discussion of insects, diseases, and timber harvesting follows below. A discussion of Fire and Fuels occurs in a later section of this chapter. For further information, refer to the Silvicultural Report (project record exhibit R-1).

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, 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.

The pathogen currently causing the most obvious affect on the forests in the Mill Creek area is dwarf mistletoe 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 is increasing evidence that important interactions exist between dwarf mistletoes and animals (Hawksworth and Wiens 1996). Birds, porcupines, squirrels, and other animals eat seeds, shoots, and other parts of the plants. The dense branch masses (“witches brooms”) caused by dwarf mistletoe provide cover and nesting sites for some birds and mammals.

Historically, wildfires have been the most important single factor governing the distribution and abundance of dwarf mistletoes (Alexander and Hawksworth 1975 *in* Hawksworth and Wiens 1996) Fires are frequently effective in limiting dwarf mistletoe populations because trees usually return to burned sites much faster than the parasite does. In addition, more heavily infested trees have highly flammable witches’ brooms and lower live crowns, which may increase intensity of fire and tree (and associated mistletoe) mortality. In some situations, fire can increase, rather than decrease, abundance and distribution of mistletoe populations. Low and mixed severity, spotty fires may leave live, infected trees on the site that infest new tree regeneration.

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

In the fuelbreak project area, the severity of dwarf mistletoe infection is very high in older age classes of Douglas-fir, as well as in western larch and ponderosa pine. Many of the older (150+ year) Douglas-fir in the stands within the project area are infected with dwarf mistletoe, most with 100 percent of the crown affected. Huge witches' brooms are common on these trees; some are already dead. The level of mistletoe infection in the younger Douglas-fir trees (<120 years) varies across the project area, from very low levels in some stands to very high levels in others (refer to Table 1, Silvicultural Report, project record exhibit R-1). Generally, where heavily infected Douglas-fir overstory exists, the infection level in the adjacent and understory trees is also high, and would be expected to continue to increase as long as the source of infection exist.

The dense, multi-canopied Douglas-fir and grand fir dominated forests in the area are also desired habitat for root diseases. Most of the stands in the watershed have some level of root disease present. All these organisms can cause increased stress, severe reduction in tree growth, and direct or indirect mortality to trees. 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". These organisms now have far more of their favored habitat available to them – dense, multi-canopied Douglas-fir forest – and therefore may cause more severe effects to the forests than has typically occurred in the past. In fact, several studies have found that the intensity and duration of budworm outbreaks and in some cases their frequency, have increased substantially over the past 50-100 years (USDA 1985).

Lodgepole pine occurs on the upper elevation areas of The Dalles Watershed Fuelbreak project area. Mountain pine beetle is the organism most likely to affect these areas, and some mortality to lodgepole pine is occurring presently. These stands are mature (70-100 years old), which increases their susceptibility to the beetle. Large populations of beetles are present in nearby watersheds and could spread to these stands and cause high mortality (Hessburg et al. 1994).

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

In the project area, records show about 588 acres of the area proposed for the fuelbreak has previously been treated, during the period from 1960 to 1999 (refer to Appendix A or Silvicultural Report, project record exhibit R-1). Of this, approximately 202 acres were thinned and 387 had regeneration harvest.

Environmental Effects

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

Alternative 1—No Action

Direct, Indirect and Cumulative Effects

No acres are treated under this alternative, and thus there are no direct, indirect or cumulative 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. The warm Douglas-fir sites, currently occupied by densely stocked Douglas-fir and grand fir stands, would experience the continuing spread of root disease and resultant mortality over the long-term, as well as continued and spreading infestation and mortality from dwarf mistletoe. Fuel levels would remain high until a natural cleansing event occurs. At which time effects to soils would be greatly increased (see Soil Productivity section in this chapter).

Alternative 2—Proposed Action

Direct and Indirect Effects

Effects on Forest Types within the Project Area and the South Fork Mill Creek Drainage:
This alternative treats nearly 1,400 acres, 1,256 with mechanical thinning, 18 acres with hand thinning and 121 acres with prescribed burning only. This equates to about five percent of the South Fork Mill Creek drainage, or hydrologic unit code level 6. It equates to 9.5 percent of the 14,646-acre vegetation analysis area for the fuelbreak.

Most of the fuel reduction treatments proposed under Alternative 2 occurs within the Douglas-fir dominated forests of concern, located on the warm, dry/moist grand fir Douglas-fir habitat associations. Alternative 2 changes about 545 acres of this type from what is currently dense, mostly closed canopy forest to a semi-open condition. This represents four percent of the total acres of this forest type within the vegetation analysis area for The Dalles Watershed fuelbreak.

Units 80, 83 and 86 in this alternative are low intensity underburns in open ponderosa pine/grass vegetation types. The treatments would result in essentially no change in the current structure or species composition on these sites. Few trees would be killed, and these would be seedlings and saplings. An open forest with grass undergrowth would still remain after treatment.

Effects on Forest Structure and Composition:
Low intensity prescribed burn treatments (Units 80, 83 & 86). About 121 acres of land would be burned with a low intensity underburn under Alternative 2. There would be a relatively minor change to the vegetation with this treatment. This burn would perpetuate the current condition of

naturally open, grassy slopes, and scattered ponderosa pine trees of all sizes and ages. Most of these trees would survive the burn, though some of the smaller seedlings and saplings may be killed. The underburn would remove some of the needle and litter layer that has accumulated over many decades and stimulate growth of the grasses and forbs. The lower limbs of some trees may require pruning prior to burning to prevent torching and subsequent mortality.

Low intensity prescribed burning after mechanical fuel reduction (Units 1-12, 21-25, 56, 71-74, 73A (hand treatment), & 76-88). The fuel reduction units within Fire Regime 1 would be assessed after mechanical treatment and pile burning to determine the need or opportunity for underburning, initially to return fire as an ecosystem process (albeit site-specifically), and then as a mechanism for maintaining the fuelbreak. Underburning would create a substrate for germination of fire resistant seral species such as ponderosa pine and western larch, while creating mortality in existing seedlings of invading climax species such as Douglas-fir and true firs. Underburning may be feasible on 264 acres of mature mixed conifer, 57 acres of immature pine/oak, and 268 acres of second growth stands. Thicker barked fire-resistant species are expected to show a high level of survival with a managed but fast-moving prescribed burn. If litter depth is reduced , as well as residence time for fire burning at the base of trees, mortality should be low in seral species.

Thinning treatments (all units except 80, 83 & 86). This alternative would mechanically or hand thin about 1,275 acres of forest (sapling to mature). Trees of all sizes down to saplings (i.e. 3" or less in diameter) would be removed, including all snags (there are very few to begin with). Focus would be on leaving the most vigorous, usually larger diameter trees, and favoring ponderosa pine and western larch over Douglas-fir. This treatment would be followed by piling to reduce the amount of fine fuels and slash concentrations left after treatment. Sound snags within the Surveyor's Ridge Late Successional Reserve will be left whenever possible.

The most notable direct change to vegetation in these areas would be a substantial reduction in tree densities. These acres of forestland would be reduced from the current 250-600+ trees per acre down to about 40-100 trees per acre. Currently dense, closed canopy stands would change to a semi-open condition, where most trees would be spaced such that their crowns would not be touching (boles about 30 feet apart). This would reduce competition among trees for moisture and light, improving growth and vigor on residual trees. Substantially more sunlight would reach the forest floor, stimulating growth of understory grass, forb and shrub species. Future underburning would also stimulate the growth of these grasses and shrubs.

Species composition would essentially remain unchanged, though ponderosa pine may increase slightly in proportion within those units where it currently exists. This is because ponderosa pine would be chosen over Douglas-fir as a leave tree whenever possible. However, because Douglas-fir is currently so overwhelmingly dominant in most stands, this increase in proportion of ponderosa pine would be quite small.

Figure 3-4. Target canopy cover in fuelbreak

Stand structures that were originally single storied and essentially even aged, composed of 80-110 year old Douglas-fir, would remain so, only far more open-canopied. Few to no old overstory trees would exist, because there were none in the original stand. Stands currently with a more multi-storied structure, and a wide range in ages of trees, would also be more open after treatment, but still in the multi-age/multi-canopied structure. These areas would appear park-like after treatment, with widely spaced trees and a relatively clean, green forest floor.

Treatment areas within mature stands in the Surveyors Ridge Late Successional Reserve (LSR) would retain slightly higher trees per acre and canopy cover than those outside the LSR. A higher downed wood and snag component would also be retained to meet LSR objectives. These areas may be less effective as a fuelbreak due to retained fuels than areas treated outside the LSR, but would maintain more biological legacies (Drever et al. 2006).

Comparison to Historical Conditions:
The character of the existing stands within the Mill Creek watershed are heavily influenced in a detrimental way by past fire suppression and logging activity, as described earlier under "Existing Condition." The treatments proposed in Alternative 2 largely counteract this influence, reducing tree densities and altering forest conditions to be closer to an estimated historical condition, but only in a very localized and linear fashion along roadsides.

Thinning maintains the overwhelmingly Douglas-fir dominated forest, though density and structure are altered to a more desirable, sustainable condition. Some improvement of conditions would occur for ponderosa pine and western larch regeneration, survival, and growth by creating small openings,

releasing of existing pine, and applying periodic underburning. Over time, it is hoped that ponderosa pine and western larch may find some sites to regenerate within these treatment units. Reducing understory ladder fuels and downed woody debris would lower risk of crown fires. Periodic underburning would restore more natural processes to the site and the landscape, reintroducing fire with all its known and unknown benefits to these plant communities.

The prescribed burn treatments in Alternative 2 are an attempt to functionally replace wildland fire with prescribed fire. The forests in the project area are adapted to fire, of variable intensities and sizes (as described more thoroughly under the section on "Fire and Fuels"). The prescribed burns would result in effects similar to that of a "natural" wildland fire. The treatments recognize 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, it is also recognized that the effect of a prescribed fire does not in all cases equate to that of a wildland fire. 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 can remain under control, or to ensure that other management objectives are met (such as avoiding excessive loss of live trees during burning operations).

Effects on Residual Trees in Thinned Areas:
In the thinned units there is an increased risk of blowdown, bending and breakage of the residual trees from snow loading. Trees that have grown for many decades in densely stocked conditions and are relatively small in diameter as a result (i.e. <9" diameter at breast height) are often more vulnerable to these effects if a thinning occurs and the surrounding "supporting" trees are removed. However, it is not expected that these effects would be significant in this area. Tree diameters would vary, but many, if not most, trees would be of large enough diameter and strength to withstand the effects of winds and snow. In addition, snow loads on these lower elevation sites are not excessive in most years.

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.

Insect and Disease Processes and Forest Vulnerability:
A minor direct reduction in the parasitic dwarf mistletoe populations would occur with treatments proposed under this alternative. This would occur mostly because many of the dwarf mistletoe infected trees would be removed from the site in the heavy thinning treatment. There would still be many mistletoe infected trees left throughout the area, because in some areas there would be no choice but to leave these trees in order to meet structure retention objectives. Rate of dwarf mistletoe spread through the stand would likely be decreased from present conditions under this alternative because of the wide space between the trees, and the girdling of some of the infected overstory trees. The range of dwarf mistletoe seed spread is limited. Understory burning has been shown to reduce stand infection (Conklin and Armstrong 2005). Smoke appears to negatively affect the dwarf mistletoe plant.

Some reduction in vulnerability of the stands to future infestations of insects such as spruce budworm and tussock moth would occur under this alternative. This is because a widely spaced forest, with lightly stocked understory tree layers, would be created by treatment and maintained through time by understory burning. Though the host species Douglas-fir would remain the dominant stand component, this change in stand structure would create conditions much less favorable for these insects (Fellin and Dewey 1986).

Residual trees in stands with root disease are expected to continue to experience mortality as the disease moves through roots in the soil substrate and reaches susceptible species. If these trees pose a hazard to adjacent travelways in the future, regional policy dictates the danger trees must be felled.

Cumulative Effects of the Proposed Action on Vegetation
Discussions of the cumulative effects are limited to those past, present and reasonably foreseeable activities that have been determined to have a cumulative effect on the vegetative resource. Refer to Appendix B in the Silvicultural Report (project record exhibit R-1) for evaluation of all possible activities that were originally considered in this cumulative effects analysis for vegetative conditions.

Landscape Scale
Cumulative Effects of Alternatives 1 and 2
The total acreage treated by thinning or prescribed burning in the proposed action is 1,400 acres. This is a fairly inconsequential amount of vegetative change when considered at the scale of a large landscape, specifically the 27,930-acre Mill Creek Watershed analysis area as described earlier. Because Alternative 2 treats only a small portion of the dense Douglas-fir stands of concern in The Dalles Municipal Watershed, by itself five percent does little towards improving overall landscape vegetation towards a condition that would have occurred under a natural disturbance regime. However, more fuel reduction projects may be proposed across this and adjacent watersheds in the future. These projects as a whole would make considerable progress towards more desired conditions of vegetation, in addition to meeting many other important land management objectives, such as reducing fire risk, protecting private lands, improving wildlife habitat, etc.

Alternative 1—No Action
Cumulative Effects
This alternative perpetuates the current condition of the vegetation along roads in The Dalles Watershed project area, which has been heavily influenced by the past fire suppression and logging activities as described previously. There is higher probability and increasing risk of mixed and uncharacteristically lethal fire (stand-replacing) in this area under this alternative (see effects discussion under the section on “Fire and Fuels”). A future high severity fire of this sort would result in dramatic changes to the vegetation condition, uncharacteristic of what Fire Regime 1 historically experienced. Results might be similar to those of the School Marm Fire, creating problems for the water source of the City of The Dalles. The dense, continuous forest canopies in this area, with substantial fuel loadings and ladder fuels, would be susceptible to lethal crown fires, killing all trees over large areas of forestland. This, of course, would have associated effects on social/human values, elk thermal cover, water quality, soil properties, and other resources.

Alternative 2—Proposed Action
Cumulative Effects

Treatments under this alternative would improve the ability of fire suppression forces to contain fires before they spread into the larger watershed area by altering fire behavior along roadsides, but not lower the overall risk of stand-replacing fire in the future in the project area. As described under "Fire and Fuels" section, future fires with ignitions in the fuelbreak area are likely to be low intensity and non-lethal, easier and safer to control. Within the fuelbreak corridor, 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 treated area from a future high intensity fire would be reduced.

Fuel reduction treatments on private lands within the watershed to reduce fuel loading and fire risk are foreseeable actions that would occur under this alternative (refer to Appendix A for ownership map). These treatments are adjacent to units on National Forest System lands and would share similar treatment methods as the proposed units in Alternative 2, but would treat whole stands rather than roadside strips. Existing forest conditions are similar (dense Douglas-fir) and conditions after treatment would be the same (semi-open forest with about 50 trees per acre).

Cumulatively, this would increase the amount of the Douglas-fir forest type treated across this area, converting dense stands to a more desirable semi-open condition, with resulting landscape and site-specific effects as described previously. These additional vegetation treatments also have associated effects on fire risk, wildlife, and other resources. The associated effects are covered in other resource sections.

Stands forming the northern border of the fuelbreak contain high levels of root disease. This factor, combined with topography and previous harvest, is expected to make residual trees more susceptible to windthrow. It is not possible to predict the full extent of windthrow that may occur.

It is recognized that trees girdled because of mistletoe infection may eventually become hazard trees. The structural benefit they provide in the long-term overrides the future maintenance cost for their felling or removing.

Wildlife Resources

A more detailed wildlife report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below.

Existing Condition

Three species of wildlife classified as threatened, endangered or proposed, have been listed as having the potential of occurring on or adjacent to the Barlow Ranger District of the Mt. Hood National Forest. There are twenty-one Forest Service Pacific Northwest Region sensitive species with potential to be found on the Barlow District.

Table 3-9 Wildlife Survey Results

Species	Habitat	Surveys	Presence
Threatened, Endangered or Proposed			
Bald eagle *(Haliatus leucocephalus)*	N[1]	-	-
Northern spotted owl *(Strix occidentalis caurina)*	Y[1]	Y[2]	N[1]
Canada lynx *(Lynx canadensis)*	N[1]	Y[1]	N[1]
Forest Service Pacific Northwest Sensitive Species			
Oregon Slender salamander *(Batrachoseps wrighti)*	Y	-	-
Larch Mountain salamander *(Plethodon larselii)*	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)*	Y	-	-
Pacific fisher *(Martes pennanti)*	Y	-	N
Horned grebe *(Podiceps auritus)*	N	-	-
Bufflehead *(Bucephala albeola)*	N	-	-
Harlequin duck *(Histrionicus histrionicus)*	N	-	-
Peregrine falcon *(Falco peregrinus anatum)*	N	-	-
Gray flycatcher *(Empidonax righti)*	N	-	-
Puget oregonium *(Cryptomastix devia)*	Y	-	-
Columbia oregonium *(Cryptomastix hendersoni)*	Y	-	-
Dalles sideband *(Monadenia fidelis minor)*	Y	-	-
Crater Lake tightcoil *(Pristiloma arcticum crateris)*	Y	-	-
Evening fieldslug *(Deroceras hesperium)*	Y	-	-
Survey and Manage Species			
Great gray owl *(Strix nebulosa)*	Y[1]	Y	N
Larch Mountain salamander *(Plethodon larselii)*	Y	-	-
Puget oregonium *(Cryptomastix devia)*	Y	-	-
Columbia oregonium *(Cryptomastix hendersoni)*	Y	-	-
Dalles sideband *(Monadenia fidelis minor)*	Y	-	-
Crater Lake tightcoil *(Pristiloma arcticum crateris)*	Y	-	-
Evening fieldslug *(Deroceras hesperium)*	Y	-	-
Mt. Hood National Forest Management Indicator Species and Neotropical Birds			
Mule deer (*Odocoileus hemionus*) and Elk (*Cervus elaphus nelsoni*)	Y	N	Y
Pileated woodpecker *(Dryocopus pileatus)* Habitat Area (B-5)	Y	-	-

Species	Habitat	Surveys	Presence
Pine marten *(Martes americana)* Habitat Area (B-5)	Y	-	-
Merriam's turkey *(Meleagris gallopavo)*	Y	-	-
Western gray squirrel *(Sciurus griseus)*	Y	-	
Snag and downed log associated species	Y	N	Y
Neotropical migratory birds	Y	N	Y

1. See narrative in the wildlife report in the project file.
2. The last surveys were conducted in 1993. The Surveyor's Ridge LSR portion of the project is being surveyed. No spotted owls were recorded in 2006. The surveys will be completed in 2007 or before implementation.

The only species discussed below are those with habitat and presence within the project area. A discussion of other species can be found in the wildlife report in the project file.

Threatened, Endangered and Proposed Species

Northern Spotted Owl

The preferred nesting, roosting, and foraging habitat of spotted owls in Oregon is mature, managed to old-growth coniferous forests with multi-layered understory and crown closure of 70 percent or greater. Stands composed of greater than 11-inch diameter trees with greater than 40 percent crown closure provide dispersal habitat. Surveys conducted on the District since l979 have revealed a number of documented sightings. All nesting, roosting and foraging habitat on the Barlow Ranger District is considered "unsurveyed" suitable habitat.

Within the Surveyor's Ridge Late-Successional Reserve (LSR), the project falls within 234 acres of suitable and 80 acres of dispersal spotted owl habitat. Outside the LSR, 237 acres of suitable habitat and 375 acres of dispersal habitat are within the fuelbreak units. The Surveyor's Ridge LSR portion of the project is being surveyed for spotted owls. The 2006 survey produced no spotted owls within the area surveyed. If a spotted owl activity center is located during the 2007 survey then a seasonal operating restriction (March 1- July 15) would be placed in the area impacted.

Baseline spotted owl information for the Mt. Hood National Forest can be found in the 2007-2008 Habitat Modification Biological Opinion for the Willamette Province (FWS reference: 1-7-06-F-0179). This includes all prior timber harvest activities.

Forest Service Pacific Northwest Sensitive Species

Oregon Slender Salamander (also a Survey and Manage Species)

The Oregon slender salamander was listed as a Forest Service Pacific Northwest Region sensitive species in 2000. Oregon slender salamander habitat has variously been described as evergreen forests, older second-growth, and old-growth Douglas-fir with large numbers of large logs and stumps. It is also characterized as a species mostly associated with the west side of the Cascade Mountains of Oregon, (Amphibians of Washington and Oregon, Leonard, et al 1993 and Amphibians of Oregon, Washington and British Columbia, Corkran and Thoms 1996). This proposed project has current tolerance levels of 30-80 percent for snags and down wood material (DecAID wood advisory tool). This equates to 2.5-8 percent cover of down wood for the project area and 10 to 32 snags/acre>10.0 in diameter at breast height (Montane Mixed Conifer Forest, Small/Medium Trees Vegetation Condition).

Larch Mountain Salamander (also a Survey and Manage Species)
The Larch Mountain salamander is listed as a Forest Service Pacific Northwest Region sensitive species in 2000. Until recently, Larch Mountain salamander habitat has been considered to be shaded talus, usually with a litter and duff covering which is not present in the planning area; therefore no surveys had been conducted in the planning area before the fall of 2000. However, surveys north of the Columbia River have found this species within conifer habitat where litter, duff, and moisture conditions are sufficient. The surveyors indicated that even in those conditions, the substrate beneath the litter/duff tended to be an open, porous rocky material with talus like characteristics. These conditions do not occur within any of the areas proposed for treatment in the planning area. Soil conditions are relatively tight with virtually no interstitial spaces suitable for salamanders to descend into as the summer heats and dries. Suitable moisture conditions in late summer for any salamander species will most likely be associated with large, decayed, down woody material.

Wolverine
Wolverine tracks have been observed near the Highway 35 corridor. No denning habitat exists within or adjacent to the project area. The general area could be considered potential foraging or travel habitat by wolverine. However, wolverines are secretive animals and try to avoid humans. All of the existing road uses, precludes use of the area by wolverine except to travel across the road from one point to another.

Puget Oregonium, Columbia Oregonium, Dalles Sideband, Crater Lake Tightcoi, Evening Fieldslug (also Survey and Manage Species)
These terrestrial mollusk species require down wood and tree canopy closure (60-100 percent) to maintain the microsite around the area where the individuals preside. None of the area has been surveyed for the presence of terrestrial mollusks. Maintaining the micro-sites needed for these species would not meet the purpose and need of this project. The risk of loss of habitat is reduced overall in the watershed.

Survey and Manage Species
See the sensitive species for discussion of Columbia oregonium, Crater Lake tightcoil, Puget oregonium, Dalles sideband, Evening fieldslug, Larch Mountain salamander, and Oregon slender salamander. These species are listed as both sensitive and Survey and Manage species according to the Record of Decision and Standards and Guidelines for Amendments to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (January, 2001).

Mt. Hood National Forest Management Indicator Species (MIS)
Deer and Elk Habitat
The Dalles Watershed Fuelbreak planning area is classified as summer range (western two thirds of project area) and winter range (eastern one third of project area) for black-tail deer and Rocky Mountain elk, and is inhabited by both during the summer and winter periods. The scope of this project is that road densities would remain the same as current conditions.

Pileated Woodpecker and Pine Marten Habitat
The Dalles Watershed project area has several stands with trees larger than 20 inches diameter at breast height, which are suitable for pileated woodpeckers to nest and martens to den. The majority of the planning area has trees that average only 11-16 inches diameter at breast height which are too small for pileated woodpecker nesting trees and marten dens.

Merriam's Turkey
Two subspecies of wild turkey (Merriam's and Rio Grande) are found on both the Hood River and Barlow Districts. Both subspecies are generally associated with the pine/oak vegetation type. Turkeys feed on acorns, conifer seed, insects and grass/forbs. Turkey nest sites are closely associated with mixed-conifer stands. Roost trees are large diameter (> 20 inch diameter at breast height) ponderosa pine and Douglas-fir.

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

Snag and Down Log Associated Species
Snags (standing dead trees) and down logs are essential components in forests. Many wildlife species depend on them for survival. The Mt. Hood Forest Plan (FW-215, 216, 217) recommends a 40% biological potential (0.9 snags/acre) for cavity nesting species across the landscape and a 60% biological potential (1.35 snags /acre) in new timber harvest units (Wildlife Habitats in Managed Forest, Thomas et al. 1979). The planning area meets the 40% level. The majority of the mature stands within the planning area exceed the 100% biological potential (2.25 snags/acre). The Surveyor's Ridge LSR Assessment recommends managing snags at 100% of biological potential. This proposed project has current tolerance levels of 30-80% for snags and down wood material (DecAID wood advisory tool). This equates to 2.5-8 percent cover of down wood for the project area and 10 to 32 snags/acre>10.0 in diameter at breast height (Montane Mixed Conifer Forest, Small/Medium Trees Vegetation Condition). The majority of the project area falls into the "Eastside Mixed Conifer Forest, East Cascades/Blue Mountains, Small/Medium Trees Vegetation Condition" as described in the DecAID tool. This zone contains 6.7 to 25 snags/acre>10.0 in diameter at breast height and 2-6 percent cover for down wood.

In the Mile Creeks watershed, snag and down woody debris density and conditions were taken from the 1995 current vegetation survey (CVS). In order to have an adequate sampling intensity, the Middle Columbia-Hood subbasin was used as the 'representative area' (264,769 acres with 85 CVS plots), of which the Mill Creek Watershed forms a portion. Vegetation stratification was by ecological zone (Eastside Douglas-fir, Grand fir/Ponderosa Pine, Pacific Silver fir/ Mountain hemlock); seral stage (early, middle, late); and history (managed or unmanaged). Portions of the project fall within each of the above ecological zones.

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 2003). Refer to this web site

listed in the Literature Citations for more detail and for definition of terms. This advisory tool focuses on several key themes prevalent in recent literature concerning this subject as follows:

- Decayed wood elements consist of more than just snags and down wood; such 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.

DecAid is an advisory tool to help managers evaluate effects of forest conditions and existing or proposed management activities on organisms that use snags and down wood. DecAid also can help managers decide on snag and down wood sizes and levels needed to help meet wildlife management objectives (such as the Mt. Hood National Forest LRMP and the NW Forest Plan). 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 sub-watersheds, watersheds, sub-basins, physiographic provinces, or large administrative units such as Ranger Districts or National Forests. DecAid is not intended to predict occurrence of wildlife at the scale of individual forest stands or specific locations. It is intended to be a broader planning aid, not a species or stand specific prediction tool.

The Northwest Forest Plan Record of Decision recommends 120 linear feet of down logs per acre greater than 16 inches in diameter within the matrix management areas. The Surveyor's Ridge LSR Assessment recommends 10-20 tons/acre, at least three tree-length logs/acre, on at least 300 acres for the Transition Zone.

Neotropical Migratory Birds:
The project area currently contains all seral stages of habitat from early seral to late seral habitat and currently supports the species associated with these seral stages.

Environmental Effects

Table 3-10. Effects for Threatened, Endangered and Sensitive Wildlife Species

Species	Proposed Action
Threatened and Endangered Species	
Bald Eagle[1]	No Effect
Northern Spotted Owl	MEILTAA
Canada Lynx[1]	No Effect
Forest Service Pacific Northwest Region Sensitive Species	
Wolverine	MII
Oregon Slender Salamander	MII
Larch Mountain Salamander	MII
Puget Oregonium	MII
Columbia Oregonium	MII
Dalles Sideband	MII
Crater Lake Tightcoil	MII
Evening Fieldslug	MII
Pacific Fisher[1]	No Impact
Survey and Manage Species	
Great Gray Owl[1]	No Impact
Larch Mountain Salamander	MII
Crater Lake tightcoil	MII
Puget Oregonium	MII
Columbia Oregonium	MII
Dalles Sideband	MII
Evening Fieldslug	MII

[1] See discussion in the wildlife report in the project file
MEILTAA—May Effect and Is Likely To Adversely Affect
ME-NLTAA—May Effect-Not Likely To Adversely Affect
MII- May Impact Individuals, but are not likely to impact populations, nor contribute to a potential loss of viability of the species

Threatened, endangered and proposed species

Northern Spotted Owl

Alternative 1 – No Action

Direct and Indirect Effects

There would be no effect to spotted owls as no habitat would be altered or removed. However, there are approximately 4,528 acres of suitable habitat and approximately 2,340 acres of dispersal habitat within the boundary of the proposed action that would remain at risk to the threat of wildfire.

Alternative 2 – Proposed Action

Direct and Indirect Effects

The tree removal activities on 455 acres which downgrade or remove habitat would have an effects determination of "**may affect and likely to adversely affect"** spotted owls. The tree removal activities on 326 acres which degrade habitat and disturbance related activities would have a determination of "**may affect and not likely to adversely affect"** spotted owls.

The portion of this project that falls within the Surveyors Ridge LSR include 234 acres of nesting, roosting and foraging (NRF) habitat downgraded and 80 acres of dispersal habitat degraded. The purpose of the fuelbreak is to protect the remaining habitat from catastrophic wildfire. This would meet the intent of the Surveyor's Ridge LSR Plan. The Surveyor's Ridge LSR portion of the project is being surveyed for spotted owls. The 2006 survey produced no spotted owls within the area surveyed. If a spotted owl activity center is located during the 2007 survey then a seasonal operating restriction (March 1- July 15) would be placed in the area impacted.

However, as a result of these activities, a large amount of suitable and dispersal habitat would be better protected from the threat of wildfire. There are approximately 4,528 acres of suitable and 2,340 acres of dispersal habitat within the alternative boundary, of which, 3,121 acres are in LSR. Any large wildfire activity would have the potential to downgrade or remove some or this entire habitat.

The effects to spotted owls for this project were consulted with US Fish and Wildlife Service through formal and informal consultation on CY 2005-2006 projects within the Willamette Province which may modify habitats for bald eagles and northern spotted owls. The Biological Opinion was recently rescinded after litigation. A new BA is being submitted to USFWS, and the Decision Notice on this fuelbreak proposal is pending a new letter of concurrence and BO.

Cumulative Effects of the Proposed Action

The analysis area is bordered on the south by Forest road 4400, on the west by Forest road 1700, on the north by the Forest boundary, on the east by the Forest boundary. Projects included in the cumulative effects analysis are the East and West Fivemile Timber Sales (Fivemile Planning Area), the city of The Dalles timber harvest, Billy Bob Hazardous Fuels Reduction project plus projects that may occur in the North Fork Mill planning area. Other historical harvest information was included in the base line spotted owl information from the 2007-2008 Habitat Modification BO for the Willamette Province (FWS reference: 1-7-06-F-0179).

The Fivemile Planning Area degraded 250 acres of NRF, removed 100 acres of dispersal habitat, and degraded 150 acres of dispersal habitat. (The Billy Bob Hazardous Fuels Reduction project may downgrade 295 acres of NRF habitat and degrade 701 acres of NRF and dispersal habitat. This project is still in the planning stages and these acres could change.) The North Fork Mill Creek Planning Area is adjacent to this project; however, no specific information is available to analyze the effects on spotted owls. The proposed plan is to treat existing plantations and previously harvested areas. This project area is in the early stages of planning.

The *Status and Trends in Demography of Northern Spotted Owls* (Anthony et al. 2004) 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 (CTWS) located 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 possibilties, including competition from Barred Owls, loss of habitat from wildfire, timber harvest including lag effects from prior harvest, poor weather conditions, and defoliation from insect infestations. The

Scientific Evaluation of the Status of the Northern Spotted Owl (Sustainable Ecosystems Institute, Courtney et al. 2004) indicated that population declines of the NSO over the past 14 years were expected, they concluded that the accelerating downward trends on some study areas in Washington where little timber harvest was taking place suggest that something other than timber harvest is responsible for the decline.

Cumulatively, the Fivemile Planning Area, City of The Dalles timber harvest, Billy Bob Hazardous Fuels Reduction project, and The Dalles Watershed Fuelbreak projects impact spotted owl habitat negatively. All projects downgrade, remove or degrade habitat. The purpose of the Dalles Watershed Fuelbreak project is to protect the watershed from catastrophic wildfire. This would also protect the spotted owl habitat within the watershed, reducing the overall removal or degradation of spotted owl habitat.

Sensitive Species
Wolverine
Alternative 1 – No Action
Direct and Indirect Effects
Human disturbance would continue from recreational and administrative uses. There would be no change in the use patterns of wolverines with this alternative. This alternative would have **no impact** on wolverines; however, more of the species habitat would reduce be at risk to be lost or altered by landscape wildfires.

Alternative 2 – Proposed Action
Direct and Indirect Effects
There would be no change in the use patterns of wolverines with this alternative. Wolverines are not likely utilizing the area because of the recreational uses throughout the year. The additional human activity created by this alternative **may impact individuals, but are not likely to impact populations, nor contribute to a potential loss of viability of this species.**

Cumulative Effects to the Proposed Action
The cumulative effects area of consideration is the Miles and Mill Creek Watersheds. The past, present and future activities described above were considered in this cumulative effects analysis. There would be no measurable change in cumulative effects since wolverines are not likely utilizing the area because of the recreational uses throughout the year.

Oregon Slender Salamander, Larch Mountain Salamander, Puget Oregonium, Columbia Oregonium, Dalles Sideband, Crater Lake Tightcoil, Evening Fieldslug
Alternative 1 – No Action
Direct and Indirect Effects
There would be **no impact** to the species or habitat with this alternative; however, more of the species habitat would reduce be at risk to be lost or altered by landscape wildfires.

Alternative 2 – Proposed Action
Direct and Indirect Effects
The down wood and canopy closure remaining post treatment would not be able to maintain populations of these species. However, the larger area protected by this fuelbreak would have good habitat for these species and have a reduced risk of loss from catastrophic wildfire.

The proposed project would remove approximately 540 acres of habitat for the time period that the fuelbreak is needed. This proposed project is adjacent to existing roads and trails, which are already barriers for these species movement. The remaining area within The Dalles Watershed is suitable habitat for these species. If and when the fuelbreak is no longer needed then this area would then become habitat. This alternative **may impact individuals, but are not likely to impact populations, nor contribute to a potential loss of viability of this species.** The area within the Surveyor's Ridge LSR would have 240 linear feet of down logs/acre (three tree length logs/acre, Surveyor's Ridge LSR Plan) and two snags/acre (Surveyor's Ridge LSR Plan, 100% biological potential) remaining post treatment. Therefore, the populations of these species would persist.

Cumulative Effects to the Proposed Action
The cumulative effects area of consideration is The Dalles Watershed Fuelbreak area. These species have a very small home range, which is less than 100 meters. The roads used for this fuelbreak already impact the habitat for these species by reducing snags (hazard trees) and down wood (firewood). There would be no measurable change in cumulative effects because of the small home range for these species.

Survey and Manage Surveys
The line officer, after consultation with the wildlife biologist, chose not to do surveys for terrestrial mollusks and Larch Mountain salamanders (ROD, 2001, S&G p. 22). The purpose and need of this project is to create and maintain a fuelbreak. Maintaining the micro-sites needed for these species would not meet the purpose and need of this project. Yet, the fuelbreak would reduce the risk that a larger proportion of terrestrial mollusks and the Larch Mountain salamander would be affected by landscape wildfires. The majority of the species listed under survey and manage are also listed under the Forest Service sensitive species list and the effects to these species is discussed above.

Mt. Hood National Forest Management Indicator Species (MIS)
Deer and Elk
Alternative 1 – No Action
Direct and Indirect Effects
There would be no change from current conditions with this alternative; however, more of the species habitat would reduce be at risk to be lost or altered by landscape wildfires.

Alternative 2 – Proposed Action
Direct and Indirect Effects
The proposed project would convert 481 acres of thermal cover to forage and retain 1,019 acres of forage. The open road density would remain the same. This project would create some long- term forage areas which are becoming limited on summer range (lack of timber harvest). Underburning may cause sprouting of the grasses and brush if soil moistures and seed sources are receptive. This

sprouting would create browse for foraging animals. Since this proposed project may attract more animals to the created forage areas, a concern of increased poaching has been raised by Oregon Department of Fish & Wildlife. Potential winter range closures on the 1720-192 road (B-10 winter range) would help reduce this poaching concern. This potential closure would be analyzed with the North Fork Mill planning project. A seasonal operating restriction (restricting harvest and fuels treatment activities) for winter range would be implemented with this project from December 1 through April 1 for units 1-9, 73-88.

Cumulative Effects to the Proposed Action
The analysis area is bounded on the south by Forest Road 4400, on the west by Forest Road 1700, on the north by the Forest boundary, on the east by the Forest boundary. This area includes the East and West Fivemile Timber Sales (Fivemile Planning Area) plus the planned North Mill Planning area and Billy Bob Hazardous Fuels Reduction Project.

Fivemile Planning Area has 63 percent cover and 37 percent forage for the summer range, plus 50 percent cover and forage for winter range post harvest. The North and South Fork Mill area has 56 percent cover and 44 percent forage. This area would have 54 percent cover and 46 percent forage post-timber removal. The optimum cover forage ratio is 60 percent forage and 40 percent cover (Thomas 1979).

Open road densities for the Fivemile Planning Area would be 1.3 miles/square mile in summer range and 1.5 miles/square mile in winter range. The planning area has 2.12 miles/square mile of road densities and the North Fork Mill Area has 5.03 miles/square mile. The Mt. Hood Forest Plan standard and guideline FW-208 recommends 2.5 miles/square mile on summer range and 2.0 miles/square mile on winter range. The Dalles Watershed Fuelbreak Project would not change the road density within the South Fork Mill Area. The Billy Bob Hazardous Fuels Reduction Project would not change road densities. The majority of the roads in the planning area is within the Dalles Watershed and not open to the public. Therefore, the planning area and Fivemile areas meet or exceed Forest Plan standards and guidelines for road density. The North Fork Mill Planning area currently is above the standard and guideline (5.03 miles/square mile); however, if the road closures are implemented as part of that project then this would reduce road densities and move towards the Forest Plan standards and guidelines.

Cumulatively, there would be no significant change in cover forage ratios and the overall roads densities for the area would be reduced.

Pine Marten and Pileated Woodpecker
Alternative 1 – No Action
Direct and Indirect Effects
There would be no change in habitat with this alternative; however, more of the species habitat would reduce be at risk to be lost or altered by landscape wildfires.

Alternative 2 – Proposed Action
Direct and Indirect Effects
The project would reduce the canopy closure below the 60-100% level that the pine marten normally inhabits and retains few dead trees large enough for pileated woodpeckers to nest in. 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 the Surveyor's Ridge LSR. The project does not impact any designated pine marten or pileated woodpecker habitat areas (B-5) designated in the Mt. Hood Forest Plan. The proposed project would reduce snags and down wood below the 30 percent level. This would impact these species negatively, however adequate snags and down wood would still persist within the watershed and Surveyor's Ridge LSR. The area within the Surveyor's Ridge LSR would have 240 linear feet of down logs/acre (three tree length logs/acre, Surveyor's Ridge LSR Plan) and 2.25 snags/acre (Surveyor's Ridge LSR Plan, 100% biological potential) remaining post-treatment. Those units outside Surveyor's Ridge LSR 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). These standards were addressed in the IDT process and determined to not meet the purpose and need of the proposed project; therefore exceptions were made.

Cumulative Effects to the Proposed Action
The analysis area is bounded on the south by Forest road 44, on the west by Forest road 17, on the north by the Forest Boundary, on the east by the Forest Boundary. This area includes the East and West Fivemile Timber Sales (Fivemile Planning Area) plus the planned NF Mill Planning area and Billy Bob Hazardous Fuels Reduction Project.

The Fivemile Planning Area retained snags and down wood at the 30 to 50 percent levels. The proposed project would reduce snags and down wood below the 30 percent level. The NF Mill Planning area would retain snags and down wood at the 30-50 percent levels.

Cumulatively, there would be no major impact on these species as adequate snags and down wood would be retained within the cumulative effects area. The area within the Surveyor's Ridge LSR would have 240 linear feet of down logs/acre (three tree length logs/acre, Surveyor's Ridge LSR Plan) and 2.25 snags/acre (Surveyor's Ridge LSR Plan, 100% biological potential) remaining post treatment.

Wild Turkey and Western Gray Squirrel
Alternative 1 – No Action
Direct and Indirect Effects
There would be no change in habitat for these species with this alternative; however, more of the species habitat would reduce be at risk to be lost or altered by landscape wildfires.

Alternative 2 – Proposed Action
Direct and Indirect Effects
For wild turkeys and gray squirrels, forage does not appear to be the limiting factor for these species within the project area. Adequate forage would be available in the stands adjacent to the fuelbreak and within the fuelbreak. Sprouting of the grasses and brush may occur after underburning if soil moistures and seed sources are receptive. This sprouting would create browse for foraging animals. Roost and nest trees would be impacted by tree removal activities. Some reduction in the number of potential roost trees would occur within the fuelbreak, however the majority of large ponderosa pine and Douglas-fir trees would be maintained. These large trees would still supply roost sites and forage for turkeys and squirrels. Turkey nest sites would be minimally impacted by this project, as nests are generally found on slopes greater than 30 percent slope. The majority of this fuelbreak is located on slopes less than 30 percent slope. Gray squirrel nest sites would be negatively impacted by this fuelbreak as tree canopies need to connect for squirrels.

Cumulative Effects of the Proposed Action
The cumulative effects area of consideration is The Dalles Watershed Fuelbreak planning area. Gray squirrels have a relatively small home range of 0.25 miles or less. Wild turkeys have a larger home range (approximately one mile during the spring nesting season). Cumulatively, there would be a minor impact on these species. Wild turkeys and squirrels would still forage in the fuelbreak. Turkey nest sites would be minimally impact as the majority of the habitat within the fuelbreak is less than 30 percent slope. Gray squirrel nest sites would be negatively impacted by the openness of the fuelbreak.

Snag and Down Log Associated Species
Alternative 1 – No Action
Direct and Indirect Effects
There would be no change in habitat with this alternative; however, more of the habitat would reduce be at risk to be lost or altered by landscape wildfires.

Alternative 2 – 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 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; however, adequate snags and down wood would still persist within the watershed and Surveyor's Ridge LSR. The area within the Surveyor's Ridge LSR would have 240 linear feet of down logs/acre (three tree length logs/acre, Surveyor's Ridge LSR Plan) and two snags/acre (Surveyor's Ridge LSR Plan, 100% biological potential) remaining post treatment.

Large dead, down and woody debris materials can be consumed during burning. Some of the large down may be consumed due to the purpose and need of the fuelbreak. The scale of the area treated is small compared to the entire landscape of the watershed. Some residual large down woody would be left as fuels treatments are generally not 100 percent effective in their removal of fuels.

Cumulative Effects
The analysis area is bounded on the south by Forest Road 4400, on the west by Forest Road 1700, on the north by the Forest boundary, on the east by the Forest boundary. This area includes the East and West Fivemile Timber Sales (Fivemile Planning Area) plus the planned North Fork Mill planning area.

The Fivemile Planning Area retained snags and down wood at the 30 to 50 percent levels. The proposed project would reduce snags and down wood below the 30 percent level. The North Fork Mill planning area would retain snags and down wood at the 30-50 percent levels (although the details of this project are not yet known). Cumulatively, there would be no major impact on these species as adequate snags and down wood would be retained within the cumulative effects area. The area within the Surveyor's Ridge LSR would have 240 linear feet of down logs/acre (three tree length logs/acre, Surveyor's Ridge LSR Plan) and two snags/acre (Surveyor's Ridge LSR Plan, 100% biological potential) remaining post treatment.

Neotropical Migratory Birds
Alternative 1 – No Action
Direct and Indirect Effects
There would be no change in habitat with this alternative; however, more of the species habitat would reduce be at risk to be lost or altered by landscape wildfires.

Alternative 2 – Proposed Action
Direct and Indirect Effects
Tree removal would create an additional 781 acres of early seral habitat for those bird species. This would a positive benefit for these species as more habitat would be available to them. The early seral habitat would remain until the fuelbreak is no longer needed. Bird species dependent upon late-seral habitat, would have a reduction in habitat of 400 acres from the existing condition. This would impact these species negatively; however, adequate habitat would still persist within the Mill Creek Watershed. Bird species dependent upon riparian habitat would not see much of a change in their habitats as long as the riparian vegetation is maintained or protected within the fuelbreak. Species dependent upon mid-seral stands would have a reduction in 381 acres from the existing condition. This would impact these species negatively; however, adequate habitat would still persist within the Mill Creek Watershed.

Cumulative Effects
The analysis area is bordered on the south by Forest Road 4400, on the west by Forest Road 1700, on the north by the Forest boundary, on the east by the Forest boundary. This area includes the East and West Fivemile Timber Sales (Fivemile Planning Area) plus the planned North Fork Mill planning area. Cumulatively, there would be an increase in early seral habitat and a reduction in late seral habitat. The riparian areas would remain the same. The mid-seral habitat would decrease slightly. There would still be adequate habitat for all bird species within the cumulative effects area.

Recreation and Trail Visual Quality

A more detailed recreation and trail visual quality report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below.

Methodology
The Barlow Ranger District is proposing treatment of the area along the ridgetop following the North Section Line Trail, the Surveyor's Ridge Trail and the Knebal Springs Loop Trail to reduce fuel loads and the capacity of the area to sustain intensive wildfires, while restoring fire-resistant tree species.

This section addresses the major effects of the fuelbreak project on recreation, trail infrastructure and visual quality as viewed from trails. The effects on dispersed and developed recreation in the area would be very minor, consisting of making facilities or small areas of the forest unavailable for a few days at a time. If a particular campground or trail is not available for a period of a few days, then there are numerous campgrounds and trails in the area that can be used. The effects to the trail infrastructure would be mitigated by reconstructing the trail tread to Forest Service standard post-activity. In other words, every stand manipulation activity, be it a timber sale, pre-commercial thinning, or prescribed burn, are always conducted so as to minimize the impacts on recreation opportunities.

The effect of the proposed actions on trail visual quality, however, can be lasting and would differ dependent on the specifics of how the project is planned and carried out, and thus is the focus of this section.

Definition of Terms Used in Describing Trail Visual Quality
The Mt Hood Forest Plan classifies trails in three Visual Quality Objective (VQO) levels (Four-115, 116). The definitions are as follows:

1) Level I trails include the Pacific Crest National Scenic Trail (PCNST) and National Recreation Trails, as well as trails within and going to and from National Scenic Areas, A2 Wilderness, and A4 special Interest Areas.
2) Level II trails are all trails not classified as Level I or Level III.
3) Level III trails are used primarily for fire protection and administrative uses, as well as low recreational use trails and trails used primarily for "putting on miles". Examples include power line corridor trails, old roads used as trails, and trails associated with equestrian, mountain bicycles, or motorcycles.

The Forest Plan also defines the VQO by distance zone for all levels of trails as follows on page Four-116:

Table 3-11. Visual Quality Objectives

Trail Sensitivity Level	Visual Quality Objective per Distance Zone			VQO Allowed within C1 for 20% of trail length
	Near Foreground (first 660 feet from trail)	Far Foreground (next 660 feet)	Middleground (1320 feet to 5 miles)	
I	Retention	Partial Retention	Modification	Partial retention
II	Partial Retention	Modification	Modification	Modification
III	Modification	Modification	Modification	NA

Visual Quality Objective Ratings can be briefly described as follows:

- ***Preservation:*** This visual quality objective allows ecological changes only. Management activities, except for very low visual-impact recreation facilities, are prohibited.
- ***Retention:*** This visual quality objective provides for management activities which are not visually evident. Under retention activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc., should not be evident.
- ***Partial Retention:*** Management activities are visually evident but subordinate to the characteristic landscape when managed according to the partial retention visual quality objective. Activities may repeat form, line, color, or texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, pattern, etc., **remain visually subordinate to the characteristic landscape.**
- ***Modification:*** Under the modification visual quality objective **management activities may visually dominate the original characteristic landscape**. However, activities of vegetative and land form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type.
- ***Maximum Modification:*** Management activities of vegetative and landform alterations may dominate the characteristic landscape. However, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middle ground, they may not appear to completely borrow from naturally established form, line, color, or texture. Alterations may also be out of scale or contain detail which is incongruent with natural occurrences as seen in foreground or middle ground.

Existing Condition

The three trails in the project area located in the vicinity of harvest units are the North Section Line Trail #451, Surveyors Ridge Trail #688, and a recently constructed extension of the Knebal Springs Loop Trail #474. Two trails (North Section Line and Surveyors Ridge) are classified as level II for trail sensitivity in the Forest Plan. The extension of the Knebal Springs Loop Trail #474 trail is classified as level III.

The North Section Line Trail and Knebal Springs Loop Trail are both surrounded by proposed treatment areas, and proposed treatment units are located on the east side of the Surveyor's Ridge Trail. A total of approximately 4.6 miles of trail is affected by the proposed activity (sum of areas affected on all three trails).

The timber stands located in the vicinity of the trails could be best classified as mixed conifer. The stands contain a great variety of tree species and age classes. Due to the lack of natural fire, more brush and true fir trees are present in undisturbed stands than under historical conditions. The Mill Creek Watershed Analysis (2000) states in Chapter II, page 8 that the landscape unit surrounding the North Section Line Trail has tree stands that are strongly influenced by fire exclusion, resulting in smaller diameter stands and a greater preponderance of grand fir than would be present under normal fire regimes.

Approximately 2,000 feet of the North Section Line trail is bordered by plantations in old clearcut units and shelterwood units (many of which experienced blow down of many of the remaining trees). These plantations dominate the landscape with evidence of human influence, and most currently do not meet Partial Retention due to the uniformity of age classes and species present and the close spacing of trees. If the existing plantations are considered as not meeting Partial Retention at this time, then the 2,000 feet of trail bordering plantations accounts for 8.6 percent of the total 4.4 mile length of the North Section Line Trail in the C1 timber emphasis zone (land allocation from the Forest Plan). It should be noted that all of the North Section Line Trail within the proposed treatment area is clearly outside the watershed boundary, and thus is C1 allocation and not B6 watershed (see Figure 1.3 in Appendix A).*

A total of 20 percent of the length of the trail is allowed to meet Modification VQOs for a temporary period of time as it is located in the C1 timber emphasis land allocation (FW558 and FW559, page Four-116 of the Mt Hood Forest Plan). The activities planned with the project would thin all of these plantations in the foreground and improve visual quality over time by diversifying the stand and decreasing the time required for the trees to reach mature size classes.

The Knebal Springs Loop and Surveyors Ridge trails have existing views similar to the North Section Line Trail with some overstocked and diseased stands and some managed areas. Since they are in a land allocation that does not allow 20 percent deviation from the standards, the existing condition was not analyzed. Only the effects of the proposed treatment units will be looked at in this section.

* Being on the edge of the two land allocations, maps vary as to what allocation the trail is placed in. When viewed on the ground it is clearly outside of the watershed because it is north of the fence that marks the boundary.

Figure 3.5. A typical overstocked stand along the North Section Line Trail showing numerous small diameter trees, and mortality from insect and disease.

Figure 3.6. A plantation view along the North Section Line Trail.

Figure 3.7. An older dense plantation that has not been pre-commercially thinned along the Knebal Springs Loop Trail.

Figure 3.8. A view along the North Section Line Trail. Note the many smaller stems in the background that have established during fire exclusion.

Figure 3.9. A view showing large amounts of down woody fuels typical of the Surveyor's Ridge and Knebal Springs Loop trails in unmanaged stands. This image was taken on the Knebal Springs Loop Trail near proposed unit 30.

Desired Future Condition

Trail Visual Quality

As mentioned above, the Forest Plan also defines the VQO by distance zone for all levels of trails (see table 3-11). Forest Plan standards FW-588 and FW-559 further define that trails located in C1 timber emphasis management areas may temporarily deviate from the prescribed standard in the foreground, but no more that 20 percent of the trail length within the C1 management area should deviate from the prescribed VQO.

The North Section Line Trail is located in a C1 management area. No definition is given to the term "temporary" in the Forest Plan; however, most stands treated by harvest in the Mill Creek area require 5-6 years to recover full ground vegetation and return to a more natural appearing condition. The images of the Yaka 22/23 Timber Sale harvest units located in the Red Hill area of the Hood River Ranger District used as examples in the effects section (shown below) are six years post-harvest. For the purposes of this analysis the term "temporary" will be assumed to be six years for VQOs in the C1 timber emphasis land allocation. All other land allocations will assume that the prescribed VQO will be met within one year of the end of activities, including timber harvest, fuels reduction, piling and burning associated with the initial entry in order to meet standards.

The Knebal Springs Loop Trail is located in a B6 (Special Emphasis Watershed) management area. The overall standard for the B6 management area is Modification in all areas (Foreground, Middle

ground, Background). The overall standards are meant to apply to general areas as viewed from roads, or as background to other views. As mentioned above, this trail is a level III trail and the standard of Modification applies to all distance zones.

The Surveyor's Ridge Trail is located in land designated as B2 scenic viewshed. The designated viewer position for the viewshed is Highway 35 and recreation sites along Highway 35. None of the units are visible from Highway 35, so the B2 standards are not applicable. Trail VQOs of Partial Retention for level II trails still apply for views from the Surveyor's Ridge Trail.

The trail visual quality section of the Forest Plan does not specify what type of stands should make up the views from the trails, only that they meet VQOs with respect to human activities. The timber stands that would be the result of the proposed action would be closer to the historic character and feature fewer, yet larger trees than the existing condition as well as more open park-like setting due to fuelbreak vegetation maintenance. This setting would be preferred by recreationists as opposed to the majority of unmanaged stands (Axelsson-Lindgren, C.; Sorte, G. 1987, Brunson, M. W. 1991, Holgen, P.; Mattsson, L.; LI, C.Z. 2000, Magill, A.W. 1992). Not only would the stands be maintained in a more desirable scenic state, but no stand-replacing entries (clearcuts) would be scheduled. Stand replacing entries are the most visually disturbing and take the longest period of time to recover. The sustained maintenance of a shaded fuelbreak would provide consistent high quality views from the trails. The initial widespread disturbance of the first entry would be outweighed by the longer term effects of the proposed management scheme.

Figure 3.10. This photograph along the North Section Line Trail represents the desired future condition with respect to tree size and stocking. With the proposed project some of the down woody fuels would be removed and some of the small trees and low limbs on larger trees would be cut. On a maintenance re-entry many of the smaller trees would be cut and disposed of or killed by the use of prescribed fire.

Environmental Effects

Alternative 1 – No Action
Direct, Indirect and Cumulative Effects
Surveyor's Ridge and Knebal Springs Loop Trails
There are no data concerning the current visual quality condition of the Surveyor's Ridge and Knebal Springs Loop trails. Many of the timber stands located along these trails have an excess amount of brush and true fir regeneration due to fire exclusion. This condition has led to greater mortality in stands, fewer large trees, and a less open, park-like setting. The plantations that border the Knebal Springs Loop Trail have not been pre-commercially thinned and have the appearance of managed tree farms. Both of these factors have led to much of the distance of these trails having a degraded visual quality, though it has occurred over a long period of time, and as mentioned above, no classification of whether or not current condition meets Forest Plan standards is available.

North Section Line Trail
A walk-through survey of the North Section Line Trail was done and an estimated eight percent of the trail currently does not meet Partial Retention due to the presence of plantations from previous clearcuts. Over time, these may be thinned by timber stand improvement projects if funding becomes available, or they may thin themselves naturally and achieve a less-managed appearance. The unmanaged stands that are experiencing overstocking and insect and disease issues would continue to experience mortality and accumulate more down woody material. This would most likely degrade the visual quality even if no evidence of human actions is present. A catastrophic wildfire, which is more likely with the no action alternative, would degrade the visual quality of the area for decades.

Alternative 2 – Proposed Action
Direct and Indirect Effects
The prescribed VQO for level II trails of Partial Retention in the foreground would probably not be met for at least two years, and possibly 6 years after harvest in units where the trail is surrounded by the unit (only proposed along the North Section Line Trail). This is the result of the units being narrow enough and located along the same ridge top as the trails that it is difficult to hide skid roads, landings and slash piles. In cable harvest units, if the trail is near the landing, it would most likely not be possible to meet partial retention until the unit is fully recovered in approximately 6 years. In cases where the trail is bordered on one side by a tractor skid unit, or is located on the side opposite the landing on the cable units, it is possible to meet partial retention one year after the activity is completed if mitigation measures are followed.

A walk-through of a previous timber sale (named Yaka 22/23), located in the Red Hill area of the Hood River Ranger District, was done with the Eastside Timber Sale Administrator on the Ranger District in the fall of 2006. The harvest activity was completed in 2000. The Sale Administrator indicated that mitigation measures implemented in the Yaka 22/23 units could be applied to this project. He also noted that more measures could be taken to improve visual quality than had been used on the units inspected.

Visual Quality Mitigation Measures for Treatment Units
USDA Agriculture Handbook No. 559 "National Forest Landscape Management Volume 2, Chapter 5 TIMBER" has specific example guidelines for partial retention in lodgepole pine stands. The guidelines are not intended to fit every situation, but are a good indicator of major factors that would determine if a project meets Partial Retention. These same mitigation measures are applicable to the mixed conifer units in the project area. On page 92, foreground Partial Retention is described as having the following characteristics in a harvest area:

a. Surface cut stumps.
b. Activity debris would remain visually subordinate in the immediate foreground.
c. Ground disturbance would remain visually subordinate in the immediate foreground.
d. Natural-appearing tree spacing in the immediate foreground.
e. Contrasting and diversified tree species.
f. Large tree character with 3 to 5 trees per acre in the immediate foreground.
g. Activities relate to small-scale design.
h. Hold the "optimum" desired character to 20 to 30 years beyond normal rotation (note-this is not possible in dead stands).
i. A forested landscape character is required in the immediate foreground to meet the VQO. (A forested landscape character is defined as a situation in which the dominate vegetation is trees. Humans feel subordinate to the vegetation.)

In addition to the mitigating measures above, experience with harvest on the eastside of the Mt Hood National Forest has shown that leaving small islands of trees and shrubs interspersed along the trails aids significantly in preserving visual quality. All of these measures have either been added to the design features of the proposed action or included as mitigation measures in Chapter 2. With these measures in place, visual quality objectives should be met.

Examples of Harvest Units in a Similar Forest Type
Following are photographs of the Yaka timber sale six years post-activity. One photo is also included of a recent harvest activity on the edge of the same trail with fuels still piled awaiting burning.

Figure 3.11. A typical view from the Laurence Lake High Loop Trail in the Yaka 22/23 sale 6 years post activity. Herbaceous and brush vegetation has recovered and hides ground disturbance. A variety of color and vegetation heights are present. In the center of the photo a small group of vegetation was left.

Figure 3.12. This image shows a skid trail parallel to the trail and on the right. This stand is open in appearance and is similar to what is proposed in The Dalles Watershed Fuelbreak project, however contains more stems per acre than is proposed.

Figure 3.13. This image looks directly up a 90 degree angle skid trail crossing of the Laurence Lake High Loop trail. The two people are standing on the hiking trail. This crossing meets partial retention.

Figure 3.14. This image shows a skid trail that does not meet Partial Retention VQO. The stumps that remain are too high, the opening too wide, and an excess of activity fuels are present. Evidence of human activity dominates this portion of the landscape.

Figure 3.15. This image is immediately post-harvest and is representative of how units may appear until activity fuels are burned. VQOs are not proposed to be met until all activities are completed.

North Section Line Trail

The two tables below indicate which units would meet partial retention one year post activity, and which would need more time to recover enough to meet partial retention. The proposed action meets standards FW-588 and FW-559 by moving about 20 percent of the trail into Modification status until the treatment units are recovered in approximately 5 to 6 years.

Table 3-12. Proposed Units Along North Section Line Trail That Would Meet Partial Retention One Year Post-Harvest and Slash Clean-up

Unit	Length Along Trail in Feet	Treatment	Comments
54	500	Fuel Treatment	
55	500	Plantation Thin	
57	1,500	Fuel Treatment	
59	1,000	Fuel Treatment	
60	500	Tractor thin, Treat Root Rot	Portion of 2,500 total
66	1,500	Plantation Thin	
67	1,200	Fuel Treatment	
71	1,500	Fuel Treatment	
52	750	Tractor Thin, Treat Root Rot	
58	50	Tractor Thin	
65	500	Tractor Thin	
73	1,000	Tractor Thin	1000' of 2000' total
Total	**10,500**		

Table 3-13. Proposed Units Along North Section Line Trail That Would Not Meet Partial Retention Until Fully Recovered in an Estimated 6 Years

Unit	Length Along Trail in Feet	Treatment	Comments
56	10	Tractor Thin	
60	2,000	Tractor Thin, Treat Root Rot	Portion of unit that surrounds trail
63	500	Cable Thin	Skid up to trail
70	50	Tractor Thin	
72	1,200	Cable Thin	Skid up to trail
73	1,000	Tractor Thin	1000' of 2000' total
Total	**4,760**	20% new disturbance along length of trail in C1 that would exceed Partial Retention VQO	

Surveyors Ridge Trail
All of the units proposed along the Surveyors Ridge Trail affect only one side of the trail and should meet Partial Retention one year post activity. The views along much of the section of trail affected would be improved in the long term by reducing dead trees and fostering the development and retention of large-diameter trees.

Table 3-14. Proposed units along Surveyors Ridge Trail that Would Meet Partial Retention One Year Post-Activity

Unit	Length Along Trail in Feet	Treatment	Comments
41	500	Plantation thin	
44	150	Plantation thin	
47	700	Cable Thin	Skid away from trail
48	1,500	Tractor Thin	One Side Only
50	1,500	Tractor Thin	One Side Only
52	600	Tractor Thin	One Side Only
Total	**4,950**		

Knebal Springs Loop Trail
Approximately 4,000 feet of the newly constructed Knebal Springs Loop Trail are affected by proposed units 30, 31, and 32. It would be possible to meet Partial Retention one year post activity over about half of this linear distance. The other half would meet the VQO of modification.

Cumulative Effects of the Proposed Action
As is mentioned in the Desired Future Condition section, the long-term effect on the visual quality of the scenery from all three trails should be to improve the existing condition and reduce the risk of catastrophic wildfire that would degrade visual quality for decades.

The possible negative cumulative effects for this project are the repeated entries to maintain fuel reduction. The repeated entries should be subject to the same mitigating measures; however, it should be possible to achieve Partial Retention VQOs in all re-entries within one year of the activity since the scale of activity would be reduced. It is highly unlikely that all 4.6 miles of trail affected by this project would be subject to re-entry fuels reduction activities in any given year.

The entire length of the North Section Line Trail is included in this project, so no other activities are foreseen to affect visual quality in the near future. No other activities are known to be planned along the Surveyor's Ridge Trail or Knebal Springs Loop Trail that would affect visual quality.

Soil Productivity

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

Existing Condition

Background and Introduction

The productivity and health of entire plant communities depend on the maintenance of healthy soils. Regional soil productivity protection standards were originally implemented in 1976, and have been revised several times since then (Pacific Northwest Region Monitoring and Evaluation Report, 2001), including incorporation into the Mount Hood Forest Plan as part of the soil productivity chapter. Soil distribution is complex across the watersheds where this analysis area is located. Each type of soil is given a soil map unit (number) to show where they occur on a soil map. Then, each soil type is assessed for many risks and hazards called management ratings (e.g. erosion risk, compaction hazard, etc.), which are located in the Mt. 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 is valuable for site-specific planning such as this and is the survey that will be used in this analysis.

Soil Types in the Planning Area

The analysis area for soil resources in this EA are the proposed treatment boundaries. 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 Mt. 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 and further subdivided into a total of four general types based on slope steepness. The two main categories are soils that formed under a more frequent fire return frequency (based on vegetation types and surface soil characteristics)

versus those under a more infrequent fire return frequency. Soils developed under more frequent fire returns tend to have a more developed, darker topsoil that 'stores and protects' site organic matter from loss during fire. Soils developed over time where fire is less frequent tend to be lighter in color and store nutrients above ground in the duff and woody material. These two types are further divided into soils on less than 30 percent slope and those on greater than 30 percent slope. A summary of soil mapping units and their associated management interpretations is located in Table 3-15.

Table 3-15. Summary of Soil Types and Management Interpretations from The Dalles Watershed Soil Survey.

Soil Map Units	Compaction Hazard	Erosion Hazard		
		Undisturbed	Bare Soil	Bare and Compacted Soil
Frequent Fire <30% slope				
2C, 2D	Severe	Slight	Severe	Very Severe
4D	Severe	Slight	Severe	Very Severe
5C, 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	Moderate	Severe	Very Severe
10C	Severe	Slight	Moderate	Severe
10D	Severe	Slight	Severe	Very Severe
Frequent Fire >30% slope				
2E	Severe	Moderate	Very Severe	Very Severe
4E	Severe	Moderate	Very Severe	Very Severe
5E	Severe	Moderate	Very Severe	Very Severe
7E	Severe	Moderate	Very Severe	Very Severe
Non-frequent Fire <30% slope				
1D	Severe	Slight	Severe	Very Severe
11C	Severe	Slight	Moderate	Severe
11D	Severe	Slight	Severe	Very Severe
Non-frequent Fire >30% slope				
11E	Severe	Moderate	Very Severe	Very Severe

Key observations from the table include:

- All potentially impacted soils have a severe or very 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.

Applicable Standards and Guidelines and Methodology
The Forest Plan standards and guidelines are used as the method to determine the measurable changes that may occur to the soil, and of the changes and effects. For this analysis and project type, the following three measures will be used to assess impacts to soil resources:

Erosion Hazard—The risk of erosion and subsequent sedimentation of adjacent water bodies. The possible impact of concern stemming directly from soil erosion is runoff from bare areas carrying sediment that affect watercourses. This hazard rating is based upon a particular soils' texture, slope, etc. under three differing circumstances (*undisturbed; bare soil; and bare and compacted soil*). Surface soils across the entire area are very consistent, resulting in similar erosion hazard ratings.

Detrimental Soil Condition—The risk of detrimental soil conditions such as heavy compaction and intense burning that alter water movement through the soil and reduce site productivity. The Mt. Hood National Forest standard of no more than 15 percent detrimental soil condition in an activity area following project completion would protect site productivity, maintain water movement through the soil, reduce erosion risks and associated sedimentation, and protect organic matter. All soils within the planned treatment areas have a severe compaction risk due to inherent soil properties.

Soil Biology (organic matter levels)—The risk of altering the soil biological ecosystem because of insufficient amounts of down woody debris to feed forest carbon and nutrient cycles in the less frequent fire plant communities *or* the burning of uncharacteristically high amount of organic matter in more frequent fire plant communities. 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. Restorative actions and the design criteria and best management practices that minimize impact are also considered when determining the alteration of soil biology. 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 affect on soil productivity and will therefore not be analyzed.

Table 3-16. Summary of Forest Plan Soil Standards in Regards to Soil Resources

Summary of Forest Plan Soil Standards in Regards to Soil Resources
In the first year following surface disturbing activities, the percent effective groundcover by soil erosion hazard class should achieve at least the following levels (Forest Plan, FW-025): **Soil Erosion Hazard Class** — **Effective Groundcover** Slight to Moderate — 60% Severe — 75% Very Severe — 85%
The combined cumulative detrimental soil impacts occurring from both past and planned activities should not exceed 15% of an activity area (Forest Plan, FW-022, FW-023, paraphrased).
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 (Forest Plan, FW-032, FW-033, FW-034, paraphrased[1]).

[1]The full texts of these standards are on pages 4-49 and 4-50 of the Forest Plan.

The methodology used to gather data needed for this effects analysis includes 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 (1999), Mill Creek Watershed Analysis (1997), and the fuelbreak on Forest Road 1700 (2002). Professional observation and knowledge of how soils respond to the proposed types of management actions was used to predict impacts.

Assumptions and Design

- It is assumed there is an existing lack of large woody debris (LWD) (as measured against the Forest Plans standard and guideline) due to previous management activities, especially firewood gathering.
- It is assumed damage on skid trails would not exceed 12 feet in width.
- The conceptual layout of logging system patterns have been designed to ensure less than 15% of the area is impacted (ground disturbance – detrimental soil condition) within each proposed treatment that uses ground-based equipment.
- Undisturbed soils meet the forest plan groundcover standards.

Effects Analysis

Current and Predicted Changed Conditions Caused by the Proposed Action

Soil Erosion Risk

No active erosion from previous vegetation management was observed during the field reconnaissance for this project. All stands proposed for treatments are expected to meet the effective groundcover standard following ground disturbing activities.

Detrimental Soil Conditions

The results of field surveys from the Mill Creek watershed are shown in Table 3-17. Areas examined showed existing detrimental damage, primarily on non-system roads and old skid trails.

Table 3-17: Summary of Stands Monitored with Shovel Probe Transects

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

Stands appeared to have no particular silvicultural prescription other than to remove scattered trees within the area. There was no evidence to indicate fuels treatments occurred post-harvest. The conceptual layout of logging system patterns for the proposed treatment areas have been designed to ensure less than 15 percent of the area is impacted (ground disturbance) within each individual stand that uses ground-based equipment. Since ground disturbance does not equate with detrimental soil condition, and design already has impact area below 15 percent, it is not expected that any of the proposed treatment areas would exceed the forest plan standard.

Soils underlying skid trails nearest landings are most likely to incur detrimental damage because they receive the most trips with equipment. Further away from landings, soils are impacted less and less as fewer trips occur over them. The past several years of forest plan monitoring results indicate a clear trend in the reduction of detrimental impacts due to the use of lower ground impact machinery. Observations during monitoring indicate obvious detrimental impacts on main skid trails and landings that receive numerous trips with higher impact machinery (such as skidders), with much less impact on lateral trails and within the unit where harvester equipment typically works. As an example, a recently 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.

Fuel reduction stands such as old plantations, would not have tree removal as part of the design to meet the purpose and need, and therefore no need for landings or skid trails. Some of these areas occur on slopes greater than 30 percent, and may have machine piling as an option to the purchaser if feasible while meeting soil standards. The process to implement this would likely result in very little ground disturbance because any point on the ground would only be passed over by a track-

mounted machine one or two times at the most. The machine would wind its way through the unit, piling as it goes, with no multiple trips impacting the ground like skid trails and landings do. If results are not satisfactory using a machine, then less impactive (i.e. hand piling) methods would be used.

Organic Matter Levels
It is likely that organic matter would be reduced to levels below forest plan standards, especially in the higher, lower fire frequency areas. Since the overarching goal of the fuelbreak is to reduce organic matter available to burn, it is a trade-off to meet the purpose and need. Stands along Forest Roads 1700 and 1722 have had chronic reductions in large woody material due to firewood gathering. However, the size and shape of the actual area impacted are long, thin linear features, that within the context of the watershed are quite small.

Effects Resulting From Changing Conditions
Alternative 1—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 that 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-up may occur, depending on many unpredictable factors such as field conditions during burning, etc. These effects would likely be localized, but some areas may experience a decrease in site productivity.

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

Organic Matter Levels
Soil organic matter and corresponding soil functions would continue to occur as they are in a general sense. Similar to erosion risk, the expected effect is that the soils at landscape and site scales would respond and change proportionate to the severity of natural events such as storms or wildfire. In addition, organic matter decomposition is influenced substantially by temperature, moisture, and fire, thus the rate of decay and cycling would continue accordingly.

Alternative 2—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 BMPs, is discussed by Rashin et al. in a recent publication of the *Journal of the American Water Resources Association*. Comparing the proposed action to the authors' application of studied BMPs would indicate the proposed buffers, logging system design criteria, etc. would substantially reduce the risk of resource damage should a storm event occur while the ground is exposed. For example, the study showed an assessment of surface erosion and sediment routing during the first two years following harvest indicated that a 10 meter (approximately 30 feet) setback (buffer) from streams can be expected to prevent sediment delivery to streams from about 95 percent of harvest related erosion features. The proposed action design uses buffers nearly double to 10 times that distance, in addition to directional felling away from streams that would further reduce erosion features and disturbance. By maintaining proper amounts of protective groundcover along with BMP design criteria, the risk of erosion and subsequent sediment delivery that could be 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 caused by heavy equipment. The increase is not expected to exceed forest plan standards, and therefore no accompanying decrease in site productivity. The Current and Predicted Changed Conditions Caused by the Proposed Action section above (under Detrimental Soil Conditions) explains how logging systems are expected to impact the ground based treatment areas.

Soil moistures and conditions (wet, frozen or dry) would have a strong influence on the effects of the fire on the soil. Soil microorganisms could be killed in areas of severely burned soil. Areas directly beneath and immediately adjacent to the burning piles would be affected. This damage would occur in the areas of large piles that maintain longer durations of heat. The effects of burning piles on the soil can be minimized by limiting the size of the piles and the amount of moisture in the soil. Pile burning is normally accomplished in the late fall after adequate moisture, either rain or snow, is present to prevent the spread of fines from the piles. The effects of underburning on the soil and litter layer are dependent on the intensity of the burn. If soil temperatures are too hot, detrimental soil conditions could occur.

Organic Matter Levels

It is likely that portions of the perimeter roads (especially along Forest Road 1700) would be lower than forest plan standards for organic matter, which is an intention of the proposed action for a fuelbreak. When this occurs, it is not expected to be a substantial impact to nutrient cycling because these are not clearcuts followed by intense burning and extreme loss of current and future organic matter; the shape and extent of the impact is narrow and discontinuous; and many of the soils impacted would retain substantial organic matter reserves in the mineral topsoil due to the way in which they have developed.

Watershed Resources

A more detailed hydrology report is located in the project record, located at the Hood River Ranger District. The analysis and conclusions of the report are summarized below.

Existing Condition

The fuelbreak is located primarily within portions of three 7th field watersheds (South Fork Mill Creek, Alder Creek, and Crow Creek). A very small portion of the proposed treatments are located in several other 7th fields, but the total acreage is so low that potential treatment effects are expected to be immeasurable at the 7th field watershed scale. All of the above mentioned 7th field watersheds are located within the Middle Columbia/Mill Creek 6th field watershed. South Fork Mill Creek is part of a Tier 1 Key Watershed, as identified in the Northwest Forest Plan.

There are many streams, springs and wetlands located within these sub-watersheds. The primary streams include 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 including: 20 miles of perennial streams (that 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 previously, 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 System 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. Since the initial agreement, further specific direction has been issued through the 1972 document entitled *Comprehensive Management Plan* and the 1972 Memorandum of Understanding (MOU) between The Dalles and the USFS. 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 USFS and the City of The Dalles and each of these entities are involved at all levels of "planning, implementing and monitoring." The emphasis of managing the watershed for water quality is discussed further in Chapter 1 under Management Direction.

Water Quality

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 South Fork Mill Creek (see figure below) and for one year on Crow Creek. Grab samples were collected during stream surveys in South Fork Mill Creek (1999), Crow Creek (1998) and Alder Creek (1998).

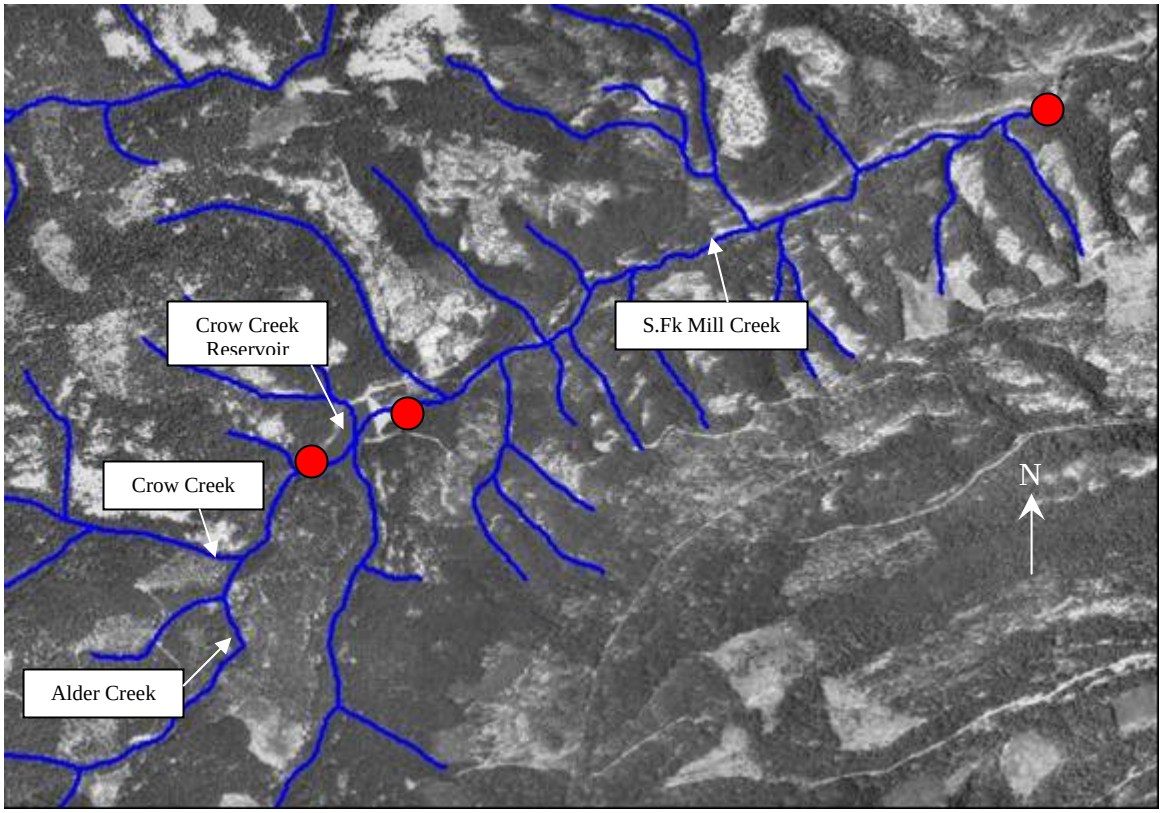

Figure 3.16. Water temperature monitoring sites in the City of the Dalles Municipal Watershed Fuelbreak project area. Monitoring sites are shown as red circles on the map.

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

Table 3-18. Average Stream Temperatures

Stream	1998	1999	2000	2005
South Fork Mill Creek at Forest Boundary	ND	ND	ND	13.66
South Fork Mill Creek Below Crow Creek Dam	ND	13.32	15.39	16.97
Crow Creek	14.7	ND	ND	ND

ND = Not Deployed for that Year

South Fork Mill Creek is listed on the 2004/2006 State of Oregon 303(d) list of impaired water bodies for salmon and trout rearing and migration stream temperatures that exceed a 7-day average maximum of 18.0° C. The listed segment extends from river mile 0 upstream to river mile 10.6 which is directly below the Crow Creek Dam. Activities on stream sections in the National Forest that supply this segment still need to be considered as they can influence water temperture in the listed area. Recorded stream temperatures displayed in the table above are below the State of Oregon 7-day average maximum standard of 18.0^{o}C for South Fork Mill Creek.

The Dalles Municipal Watershed MOU identifies water quality objectives and water quality criteria that will 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 "Permissible Criteria" for water temperature is <13° C.

Stream Channel Condition and Sediment
Alder Creek, Crow Creek and South Fork 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 (Mt. Hood National Forest stream surveys, 1998 and 1999). These channels are generally stable and Rosgen (1996) identified this channel type as having "low to moderate" sensitivity to human disturbance. He also identified riparian vegetation as having a "negligible to moderate" controlling influence on the stability of an 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 South Fork 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 judgment by local Forest Service hydrologists, fish biologists, and earth scientists. Following is a table displaying total specified road densities for 7th field watersheds within the planning area.

Table 3-19. Road Densities

Sub-watershed	Road Density (mi/mi^2)
South Fork Mill Creek (14B)	2.4
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 (Mt. Hood National Forest 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 "Permissible Criteria" for turbidity, which is used as a surrogate 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 identified 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 3-20. Stream Shade

Stream	Avg. Stream Shading	Max. and Min. Stream Shading
South Fork Mill Creek-Reach 1	29%	0 – 97%
South Fork Mill Creek-Reach 2	11%	0 – 38%
Crow Creek	27%	0 – 54%
Alder Creek	23%	0 – 44%

Effects Analysis

Alternative 1—No Action Alternative

Direct, Indirect and Cumulative 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 temperatures any great degree within the project area.

These densely vegetated areas are more susceptible to high severity burns due to excess fuel loading from fire exclusion. In the event a wildfire burned in this watershed, riparian areas have the potential to burn hot in areas that have high fuel loading. Recent research by Tollefson and others

(2004) on 33 burned watersheds in the central-western Cascades of Oregon indicates that fire severity in intense events may be similar between intermittent stream channels and adjacent upland areas. It had been thought that the riparian areas may burn with a lower severity due to the presence water and other fire resistant features. Research on the effects of wildfire on stream temperature is limited, but there is quite a bit of research on burning after clear-cut logging. In the central Oregon Cascades, clear-cut harvesting along a stream increased summertime maximum stream temperatures by 4° F. This same area was burned the following year and stream temperatures increased 14° F when compared to an undisturbed forest watershed (Levno and Rothacher 1969). In the central Oregon Coast Range, clear-cut harvesting along a stream increased maximum stream temperatures by 17° F; after a hot slash burn, an additional increase of 10° F was measured the following summer (Brown 1972). The previously 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 land sliding 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 increased sediment yields.

While much of the sediment increase can occur within the first year after the fire (Agee 1993, Debano et al. 1998), it may take many years for sediment levels to reach pre-fire levels depending on fire severity. DeBano et al. (1996) demonstrated that following a wildfire in ponderosa pine, sediment yields from a low severity fire recovered to normal levels after three years, but moderate and severely burned watersheds took 7 and 14 years, respectively. Robichaud and Brown (1999) reported first year erosion rates after a wildfire from 9 to 22 tons per acre decreasing by one to two orders of magnitude by the second year and to no sediment by the fourth in an unmanaged forest stand in eastern Oregon. Erosion rate reduction was due to recovery of natural vegetation. First year growing season shrubs, forbs and grasses accounted for 28 percent of the total ground cover whereas after the second growing season, total ground cover was 82 percent. In the event of a high severity burn, 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. Therefore there are also no cumulative effects. 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 USFS. If a wildfire does occur in this project area, it would likely lead to seriously impaired water quality conditions for quite some time. The overstocked riparian areas would encourage higher intensity fires due to high fuel loading that could lead to higher burn severities. As described above, these high severity burn areas have the potential for high turbidity and increased stream temperatures.

Alternative 2—Proposed Action
Direct and Indirect Effects
Several mitigation measures and BMPs are in place that would reduce the effects of project activities to water quality. These mitigation measures are described in detail in Chapter 2.

Stream Temperature
This alternative proposes to thin vegetation within Riparian Reserves. Vegetation removal has the potential of increasing solar radiation to surface water, which in turn may increase water temperature. The following analysis will utilize tools contained within the "Sufficiency Analysis for Stream Temperature" (2004) document to identify necessary shade so that stream temperatures within treatment areas would not increase as a result of the proposed vegetation treatments. The previously mentioned document is the result of work between the USFS, BLM and State of Oregon DEQ and identifies how to maintain sufficient stream shading while providing the opportunity to treat Riparian Reserve vegetation to improve stand condition. Vegetation treatments in the planning area would have the benefit of minimizing negative effects that may result from a catastrophic wildfire.

The concept of the sufficiency analysis is to maintain a primary shade zone next to the stream and identify a secondary shade zone that can be treated to reach Riparian Reserve objectives. In order to maintain sufficient shade next to the stream, the primary shade zone is untreated. The size of this zone is dependant on the current height of the trees and the hill slope. This relationship is shown in the Table 3-21, below.

Table 3-21. Shade Zones Next to Streams

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 percent 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 33' for the project area. Since the majority of treatment would be located in The Dalles Municipal Watershed, the primary shade zone was expanded to 50' to

provide an extra level of water quality protection. This area would be left untreated next to perennial streams to maintain current stream shading and temperatures.

In addition, vegetation treatments within the secondary shade zone (55' to 100' from the stream) would leave a canopy closure of approximately 60 percent. This would result in a canopy closure reduction of <50 percent, which would provide consistency with the Sufficiency Analysis. Due to project design that meets and exceeds the Sufficiency Analysis, there should be no increase in stream temperature resulting from implementation of this project.

Sediment

Some ground-disturbing activities in this alternative have the potential to dislodge soil particles, which in turn may increase erosion and sedimentation to surrounding surface water. These features 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 soil productivity 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 implementation of BMP design criteria.

The ability of BMPs to reduce erosion and sediment delivery is documented in a study referenced in the soil section (Rashin et al. 2006). Other studies also support the effectiveness of mitigating sediment delivery by maintaining a buffered area adjacent to surface water. Burroughs and King (1989) found that 80 percent of sediment reaching streams from roads in the first year after construction came from the fill slope of the road. They also found that transport distances and obstructions between the fill slopes and streams influenced the amount and likelihood of eroded material reaching these streams. Burroughs and King found that windrowed fill slopes, which would act very similar to unharvested Riparian Reserves in that there would be obstructions to flow, had an average travel distance of 3.8 feet for eroded material, and a maximum travel distance of 33 feet. Similar results were found 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 that includes erosion control (e.g. erosion control blankets, straw wattles, waterbars etc.) 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 can 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.

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 of riparian areas and the other required mitigation measures such as ripping and water barring skidtrails.

Cumulative Effects of the Proposed Action

Stream Temperature

No detrimental cumulative effects are expected as a result of increased water temperature due to mitigation measures designed to maintain existing 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 features aimed at minimizing erosion and sedimentation reduce the potential of erosion and delivery of the material to adjacent surface water. There is a chance that some suspended sediment from the Long Prairie grazing allotment would mix with fine sediment from a road maintenance site along West Fork Neal Creek creating a cumulative effect. The amount of sediment from the allotment is expected to be very small since it is located approximately two miles upstream from the roadwork site.

Key Watershed

The Northwest Forest Plan (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 NWFP. 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. An additional cumulative effects analysis is included in the table below.

Special Emphasis Watersheds

Fifteenmile and Mill Creek watersheds are identified in the Mt. Hood National Forest Plan as Special Emphasis Watersheds. As Special Emphasis Watersheds, watershed impact areas "should not exceed the "thresholds of concern" (TOC) for watershed stability" of 25 percent. This threshold is set to disperse activities in space and time to "minimize cumulative watershed effects." Currently, the watershed impact area for the two watersheds stands at 7 and 8 percent, respectively, which is well below the TOC of 25 percent. Implementation of this alternative would result in a very minor increase in the impact area of approximately 0.3%, which still is well below the Forest Plan standard and guideline from the Forest Plan.

Summary Cumulative Watershed Effects

Table 3-22 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 Fuelbreak, whether these projects overlap in time and space and an assessment if a measurable cumulative effect is expected. Findings of this summary are supported by the previous analysis which utilizes pertinent research, mitigation measures and design features and applicable management standards and guidelines.

Table 3-22. Summary of Cumulative Watershed Effects

Project	Potential Effects	Overlap in		Measurable Cumulative Effect?	Extent, Detectable?
		Time	Space		
Existing Forest Service Timber Harvest	Suspended Sediment	No	Yes	No	Projects are completed. No remaining sediment, stream temperature and water quantity effects due to mitigation implementation and natural recovery.
	Stream Temperature	No	Yes	No	
	Water Quantity	No	Yes	No	
Existing The Dalles Timber Harvest	Suspended Sediment	No	Yes	No	Projects are completed. No remaining sediment, stream temperature and water quantity effects due to mitigation implementation and natural recovery.
	Stream Temperature	No	Yes	No	
	Water Quantity	No	Yes	No	
Misc. Tree Salvage (Hazard Trees)	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing of this project with The Dalles Fuelbreak project; any minor suspended sediment would not be measurable due to implementation of mitigation measures and the small amount of disturbance with this project.
	Stream Temperature	Yes	Yes	No	This project and The Dalles Fuelbreak project would maintain the primary shade zone so there should be no increase in stream temperature.
Long Prairie Grazing Allotment	Suspended Sediment	Yes	Yes	Yes	There may be an overlap in timing of this project with Tree Salvage, Invasive Plant Treatments, Road Maintenance and The Dalles Fuelbreak project; there is a chance of some short term mixing of fine sediment from the grazing allotment and road maintenance on Forest Road 1700 in West Fork Neal Creek.
	Stream Temperature	Yes	Yes	No	The Dalles Fuelbreak project would maintain the primary shade zone so there should be no increase in stream temperature.
Invasive Plant Treatments	Suspended Sediment	Yes	Yes	Not Measurable	There may be an overlap in timing of this project with The Dalles Fuelbreak project; any minor suspended sediment would not be measurable due to implementation of mitigation measures and the small amount of disturbance with this project.
	Stream Temperature	Yes	Yes	No	The Dalles Fuelbreak project would maintain the primary shade zone so there should be no increase in stream temperature.