CHAPTER 2 – ALTERNATIVES

This chapter is intended to describe the alternatives and how they were formulated for The Dalles Watershed Phase II project. This chapter provides readers and the recommending and responsible officials with a description of the project, design criteria and mitigation measures, monitoring requirements, and regulatory framework.

2.1 ALTERNATIVE FORMULATION

This project is being prepared under the Health Forest Restoration Act (HFRA) authorities with an emphasis on reducing hazardous fuels in The Dalles Municipal Watershed. The project is located within entirely within the municipal watershed. As such, HFRA requires the agency to analyze the Proposed Action and No Action [HR 1904, Section 104(c)(1) and (2)]. An additional action alternative is required, if the additional alternative (i) is proposed during scoping or the collaborative process; and, (ii) meets the purpose and need for action [HR 1904, Section 104(c)(3)]. Two additional alternatives were suggested during the scoping process.

- Bark recommended that the Forest Service include an action alternative that does not include "commercial logging". They stated: "We strongly advocate for an alternative that does not include commercial logging, and is wholly focused on science-based fire restoration." The IDT and Responsible Official considered this alternative and concluded that it would not meet the purpose and need for action as stated in Section 1.3. Specifically, using management strategies such as thinning overstory and understory trees would not reduce the risk of large stand replacing wildfire events because the overstocked and dense stands would remain and the hazardous fuels associated with the standing trees (fuel ladders) would not be removed. Also, these methods would not reduce hazardous fuel loadings and fuel ladders (small reproduction that increases potential for crown fire initiation) to reduce the risk of unwanted effects of wildfire on National Forest System lands and City of The Dalles in-holdings within the municipal watershed for similar reasons. Because this alternative would not meet the requirement in HFRA to meet the purpose and need for action, it was not analyzed in detail. This alternative is discussed in more detail in the Section 2.3, Alternatives Considered, but Eliminated from Detailed Study.

- Oregon Wild also recommended that the Forest Service "consider more than one action alternative because that will foster more informed decision-making, help illuminate and reconcile trade-offs, and result in a better decision. We suggest an alternative that focuses on ways of retaining and recruiting desired levels of dead wood in riparian reserves and uplands by planning and retaining adequate levels of untreated "skips" to meet targets for dead wood recruitment over time. It should be recognized that retention of large dead wood is not necessarily adverse to fuel reduction objectives because large wood usually stays wetter longer than small wood, and if treatments reduce the spatial continuity of fuels then discontinuous islands of abundant dead wood can be maintained well-distributed across the landscape to meet terrestrial and aquatic habitat, and hydrologic objectives." The proposed considerations have been considered and are incorporated into the Proposed Action, specifically by implementing variable density thinning. As such, it

is not required to analyze another action alternative.

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

2.2 Alternatives Considered in Detail

The City of The Dalles Municipal Watershed is located primarily in the South Fork Mill Creek Watershed on the Mt. Hood National Forest in Hood River and Wasco Counties. The planning area is the interior of the municipal watershed. The Proposed Action is located approximately 16 air miles South West of The Dalles, Oregon. The legal description for the project area is: T 1S, R 10E and T 1S, R 11E (see Figure 1-1 for Vicinity Map).

2.2.1 No Action Alternative

Under this alternative, no hazardous fuels reduction treatments or associated activities would be implemented. Because dead or dying vegetation would not be removed, fuels would continue to accumulate, thereby increasing the fuel hazard within The Dalles Municipal Watershed. No fire suppression openings would be created; therefore, interagency fire suppression efforts would continue as they operate currently. Natural processes of decay are not likely to remove the down and dead woody debris before the next fire cycle. As the available fuel continues to increase, so would the potential for a large stand-replacing wildfire event. A resulting catastrophic fire could result in the City of The Dalles' water treatment plant being shut down, similar to what occurred during past fire events in 1967 and 2002. The effects of the No Action alternative are analyzed by resource in Chapter 3.

2.2.2. Proposed Action Alternative

In order to reduce hazardous fuels, smaller diameter trees growing in lower crown positions would be removed, leaving more space around remaining larger trees. Trees would be selected for removal if their spacing facilitates the spread of a crown fire (canopy closure), or a tree form contributes to the initiation of a crown fire (crown base height) such as low growing tree branches over brush, which if ignited, could lead to crown fire initiation. Activity fuels (residue from mechanical treatments such as masticated material and thinning) as well as naturally accumulated fuels would be treated by piling and burning. Stands where the dominant species and fire regime are appropriate, such as ponderosa pine, Douglas fir, and western larch which are adapted to low intensity, frequent fire return intervals, would be treated so that future underburning could occur to maintain stand conditions. The proposed treatments to achieve these goals are shown in the table below. All proposed treatment areas are shown on the Proposed Action map (see Figure 1-6).

Table 2-1: Proposed Action Treatment Acres

Treatment	Acres
Fuels Reduction Thinning (natural stands)	1352
Fuels Reduction Thinning (plantations)	107
Sapling Thin	435
Jackpot Burning	742
Prescribed Burning on City of The Dalles Lands	872
Mechanical Fuels Reduction	151
Total Acres	3660

Fuels reduction thinning treatment within the natural stands include prescriptions to thin ponderosa pine and Douglas-fir dominated stands to an average canopy closure of 40 to 60 percent on 1,352 acres. Prescribed burning, pile burning, and/or mechanical fuels treatments would be applied to these treatment areas as well. Mechanical fuels treatments could include, but would not be limited to, grapple piling, lop and scattering, or masticating.

Plantation fuels reduction thinning on 107 acres to an average canopy closure of 40 percent in ponderosa pine/Douglas-fir dry forest type and 50 percent in Douglas-fir/ponderosa pine and grand fir wet forest type to promote and develop more resilience stand conditions. Prescribed burning, pile burning, and/or mechanical fuels treatments would be applied to these treatment areas as well. Mechanical fuels treatments could include, but would not be limited to, lop and scattering, or masticating.

Sapling thinning with mechanical brush treatment on 435 acres to approximately 60 to100 trees per acre in ponderosa pine/Douglas-fir dry forest type and 100 to 200 trees per acre in Douglas-fir/ponderosa pine and grand fir wet forest type to promote and develop more resilience stand conditions. Brush treatments would be a mix of mechanical and hand treatments based on site conditions. Prescribed burning, pile burning, and/or mechanical fuels treatments would be applied to these treatment areas. Mechanical fuels treatments could include, but would not be limited to, lop and scattering, masticating, or biomass collection. Biomass collection would include machine piling and removal of materials to be used to generate electricity.

Approximately 740 acres are proposed for prescribed jackpot burning treatments in the Research Natural Area (RNA) outside of the above proposed thinning treatments and would likely be burned in conjunction with acres identified for burning within proposed treatment areas. Jackpot burning includes burning high concentrations of fuel loadings using prescribed burning. Roads and skid trails would be utilized first as control lines; however, some handline may need to be constructed in order to block up burn areas.

Mechanical fuels reduction treatment is a non-commercial thinning and mechanical brush treatment on 151 acres to approximately 60 to100 trees per acre in ponderosa pine/Douglas-fir dry forest type to promote and develop more resilience stand conditions. Brush treatments would be a mix of mechanical and hand treatments based on site conditions. Prescribed burning, pile burning, and/or mechanical fuels treatments would be applied to these treatment areas. Mechanical fuels treatments could include, but would not be limited to, lop and scattering, masticating, or biomass collection. Biomass collection would include machine piling and removal of materials to be used to generate electricity.

In addition, The City of The Dalles has requested the assistance of the US Forest Service in prescribed burning the City owned lands (approximately 872 acres) in the municipal watershed and within the boundaries of Mt. Hood National Forest. The prescribed burning of these private in-holdings would benefit the National Forest System lands by reducing the fuel loading within the watershed and moving the landscape to a more historical condition.

Variable Density Thinning

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

The end-result of variable density thinning is to have skips and gaps within the stands to mimic more natural stands. Skips are areas where no trees would be removed; Gaps are areas where few trees would be retained. Some of the characteristics of skips and gaps include the following.

- Skips and gaps would be created in a variety of sizes. The sizes and total quantity would vary within and between units.
- Skips may be placed where there are special features such as clumps of minor species, clumps of down logs, key snags or potential snag concentrations, wet areas, or locations of rare or uncommon species.
- Gaps would be half to two acres in size and would retain one to six trees. In gaps, minor tree species would be retained if present.
- Areas of heavy thinning (25 to 50 trees per acre retained) would be created in a variety of sizes quarter acre or greater. Heavy thinning is proposed to benefit species such as deer and elk, as well to enhance diversity.
- All non-hazardous snags would be retained. Future snags and down logs would be recruited through the use of skips.
- Existing down logs would be retained as practical and key concentrations of woody debris in the older decay classes would be protected as long as doing so would meet the intent of the project.

Prescribed burning and/or mechanical fuels treatments in harvested stands would be applied when all thinning treatments have been completed. This is expected to be within five years of mechanized treatments. Post-activity assessments would be completed to determine specifically when and where prescribed fire would be applied.

Specific Treatments by Unit and Logging Systems

Table 2-2 provides unit-by-unit information including current stand conditions and proposed treatments. Approximately 1460 acres (40% of the units) include thinning activities. Of the treatment units including thinning activities, approximately 760 acres (52%) would be logged used ground based logging systems; approximately 280 acres (19%) would be skylined logged because they are slopes greater than 30 percent; approximately 140 acres (9%) would be helicopter logged; and, 280 acres (19%) would be logged through a combination of logging systems. If no there is no entry for a specific cell the information is not applicable to that unit. Figure 2-1 is a map that shows the logging systems that would be used for each unit.

Table 2-2: Unit Information. Abbreviations used in the table include: PP = ponderosa pine, DF = Douglas fir, GF = grand fir, WWP = western white pine, WH = western hemlock, LP = lodge pole pine, WL = western larch, RC = red cedar, OO = Oregon Oak

Unit	Treatment	Acres	Species	Logging System	Skips & Gaps	Current Canopy Cover	Target Canopy Cover
5	Fuels Reduction Thinning (natural stands)	25	PP, DF, GF	Ground based	No	75	30
7	Fuels Reduction Thinning (natural stands)	13	PP, DF, GF	Skyline	No	75	30
18	Fuels Reduction Thinning (natural stands)	8	DF, GF	Ground based	Yes	70	60
22	Fuels Reduction Thinning (natural stands)	116	PP, DF, GF	Ground based	No	70	30
24	Fuels Reduction Thinning (natural stands)	27	PP, DF, GF, WWP	Ground based	Yes	70	40
28	Fuels Reduction Thinning (natural stands)	53	PP, DF, GF, WH	Ground based	Yes	70	40
30	Fuels Reduction Thinning (natural stands)	27	DF, GF, LP, WL	Ground based	Yes	70	60
32	Fuels Reduction Thinning (natural stands)	35	PP, DF, GF, WL	Ground based Skyline Helicopter	Yes	70	60
33	Fuels Reduction Thinning (natural stands)	31	PP, DF, GF, WL	Ground based	Yes	70	40
34	Fuels Reduction Thinning (natural stands)	35	PP, DF, GF, WH	Helicopter	Yes	75	50
35	Fuels Reduction Thinning (natural	133	PP, DF, GF, WL	Ground based	Yes	70	30

Unit	Treatment	Acres	Species	Logging System	Skips & Gaps	Current Canopy Cover	Target Canopy Cover
	stands)						
36.1	Fuels Reduction Thinning (natural stands)	119	PP, DF, GF	Ground based Skyline Helicopter	Yes	65	60
36.2	Fuels Reduction Thinning (natural stands)	11	PP, DF, GF	Skyline	Yes	65	60
38	Fuels Reduction Thinning (natural stands)	23	PP, DF, GF	Ground based	Yes	70	30
39	Fuels Reduction Thinning (natural stands)	155	PP, DF, GF, WWP, WL	Skyline	Yes	70	40
40	Fuels Reduction Thinning (natural stands)	101	PP, DF, GF, WL	Ground based	Yes	70	40
41	Fuels Reduction Thinning (natural stands)	61	PP, DF, GF	Ground based Skyline	Yes	70	60
42	Fuels Reduction Thinning (natural stands)	23	PP, DF, GF, WL	Ground based	Yes	70	60
44	Fuels Reduction Thinning (natural stands)	20	PP, DF, GF	Ground based	Yes	70	60
45	Fuels Reduction Thinning (natural stands)	19	PP, DF, GF, WL	Skyline	Yes	65	60
46	Fuels Reduction Thinning (natural stands)	75	PP, DF, GF	Helicopter	Yes	70	60
47	Fuels Reduction Thinning (natural stands)	52	PP, DF, GF, WH, RC	Skyline	Yes	75	50
48	Fuels Reduction Thinning (natural stands)	51	PP, DF, GF, WL	Ground based Skyline	Yes	70	50
49	Fuels Reduction Thinning (natural stands)	28	PP, DF, GF	Helicopter	Yes	70	40
50	Fuels Reduction Thinning (natural stands)	26	DF, PP	Ground based Helicopter	No	70	40
51	Fuels Reduction Thinning (natural	38	PP, DF, GF	Skyline Helicopter	Yes	75	60

Unit	Treatment	Acres	Species	Logging System	Skips & Gaps	Current Canopy Cover	Target Canopy Cover
	stands)						
52	Fuels Reduction Thinning (natural stands)	17	PP, DF, GF, WL	Ground based	Yes	70	40
53	Fuels Reduction Thinning (natural stands)	23	PP, DF, GF	Skyline	No	70	30
54	Fuels Reduction Thinning (natural stands)	6	PP, DF, GF	Skyline	No	70	30
108.1	Jackpot Burning	311	PP, DF, GF, OO	n/a	n/a	60	n/a
108.2	Jackpot Burning	268	PP, DF, GF, OO	n/a	n/a	65	n/a
108.3	Jackpot Burning	124	PP, DF, GF, OO	n/a	n/a	60	n/a
108.4	Jackpot Burning	39	PP, DF, GF, OO	n/a	n/a	60	n/a
109.1	Prescribed Burning on City of The Dalles Lands	160	PP, DF, GF	n/a	n/a	75	n/a
109.2	Prescribed Burning on City of The Dalles Lands	513	PP, DF, GF	n/a	n/a	65	n/a
109.3	Prescribed Burning on City of The Dalles Lands	200	PP, DF, GF, OO	n/a	n/a	65	n/a
120	Sapling Thin	26	PP, DF	n/a	n/a	50	n/a
121	Sapling Thin	15	DF, WH	n/a	n/a	40	n/a
122	Sapling Thin	22	PP, DF, OO	n/a	n/a	40	n/a
123	Mechanical Fuels Reduction	89	PP, DF, OO	n/a	n/a	50	n/a
124	Mechanical Fuels Reduction	63	PP, DF	n/a	n/a	40	n/a
125	Sapling Thin	47	DF, WH	n/a	n/a	30	n/a

Unit	Treatment	Acres	Species	Logging System	Skips & Gaps	Current Canopy Cover	Target Canopy Cover
126	Sapling Thin	18	DF, WH	n/a	n/a	30	n/a
127	Sapling Thin	31	PP, DF, GF	n/a	n/a	20	n/a
128	Sapling Thin	23	PP, DF	n/a	n/a	60	n/a
129	Sapling Thin	35	PP, DF, GF	n/a	n/a	30	n/a
130	Sapling Thin	27	DF, GF	n/a	n/a	35	n/a
131	Sapling Thin	25	PP, DF, GF	n/a	n/a	60	n/a
132	Sapling Thin	9	PP, DF, GF, WWP	n/a	n/a	40	n/a
135	Sapling Thin	17	PP, DF	n/a	n/a	50	n/a
136	Sapling Thin	9	PP, DF, GF	n/a	n/a	60	n/a
137	Sapling Thin	7	PP, DF, GF	n/a	n/a	60	n/a
140	Sapling Thin	21	DF, WH	n/a	n/a	30	n/a
141	Sapling Thin	11	PP, DF, GF, WL	n/a	n/a	70	n/a
142	Sapling Thin	22	PP, DF, GF, WH	n/a	n/a	80	n/a
143	Sapling Thin	32	PP, DF, GF	n/a	n/a	60	n/a
144	Sapling Thin	6	PP, DF, GF	n/a	n/a	60	n/a
145	Sapling Thin	4	PP, DF, GF	n/a	n/a	50	n/a
146	Sapling Thin	30	PP, DF, GF, WL	n/a	n/a	65	n/a
150	Fuels Reduction Thinning (plantations)	13	PP, DF, GF	Ground based	Yes	70	40
151	Fuels Reduction Thinning	16	PP, DF, GF, WL	Ground based	Yes	75	40

Unit	Treatment	Acres	Species	Logging System	Skips & Gaps	Current Canopy Cover	Target Canopy Cover
	(plantations)						
152	Fuels Reduction Thinning (plantations)	6	PP, DF, GF	Ground based	Yes	60	40
153	Fuels Reduction Thinning (plantations)	13	PP, DF, GF	Ground based	Yes	60	40
155	Fuels Reduction Thinning (plantations)	10	DF, GF	Ground based	Yes	60	50
156	Fuels Reduction Thinning (plantations)	8	DF, GF	Ground based	Yes	60	50
157	Fuels Reduction Thinning (plantations)	15	PP, DF, GF	Ground based	Yes	60	40
158	Fuels Reduction Thinning (plantations)	5	PP, DF, GF	Ground based	Yes	50	40
159	Fuels Reduction Thinning (plantations)	3	PP, DF, GF	Ground based	Yes	60	40
164	Fuels Reduction Thinning (plantations)	15	PP, DF, GF	Ground based	Yes	60	40
165	Fuels Reduction Thinning (plantations)	3	PP, DF, GF	Skyline	Yes	55	40

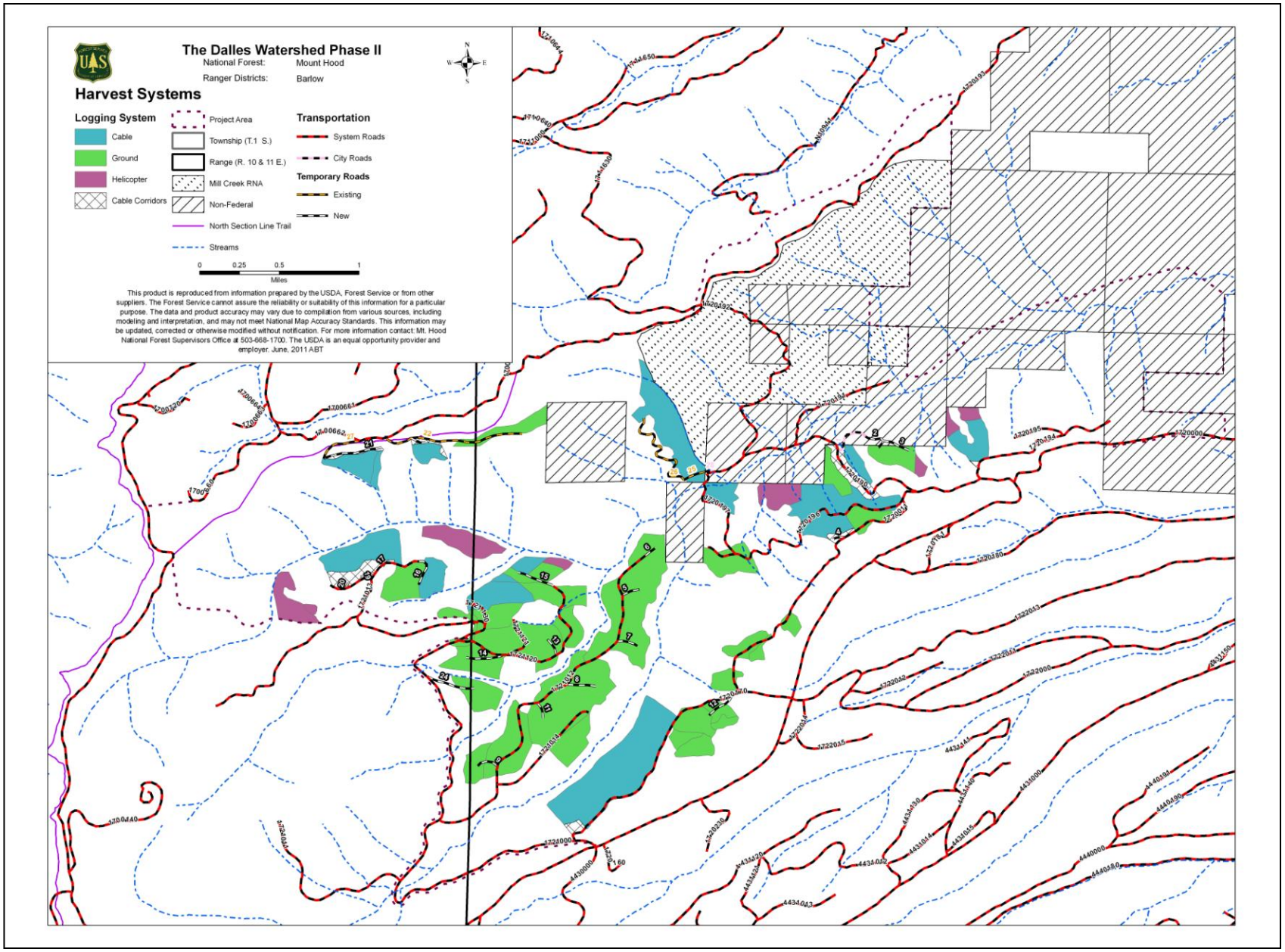

Figure 2-1: Proposed Logging Systems and Temporary Roads within the Project Area

Figure 2-1 also shows the location of the proposed temporary roads associated with the Proposed Action. The temporary roads are either new construction or previously used (existing) temporary roads. Overall, the project includes 5.3 miles of temporary roads. The location of these roads may change slightly during implementation, if unforeseen resource concerns are present on-the-ground. Even in small changes are made during implementation, no more than 5.3 miles of temporary roads would be constructed.

Temporary roads are roads that are built to access landings and are rehabilitated upon completion of treatments. They are not considered part of the Forest's transportation system of permanent roads. Some of the units proposed for treatment were accessed by temporary roads during previous vegetation management activities. Existing temporary roads were assessed to determine whether they could be used for this project. It was determined that approximately 2.1 miles of existing temporary or previously decommissioned roads would be reused and rehabilitated upon project completion. Approximately 3.2 miles of new temporary roads would be constructed and rehabilitated upon project completion.

After use, temporary roads would be bermed at the entrance, water barred, decompacted and roughened with the jaws of a loader or excavators, and debris such as rootwads, slash, logs or boulders would be placed near the entrance and along the first portion of the road to limit unauthorized access.

Riparian Thinning Prescriptions

In riparian reserves the treatments would be designed to create conditions suitable for maximum diameter growth to enhance the potential for large wood recruitment and to enhance diversity. The intention is to enhance riparian reserves by accelerating the development of mature and late-successional stand conditions. The proposed treatments would be designed to meet Riparian Reserve objectives with a single treatment entry.

A protection buffer is the portion of the riparian reserve that would not be treated. The minimum width of protection buffers would be based on stream type and location. The protection buffers along streams may be considered skips. Skips would be created outside of protection buffers and gaps would be created within riparian reserves. The gaps would be 100 feet or farther from a stream. Gaps would make up zero to ten percent of the available riparian component. The details of protection buffer widths and the riparian thinning prescriptions follow.

Perennial Streams

0 to 60-feet: This prescription would have an undisturbed vegetative buffer that would be maintained in the primary shade zone as defined in the March 3, 2004 "Sufficiency Analysis for Stream Temperature." Some areas of prescribed fire may creep into the outside portions of this zone which is acceptable as long as these are infrequent and no vegetation currently providing shade to surface water would be removed or destroyed. Danger trees that pose a risk to human safety such as along roads are allowed to be felled and left within this area. The width of the primary shade zone depends on the height of the trees proposed to be cut in the general treatment prescription and the hill slope. Based on the physical setting (some streamside slopes >60%) and that trees identified for thinning in the general prescriptions may be up to 80' tall, the primary

shade zone should be 60' wide on either side of a perennial stream in order to maintain current water temperatures.

60 to 150-feet: This area is still within the Riparian Reserve and constitutes the secondary shade zone as defined in the March 3, 2004 "Sufficiency Analysis for Stream Temperature." Treatments should not reduce final canopy closure below 60% in order to maintain suitable habitat for wildlife species. The prescription should emphasize creating species diversity of riparian vegetation and thin dense understories to maintain survival of late-seral trees by creating a stand that is moving toward a natural, pre-fire exclusion structure and composition with high large woody debris recruitment potential. The resulting prescription should maintain as many of the larger trees and snags as possible. Controlled burning may take place in this area in order to restore plant species composition and structure that would occur under natural fire regimes.

150 to 300-feet along Fish-bearing Streams: Treatments should not reduce final canopy closure below 60% in order to maintain suitable habitat for wildlife species. The prescription should emphasize creating species diversity of riparian vegetation and thin dense understories to maintain survival of late-seral trees by creating a stand that is moving toward a natural, pre-fire exclusion structure and composition with high large woody debris recruitment potential. The resulting prescription should maintain as many of the larger trees and snags as possible. Controlled burning may take place in this area in order to restore plant species composition and structure that would occur under natural fire regimes.

Intermittent Streams and Wetlands

0 to 30-feet: This area would have a 30' undisturbed vegetative buffer for sediment control which would be consistent with the Rashin and others (2006) research. Danger trees that pose a risk to human safety such as along roads or in developed recreation sites areas are allowed to be felled and left within this area.

30 to 100-feet: The prescription should emphasize creating species diversity of riparian vegetation and thin dense understories to maintain survival of late-seral trees by creating a stand that is moving toward a natural, pre-fire exclusion structure and composition with high large woody debris recruitment potential. The resulting prescription should maintain as many of the larger trees and snags as possible. Controlled burning may take place in this area in order to restore plant species composition and structure that would occur under natural fire regimes.

100 to 150-feet along Wetlands greater than one acre: The prescription should emphasize creating species diversity of riparian vegetation and thin dense understories to maintain survival of late-seral trees by creating a stand that is moving toward a natural, pre-fire exclusion structure and composition with high large woody debris recruitment potential. The resulting prescription should maintain as many of the larger trees and snags as possible. Controlled burning may take place in this area in order to restore plant species composition and structure that would occur under natural fire regimes.

Ephemeral Streams

0 to 30-feet: These streams do not have Riparian Reserve designation, but have been identified by The City of The Dalles personnel as important in maintaining water quality in the municipal

watershed. The prescription should emphasize creating species diversity of riparian vegetation and thin dense understories to maintain survival of late-seral trees by creating a stand that is moving toward a natural, pre-fire exclusion structure and composition with high large woody debris recruitment potential. The resulting prescription should maintain as many of the larger trees and snags as possible. Controlled burning may take place in this area in order to restore plant species composition and structure that would occur under natural fire regimes.

Economics

While economics were considered when developing the Proposed Action for The Dalles Watershed Phase II, it was not a primary driver to project design, as the Purpose and Need pertains to hazardous fuels reduction and not timber production or economic recovery.

Using stand exam information it was determined that an average of roughly 26 ccf/acre may be removed to meet fuel reduction goals across 1,459 acres which are proposed for thinning (Plantation and Natural Stands). With this information an economic analysis was completed utilizing the region six "Sale Economic Evaluation (Residual Value)" program (Rheinberger 2009). This program estimates residual value of timber products based on current delivered log values minus the current local costs associated with harvest and transportation of the timber to a mill location. Also considered in the economic analysis were the estimated costs associates with additional fuel treatments including piling (hand and mechanical), underburning, and mastication. The results of the analysis indicate that the 1,459 acres with a commercial component would be economically feasible as a traditional timber sale. When the additional costs associated with all fuel treatments are considered, however, the timber value would not be sufficient to fund all fuel reduction activities. Other funding sources outside of the residual timber value would need to be utilized to fully implement the Proposed Action. Potential funding sources include, but are not limited to, hazardous fuels funding, retained receipts from other projects and The City of The Dalles (for underburning on city lands).

Other Fuel Reduction Activities

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

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

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

disturbance.

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

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

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

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

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

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

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

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

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

Maintenance Treatments
It is expected that vegetation would return at varying rates, which would facilitate a staggered maintenance program. Most of the maintenance would include brush removal. Triggers would be established to determine when an area was ready for future treatment (e.g. when grass or trees get to a certain height). Tall shrubs are reduced significantly after a thinning, but may return to pre-thin levels within 5-7 years (Wilson and Puettmann 2006). Prescribed burning and pile burning would be included as part of the maintenance plan.

Road Reconstruction/Maintenance

Road reconstruction and maintenance is necessary on haul routes identified for this project. Weak areas would be reconstructed as needed. The roads would be repaired to a minimum standard for both safety and resource protection before use. No new permanent road construction would be necessary to implement the Proposed Action. Snow plowing would not be allowed on any roads within the watershed. The proposed roads activities include actions on National Forest System roads as well as City of The Dalles roads that are within the watershed and would be used for timber hauling.

Table 2-3 list four basic maintenance and repair work categories that would be utilized on all roads during and after use to maintain minimum standards. These work categories include brushing, drainage, blading, and surface repair. Brushing work consists of cutting all vegetative growth, including trees and other vegetation less than 4-inches in diameter measured 6-inches above the ground, on roadway surfaces and roadsides. Drainage work consists of providing

minimum access required for contractors operations and associated Forest Service contract administration and preventing unacceptable resource or road damage. Blading work consists of surface blading the traveled way to a condition that facilitates traffic and provides proper drainage. Blading includes shaping the crown or slope of travel way, berms, and drainage dips. Surface repair work consists of placing surface aggregate as designated on the ground. It includes preparing the area, furnishing, hauling, and placing all necessary materials and other work necessary to blend with the adjacent road cross section. All work would be within the existing road structure. Only the activities needed for log hauling would be completed.

Table-4: Proposed Road Reconstruction/Maintenance Work on National Forest System and City of The Dalles Roads

Road #	Proposed Road Reconstruction/Maintenance Work	Miles
1700000	No proposed road work	0.3
1700660	No proposed road work	0.8
1700662	No proposed road work	3.0
1711630	No proposed road work	0.1
1720000	No proposed road work	5.1
1720011	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	1.8
1720170	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	1.9
1720190	Meets Standard	2.3
1720191	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	0.8
1720192	No proposed road work	1.6
1720193	No proposed road work	2.2
1720194	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	1.0
1720195	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	0.3
1720196	No proposed road work	1.7
1720197	Brushing, Cutting Roadway Vegetation Only.	0.7
1721000	No proposed road work	3.7
1721011	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	0.1
1721012	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	2.5
1721013	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	0.6
1721014	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	0.8
1721120	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	1.2
1721121	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	0.3

Road #	Proposed Road Reconstruction/Maintenance Work	Miles
1721130	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	0.2
1721140	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	0.3
City Road 1	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	0.3
City Road 28	Blading, Surface Repair (Spot Rock 50 cubic yards of 3-inch minus), Drainage and Brushing.	0.2
Total		**33.8**

In addition to the roads listed above that fall within the project area, additional roads outside of the project area may also be utilized for product removal. These roads include Forest Service Road (FSR) 1700, 1700-660, 1720, 1721, 44 and 4430. All of these roads currently meet the standards and would not require any additional work as a result of this project.

2.2.3 Design Criteria/Mitigation Measures for All Alternatives

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

Fuels:

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

Vegetation:

1. Patch openings would be created in root disease pockets. Openings would be reforested in accordance with site conditions.
2. Ponderosa pine dominated planting would occur in specific areas where appropriate to assist in restoring and maintaining a historically fire tolerant ecosystem.

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

Roads:

1. As appropriate and to the extent practical erosion control measures should be employed to reduce or eliminate sediment delivery from roads to streams.
2. Haul would be restricted to the normal operating season, unless weather conditions permit operating outside of this window.
3. New temporary roads and landings should be located outside of Riparian Reserves. Use of existing facilities within riparian reserves may be allowed if erosion potential and sedimentation concerns could be sufficiently mitigated. All temporary roads and landings would be decommissioned immediately after operations are completed, including harvest, fuels reduction and restoration activities.

Soil Resource:

1. All skid trails would be rehabilitated immediately after harvest activities. If harvest treatments are anticipated to extend beyond the current field season, temporary effective closures would be employed to prevent unauthorized use and necessary erosion control measures would be implemented.
2. In timber harvest units, ground-based harvest systems should not be used on slopes greater than 30 percent to avoid detrimental soil and/or watershed impacts.
3. If a proposal to operate outside the normal operating season is presented (e.g., mechanical fuels reduction or timber harvesting), the following would be considered by the District Ranger and Responsible Official if the ground is not frozen hard enough and/or insufficient snow depth is present to support the weight and movement of machinery in moist to wet soil conditions (these are based upon observations and monitoring of winter logging in Sportsman's Park):
    a. The proposal would be considered on a unit-by-unit basis using soil types in the area since some soils may be more prone to detrimental damage than others.
    b. Since the margin of difference between not detrimental and detrimental soil damage could be so slim under moist to wet soil conditions, monitoring of the logging activity may need to occur daily, or more, as agreed to by sale administrator and soil scientist.
    c. Equipment normally expected to traverse the forest, such as feller bunchers, track mounted shears, etc., would be restricted to skid trails once soil moistures are such that even one or two trips are causing detrimental soil damage out in the unit (i.e., not on landings or skid trails).
    d. When soils become fully saturated (approach their liquid limit), equipment with a pounds per square inch of 9 or higher would not be used. Typically rubber-tired equipment (e. g., skidders) would not be permitted under these conditions.

Riparian Areas*:*

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

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

2. No wheeled or tracked motorized equipment would be allowed within 100-feet[2] of perennial and intermittent, streams, seeps, springs or wetlands and within 30-feet[2] of any ephemeral drainages. This would reduce the chance of sediment delivery to surface water.
3. No brush or slash piling would occur within 30-feet of ephemeral drainages.
4. Fueling of gas-powered machinery would not occur within 150-feet of any surface waters to maintain water quality. Each fueling area and or active landing would have a hazardous material recovery kit, which is adequate to contain any potential hazardous spill for the equipment used (at least until additional containment/cleanup support arrives).
5. Contractors or there subs hauling fuel should be aware of the CFR requirements of notifications if a spill should occur. These are to notify the National Response Center and the Contracting Officer. They should also be aware of action required to clean up or contain such spills. If any fuel or fluid storage container exceeds a capacity of 660 gallons, the contractor would prepare a spill prevention control countermeasures plan. Such plan would meet applicable Environmental Protection Agency requirements (40 CFR 112) including certification by a registered professional engineer.
6. The contractor would be liable for cleanup of any hazardous material, garbage, septic waste, or fuel spills occurring as a result of contractor operations anywhere within the project area.
7. Use erosion control BMP's where de-vegetation may result in delivery of sediment to adjacent surface water. Soil scientists or hydrologists would assist in evaluation of sites to determine if treatment is necessary and the type of treatment needed to stabilize soils.
8. Directional felling would be required within 100-feet of any 30-foot or 60-foot unmanaged riparian areas. Any felled trees which fall into one of these unmanaged riparian areas would be left.
9. Low severity burns[3] should constitute the dominant type of controlled burn within the Riparian Reserve, resulting in a mosaic pattern of burned and unburned landscape.
10. Moderate-severity burns[4] are permitted in no more than 20% of the Riparian Reserves to invigorate desirable deciduous species.
11. Ignition could occur anywhere in the Riparian Reserve as long as all other design criteria are met.
12. Burning activities excluded in the Riparian Reserves are as follows: mechanical fire line construction (e.g. dozer, small tractor etc.), or chemical fire retardants. Fireline construction is defined to mean activities that result in exposure of bare mineral soil.
13. Hand fireline construction should be minimized within the Riparian Reserve and wet line or black line is preferred. An exception to this would be situation where fireline is needed to control burn intensity and spread due to unforeseen circumstances. In these situations, implement BMP's to control erosion and sedimentation to stream channels, these include constructing waterbars on all the firelines where slopes are greater than 20%, while the fireline is being constructed.

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

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

Wildlife:

1. Known Northern spotted owl core areas would be protected through the implementation of seasonal operating restrictions (March 1 to July 15) for units 24, 28, 32, 35, 37, 40, 41, 42, 50, 51, and 52. In the event that new core area(s) is/are located during the period of the contract(s) seasonal operating restrictions would be implemented in the area affected.
2. No burning may take place within ¼-mile of spotted owl core areas between March 1 and July 15.
3. Rare and uncommon species needing protection would be designated on-the-ground prior to ground disturbing activities occurring.
4. No operations would take place during the last eight days of October to allow for The Dalles Watershed special elk hunt (Hunt Reference # 241A).
5. No heavy helicopter operations (Type 1) may take place within ¼-mile of spotted owl core areas between March 1 and Sept 30. Small helicopters would be subject to the same distance restriction between March 1 and July 15.

Botany:

1. Conduct an autumn underburn in the northeast corner of the Research Natural Area to protect habitat for *Arabis sparsiflora v. atrorubens* (ARSPA). If an autumn underburn is not feasible, the boundary of the unit should be adjusted to exclude the site.
2. Fire in meadows should only be incidental to fire treatment in adjacent areas. Do not burn the meadows intentionally except as part of research work.
3. Minimize any activity that exposes bare soil. Fire lines may need to be constructed but every effort should be made to minimize the impact without compromising the effectiveness of the line.
4. Pursue opportunities to partner with someone to conduct research studies on the effects of fire on the spread of *Ventenata dubia* (VEDU) and how to manage post burn. Studies should have scientific rigor and the results disseminated.

Invasive Species:

1. It is recommended that "pre-treatment" occur before any harvest activities are implemented along roads 1720-190, 192, 194, 195, 196, and 1721-012. If possible schedule implementation of work from infestation-free areas into infested areas rather than vice-versa.
2. Incorporate the standard contract provision that require cleaning of equipment.
3. The process for locating all new skid trails and landing locations would be coordinated with a noxious weed specialist so as to insure these locations are not within any currently established noxious weed populations. If necessary, pre-treat existing landings and skid trails that may be used for project implementation where existing infestations present an unacceptable risk of spreading established invasive plant populations.
4. If the need for restoration/revegetation of skid trails and landings is identified, the use of native plant materials are the first choice for meeting this objective where timely natural regeneration of the native plant community is not likely to occur. Non-native, non-invasive plant species may be used in any of the following situations: 1) when needed in emergency conditions to protect basic resource values (e.g., soil stability, water quality and to help prevent the establishment of invasive species), 2) as an interim, non-persistent measure designed to aid in the re-establishment of native plants, 3) if native plant materials are not

available, or 4) in permanently altered plant communities.
5. If using straw, hay or mulch for restoration/revegetation in any areas, use only certified, weed-free materials.
6. Reforestation and restoration efforts should limit use of container stock or other practices where soils or other growing mediums are brought into the planning area.
7. In open meadows, which may be at an increased risk from invasive non-native grasses and other noxious weeds, the appropriate resource specialist would provide specific information to the Burn Plan in which suitable measures would be developed to limit the spread and or occurrence of such weed populations. Collection of fire tolerant perennial native bunch grasses for seed increase contract should also be included, if deemed necessary.
8. Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that is judged to be weed free by District or Forest weed specialists.

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

Recreation:
1. Prescribed burning would be conducted in such a manner (i.e. using favorable wind direction and adequate mixing heights) to reasonably minimize effects from smoke and particulates to hikers and campers using the North Section Line Trail, the Surveyor's Ridge Trail, and the Gibson Prairie Horse Camp.
2. Prescribed burning and pile burning near the North Section Line Trail #451 would be conducted in the fall or later to limit impacts to hikers and campers.
3. Burning should be conducted in units 5, 7, 53, 54, 127, 129, and 132 during weekdays to limit impacts to recreationists along the North Section Line Trail.
4. The Recreation Staff would be notified two weeks prior to burning activities. Notices would be published in the local papers and signs would be posted at the trailheads prior to burning activities.
5. No brush piles would be located within 100 feet of the North Section Line Trail #451.
6. If support wires for skyline support anchors cross the North Section Line Trail #451, the trail would be closed and closure signs posted. Any closures would be limited in duration.
7. No new temporary roads or skid trails would cross the North Section Line Trail #451.

Visual Quality:
1. Timber harvest activities within 660 feet of the North Section Line Trail #451 would be accomplished to meet VQOs of Partial Retention.
2. Slash would be lopped and scattered in units 5, 7, 53, 54, 127, 129, and 132 within 100 ft of designated trails.

3. Slash piles in units 5, 7, 53 and 54 would be burned within two years of harvest completion.
4. No piles would be located within 50 feet of standing mature residual trees.

Guidelines for Operating within the Municipal Watershed

The Dalles Municipal Watershed's MOU with the US Forest Service and Comprehensive Management Plan (1972) includes guidelines on activities including allowable timber harvests (methods and acreages), road construction and maintenance, and other planning and protection measures to be taken to protect water quality. Those guidelines listed below are more restrictive than the mitigation measures listed above and would be added to the contract.

Gate Access:

1. All locks other than US Forest Service or City of The Dalles shall be coded or removed.
2. Gates shall be closed and locked after normal log hauling hours, weekends, and any other time it is deemed necessary for control of unauthorized personnel.
3. During the time logs are being hauled and the gate(s) are open, a highly visible sign shall be posted indicating that Public Access is prohibited beyond the Boundary Gate.
4. Gates found open by City Security Patrols during determined non-access time would be closed and locked. Search of area would be made to insure no one is in the Watershed before locking the gate. Anytime a gate is locked under this circumstance, the City would notify Dufur Ranger Station to check on the situation. All damage to gates and/or fences shall be repaired as soon as possible on the day the damage occurs.

Personnel Limitations:

1. No person would be permitted to carry a big game rifle into the Watershed either in a vehicle or by personal transportation.
2. No person or crew would be permitted to remain overnight in the Watershed with the exception of authorized persons in the performance of their duties, such as security staff or fire patrols necessary to harvest or construction activity. Any overnight camping would require approval by the Forest Service. Forest Service would consult with the City of The Dalles prior to approving overnight camping.
3. All logging operators (personnel) shall be made aware of and required to preserve all historical, archaeological, or relative cultural sites existing within the given sale area.

Sanitary Waste:

1. Privies or suitable toilet facilities shall be provided on-site prior to any sale layout, construction, or harvest activity. These facilities shall not be within 500 feet of any stream, spring, or seepage; secured from weather damage; and be maintained at necessary intervals. Special circumstances would be handled on a case by case basis.
2. Personal porta-potties are acceptable for use by personnel if such units are maintained daily and secured properly.
3. Personnel are to be instructed that the sanitary facilities are to be used and that such facilities must move with the job activity.
4. Disposal of composted human waste is prohibited inside the Watershed area.
5. Privies would be located in sites of activity concentration such as landings. One privy would be required for each operation requiring a fire toolbox. The privy would be located

on a site where tipping over cannot occur and it would be no further away from the work site than the fire box.

Petroleum Product Care:

1. Absorbent pads shall be placed on the ground or on stationary equipment such as a loader and yarder to catch spills or leaks.
2. There shall be no discharge of any petroleum product within the Watershed. If oil is changed on-site, all waste materials must be removed from the Watershed Reserve.
3. Hydraulic fluid, gasoline, diesel fuel, and any other petroleum product spills or leaks would require immediate and proper attention. Complete removal of contaminated soil may be required.
4. Fixed storage of petroleum products within the Reserve would not be permitted.
5. Application of Road Emmulsions and dust control products (except water) to transportation systems within the Watershed Reserve would require Forest Service approval. Forest Service would consult with the City of The Dalles prior to approving any emmulsion application. Any water tanker used for dust control would not have been used for any other previous chemical storage or application purpose and would not present a potential chemical/bacteriological contamination to the Reserve.

Stream Restrictions:

1. Pumping water from streams is prohibited without prior approval of the Forest Service. Forest Service would consult with the City of The Dalles prior to issuing approval of water removal.
2. Operating equipment or timber harvesting of any type through any stream, spring, or other flow discharging bog is prohibited.
3. No burn piles would be placed within 100 feet of a stream or spring because soils may become non-wettable from high burn heat intensity and are subject to erosion. Burn pile locations, concentration, and burning time shall be discussed at time of fuel treatment plan development. Burn piles between 100 to 200 feet of a stream or spring would have a maximum pile size of 10-feet wide, 10-feet long, and 10-feet high.
4. No fuel would be stored within 1,000 feet of streams.

Harvest Activity:

1. All trails affected by Harvest Activity shall be reestablished prior to Big Game seasons beginning in October of each year (for closure patrol purposes).
2. Water barring of all skid trails and roads is to be done prior to winter season or, as stated in some contracts, before moving into the next unit. Adherence to contractual agreements is required by this Department if they are more stringent than stated in this memorandum.
3. Continued access to City facilities, Crow Creek Dam, cabins, intake sites, etc. shall be provided for in the contract, location of landings, road, and logging operations. City use of sale roads shall be reviewed during preparation of contract to insure proper contract provisions are included.

General:

1. Normal firefighting equipment as required by US Forest Service shall be readily available and in proper working condition.

2. A pre-work session would be held for all parties involved. All parties would be notified prior to implementing any changes in Harvest or Construction Plans. Cooperation and continuity is imperative in all activities.
3. The City and the Forest Service would make joint reviews of active projects bi-weekly (once every two weeks). The City would make contact with the Forest Service to set up a specific day for each review. The review would be documented at the end of each trip with each party signing the report and receiving a copy.
4. The City of The Dalles, Department of Water Supply & Treatment, would be provided names and telephone numbers of supervisors, field boss, foreman, or any person in charge of each ongoing harvest or construction activity.
5. The City would be given the opportunity to attend and become an integral part of all pre-work conferences to assist in the identification of water quality protection needs.

Contacts:

1. Contacts between the City and the Forest Service contractors should be kept to a minimum because of contract responsibilities and liabilities - contact should be made only in emergencies.
2. The Forest Service would be required to immediately notify the city water treatment plant in case of a spill or release of petroleum products or hazardous materials into a live stream or reservoir. The telephone contact number would be provided to the contractor prior to moving any equipment into the watershed.

2.2.4 Monitoring Requirements

Prior to advertisement of a contract, the provisions of the contract and other implementation plans would be reviewed to insure that required elements are properly accounted for.

During implementation, Timber/Stewardship Sale Administrators and Contract Administrators monitor compliance with the contract which contains provisions for resource protection including but not limited to: seasonal restrictions, snag and coarse woody debris retention, stream protection, erosion prevention, soil protection, road closure and protection of historical sites.

Post harvest reviews would be conducted where needed prior to post harvest activities, such as slash treatment and firewood removal. Based on these reviews, post harvest activities would be adjusted where needed to achieve project and resource objectives.

Monitoring of noxious weeds and invasive plants would be conducted where appropriate to track changes in populations over time and corrective action would be prescribed where needed.

Monitoring is also conducted at the Forest level as part of the Forest Plan implementation. For example, water quality is monitored for both temperature and turbidity at several locations across the Forest. Monitoring reports can be found on the Forest's web site at http://www.fs.usda.gov/goto/mthood under Forest Publications.

2.3 Alternatives Considered, but Eliminated from Detailed Study

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

Amending the Forest Plan Standards and Guidelines for Research Natural Area (RNA)
The Responsible Office and Interdisciplinary Team considered additional hazardous fuels reduction treatments within the Mill Creek RNA. The specific treatments considered within the RNA included fuels reduction thinning, sapling thinning and mechanical fuels reduction treatments. In order to implement these treatments, a site-specific Forest Plan amendment would be required for A3-048 which states: "Unless required to provide protection to adjacent non-RNA acreage, fuels treatment shall not occur where the sole purpose of the project is fire hazard reduction." This alternative would further reduce the hazardous fuels within the interior of the municipal watershed and would need the purpose and need for action for this project. However, this alternative would not meet the goal for the RNA as stated in the Forest Plan.

The goal for RNA (A3) is to preserve examples of natural ecosystems in an unmodified condition for research and education, and to provide areas to serve as a baseline against which human impacts on natural systems can be measured (Forest Plan p. 4-145). For the RNA, the major characteristics for the desired future condition as related to this project include (Forest Plan p. 4-146): Contains a representative or unique plant community and serves as a gene pool reserve for native plant and animal species; and Natural processes in undisturbed conditions predominate.

In order to meet the goal for RNA as stated in the Forest Plan, this alternative was not considered in detail and only limited treatments are proposed within the research natural area in order to achieve the desired future condition and to meet the standards and guidelines of prescribed fire. Although on a more restricted basis, these treatments do reduce the hazardous fuels within the RNA as well as the risk of a catastrophic wildfire within the RNA. As such, these limited treatments do meet the purpose and need for action and this alternative was considered not reasonably viable.

Hazardous Fuels Reduction Treatments within Late-Successional Reserves (LSR)
An alternative with additional treatments within the Surveyor's Ridge LSR, specifically the Mill Creek Butte area, was considered. In this alternative the full suite of hazardous fuels reduction treatments would be proposed within the LSR, including fuels reduction thinning, sapling thinning, jackpot burning, and mechanical fuels reduction treatments. Hazardous fuels treatment within the Mill Creek Butte area would address the concerns identified in the Surveyor's Ridge LSR Assessment, which stated: "The areas are collapsing due to years of disease and insect infestations. . . . The fuels build up is such that a catastrophic fire risk does appear to exist.

Without treatments these areas would threaten surrounding areas and weaken or break several areas where good to fair connectivity currently exists. [The Forest Service] believes to minimize the risk, reducing the fuel hazard created is needed through silvicultural treatment. This would provide for the maintenance and protection of the Late Successional Reserve as a whole, and for the longevity of the healthier parts of the stands where this condition (trigger) does currently exist" (US Forest Service, 1997, page 86).

The Mill Creek Butte area of the LSR is adjacent to the project area, and serves as dispersal and suitable habitat for the northern spotted owl. Within the project area, approximately 658 acres of the treatment units are providing dispersal-only habitat for spotted owls and 660 acres are providing suitable nesting habitat. The Natural Resource Area provides an additional 203 acres of suitable nesting habitat. If additional treatments were proposed within the LSR, the acres of impacted dispersal and suitable habitat would increase, and would create additional stress on the species. The effects to northern spotted owls are discussed in detail in Section 3.7.

Also, the Surveyor's Ridge LSR Assessment states that there is an estimated 1,000 acres of risk reduction work needed. The number of acres treated to date through previous fuels reduction projects, including The Dalles Watershed Fuelbreak and North Fork Mill Creek Restoration Opportunities accounts for the majority of these acres. The additional acres from this project would exceed the 1,000 estimation. Before exceeded these acres, the Responsible Official requested that the Interdisciplinary Team review the LSR Assessment to determine if it was appropriate to exceed the estimated acres and if exceeding the acres would have unnecessary or avoidable negative impacts to the resource. At this time, the Forest Service does not have the capacity to update the LSR assessment. As such, this alternative is not reasonably feasible at this time, and this alternative was not considered in detail.

"Science-Based Fire Restoration" Alternative Recommended by Bark

During the scoping period, it was recommended that the Forest Service analyze an additional action alternative that does not include any "commercial logging", but rather focused on science-based fire restoration including prescribed fire and mechanical fuels reduction. In this alternative, all trees over 8-inches in diameter at breast height (DBH) would not be removed for "commercial logging" purposes, but would rather remain standing or would be felled and left on-site all down woody material. As such, the fuels reduction thinning in natural stands and plantations (40% of proposed treatments) would not be implemented as currently described in Section 2.2.2. The sapling thinning, jackpot burning, prescribed burning on City of The Dalles lands, and mechanical fuels reduction treatments would be included in this alternative.

Under this alternative, overstocked and dense stands would remain and the hazardous fuels associated with the standing trees (fuel ladders) would not be removed. The trees would either remain standing or would be felled and left on-site all down woody material. Overtime the dry mix conifer sites, currently occupied by densely stocked Douglas-fir and grand fir stands, and would experience the continuing spread of root disease and resultant mortality over the long-term, as well as the continued infestation and mortality from dwarf mistletoe. By maintaining high tree competition, stems would continue to grow in height, but diameter growth would continually slow. These trees would become more dependent on neighboring trees for support. When trees develop in this manner they are more likely to blow down in large groups or if drought conditions persist which would increase the hazardous fuels within in the watershed over

the long-tern.

Based on the long-term predictions of increase fuel loading, this proposed alternative does not meet the purpose and need for action as stated in Section 1.3. Specifically, it does not reduce the risk of large stand replacing wildfire events in the watershed using management strategies such as thinning overstory and understory trees (thinning from below); nor does it reduce hazardous fuel loadings and fuel ladders (small reproduction that increases potential for crown fire initiation) to reduce the risk of unwanted effects of wildfire on National Forest System lands and City of The Dalles in-holdings within the municipal watershed. As such, this alternative was not considered any further.

2.4 Mt. Hood Land and Resource Management Plan Consistency

Standards and guidelines in the Mt. Hood Forest Plan were not written to address hazardous fuels reduction. When the Mt. Hood Forest Plan was written, it emphasized traditional timber sales, rather than fuels reduction projects. As such, there are several Forest Plan standards that would not be met in order to meet the Purpose and Need for Action as described in Section 1.3. Exceptions to the Forest Plan standards are allowed under the Forest Plan, if they are identified during the interdisciplinary process. The exceptions were identified during the interdisciplinary planning analysis and the IDT process concluded that these exceptions were within the Purpose and Need for Action. Forest Plan page 4-45 states that for "should" standards "action is required; however, case-by-case exceptions are acceptable if identified during interdisciplinary project planning, environmental analyses. Exceptions are to be documented in environmental analysis (National Environmental Policy Act 1969) public documents." Also, the exceptions were shared with the public during the scoping comment period. All other standards and guidelines are expected to be met with this proposal.

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

  For organic matter (FW-033), it is likely that some localized acreage would be lower than the Standard and Guideline. This is most likely to occur on south facing soils where treatments are proposed (soils 2, 5, 7 and 8). When this occurs, it is not expected to be a substantial impact to nutrient cycling due to the following: these are not clearcuts followed by intense burning and extreme loss of current and future organic matter; the shape and extent of some of the impact is narrow and discontinuous; and many of the soils impacted would retain sufficient organic matter reserves in the remaining standing trees and mineral topsoil due the way in which they have developed. See Section 3.4, Soil Productivity for more details.

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

For snags (FW-215), implementation of the Proposed Action would reduce the amount of small snag recruitment that would have occurred through the process of stress and mortality in the next 20 to 30 years. Some of the snags and downed logs that might have formed from the death of the intermediate and suppressed trees would be removed by thinning activities. As a result the attainment of moderate-sized snags and down wood would be delayed because of the reduction in density of the stands which would reduce the levels of suppression mortality. For more information, see Section 3.7, Wildlife Resources.

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

  Currently, most areas are below 2 percent cover of down wood and therefore are below the 30 percent tolerance level for wildlife habitat. As a result of this project, the recruitment of down wood would be delayed because of the reduction in density of the stands which would reduce the levels of suppression mortality. Although some trees with elements of wood decay would be left to provide habitat for snag-dependent species; fewer new snags, trees with elements of wood decay, or down wood would be recruited for the short to mid-term. In the long term, trees would be larger compared to no action, and some would eventually die and become large snags and some would eventually fall naturally to create large coarse woody debris. See Section 3.7, Wildlife Resources for more details.

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

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

  Silvicultural systems refer to whether even-aged or uneven-aged management should be applied. Even-aged systems are regeneration harvests, including clearcutting, seed tree, and shelterwood cuts. The Forest Plan recommends an even-aged system on slopes over 30 percent because the residual trees in an uneven aged harvest system are often damaged with cable logging systems. These Standards (FW-333 and FW-337) are not being met because the silvicultural prescriptions specify appropriate mitigation measures in management areas where uneven-aged management is being considered to fulfill resource objectives other than timber production (Forest Plan, Four-88). The objective of this project is fuels reduction while maintaining structure for aesthetics, wildlife, nutrient cycling, future stand composition and health. Mitigation measures create patch openings, underburn, and use directional falling techniques to limit residual tree damage on cable logged slopes which are part of the design of the Proposed Action. The expected condition after harvest is to create a more open forest with a greater grass, forb, and shrub undergrowth. See Section 3.3, Vegetation Resources section for more details.

NFMA Findings for Vegetation Manipulation:
As required by regulations (FSH 1909.12 5.31a), "all proposals that involve vegetative manipulation of tree cover for any purpose must comply with the seven requirements found at 36 CFR 219.27(b)." All of these requirements are met by the project as described in the Vegetation Resources Specialist Report and analysis materials, which are available in the project record, located in Dufur, Oregon.

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

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

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

- There is reasonable assurance that lands could be restocked within five years of final harvest. This generally does not apply to the proposed harvest units, as they would be thinned.

2.5 Regulatory Framework

2.5.1 Best Management Practices

According to the Northwest Forest Plan, Best Management Practices (BMP) would be incorporated into the implementation of the project. BMP are drawn from General Water Quality Best Management Practices, Pacific Northwest Region (November 1988) and the Draft Environmental Protection Agency Region 10 Source Water Protection Best Management Practices for USFS, BLM (April 2005). The BMP have been incorporated in the project design criteria/mitigation measures as described in Section 2.2.3 as well as the standard contract language for implementing these projects.

2.5.2 Consistency with the Healthy Forest Restoration Act

The Healthy Forest Restoration Act (HFRA) requires that projects designed under its authority fully maintain, or contribute toward the restoration of, the structure and composition of old growth stands according to the pre-fire suppression old growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and H. R. 1904-8 watershed health, and retaining the large trees contributing to old growth structure.

Old growth stands: Section 102(e)2 states HFRA projects should "fully maintain, or contribute toward the restoration of, the structure and composition of old growth stands according to the pre-fire suppression old growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health, and retaining the large trees contributing to old growth structure." This project would retain the structure and composition of pre-fire suppression old growth by promoting fire-adapted species where their health condition does not threaten the overall health of the stand. Also, the treatments would not impact the Spotted Owl Habitat Area (A8) in the planning area.

HFRA provides that old growth direction in the Northwest Forest Plan Record of Decision is sufficient to meet the requirements of the Act. The Northwest Forest Plan Record of Decision recognizes that large-scale disturbances, such as fire, could eliminate spotted owl habitat on hundreds or thousands of acres. "Elevated risk levels are attributed to changes in the characteristics and distribution of the mixed conifer forests resulting from past fire protection. Risk reduction efforts are encouraged where they are consistent with the overall recommendations in these guidelines" (S&G C-10 thru C-13, ROD).

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

The proposed treatments meet this requirement by retaining large trees suitable to the site in mature stands, and reducing stand density that has increased since the exclusion of fire. Large trees would be retained where they do not threaten the overall health of the stand. Grand fir trees in the pine/oak and Douglas-fir forest type are neither appropriate for the forest type, nor do they promote fire-resilient stands. Only the largest of the grand fir trees would be retained in stands in this forest type. Large Douglas-fir trees with large brooms created by dwarf mistletoe infection provide ladder fuels that also do not promote fire-resilient stands. The HFRA states that the large tree retention requirement must not prevent agencies from reducing wildland fire risk to communities, municipal water supplies, and at-risk Federal land.