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Environmental Assessment

South Pyramid Timber Sale

**Sweet Home Ranger District
Willamette National Forest
Linn County, Oregon**

Legal Location: T12S, R5E, sections 19 and 28-34

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Summary

Purpose and Need

The Sweet Home Ranger District of the Willamette National Forest is proposing South Pyramid Timber Sale to be offered in fiscal year 2007 with one or more sales resulting from this analysis. The purpose of this project is to:

1. Contribute approximately 8,000 to 9,000 CCF (hundred cubic feet) of wood fiber toward the District's timber target for fiscal year 2007
2. Enhance growth and vigor of timber stands and/or reduce future losses from fire, insects and diseases.
3. Utilize imminent competition-induced mortality for use as commercial wood products and reduce long term fuel buildup

The action is needed (a) to meet district timber targets assigned through the Forest budgeting process and (b) to address health and vigor of densely-stocked, mid-seral stands, that are experiencing stagnation and mortality in a management area where the primary management goal is to produce an optimum and sustainable yield of timber compatible with other resource objectives.

Alternatives including the Proposed Action

The **proposed action** focuses on thinning about 189 acres of overstocked, mid-seral, natural stands within the South Pyramid analysis area. A thinning prescription is being used to increase growing space for the residual trees and reduce mortality from competition which is contributing to high fuel loadings and increased potential for fire, insects and diseases. In addition, thinning is being done to maintain dispersal, and in some cases suitable (nesting, roosting and foraging) habitat, within harvest units in a Critical Habitat Unit (CHU) for northern spotted owls and to retain future management options in an area that is currently unroaded. Thinning was also chosen to add to habitat diversity in this block of densely-stocked, fire-regenerated second growth.

Eight of the 12 units proposed for harvest in this action are partially or entirely within a CHU for northern spotted owls. Seven units occur within an unroaded block and three units are near, but outside the required buffer, for a goshawk nest site in the southeastern portion of the analysis area. A 650 foot no-harvest buffer (about 30 acres) would be left around the nest tree and a ¼ mile logging restriction zone would be required to minimize disturbance during nesting season from April 1 – July 31.

This alternative yields about 8, 828 CCF (hundred cubic feet) toward the district's harvest targets. Stands would be harvested using a combination of ground-based and helicopter yarding systems. Helicopter yarding is being used on several units, in lieu of building roads

and using less expensive yarding methods, in order to preserve the unroaded nature of the area.

Full-leave, no-harvest Riparian Reserves would be left along stream courses, wetlands, and unstable areas. This would help maintain water quality, fish habitat and dispersal corridors for terrestrial species.

About 800 feet of a currently closed, temporary operator's spur road would be re-opened to facilitate harvest operations. This road is located on a ridge outside of the unroaded area and would be ripped and closed following harvest operations. No new system-road construction is required for this alternative, but about 27 miles of road maintenance would be needed along haul routes (22 miles) and local roads accessing harvest units (5.4 miles). Maintenance activities include spot rocking, brush cutback to provide a safe site distance, felling snags that pose a safety hazard to travel, road blading, ditch cleanout, culvert catch basin cleanout and replacement of a 4-foot section of damaged inlet to a ditch relief pipe on road 2047 852.

Alternatives to the Proposed Action

An option to address project objectives is to take No Action. This alternative would delay contribution to district harvest targets to some time in the future. Densely-stocked, naturally-regenerated, second growth stands would self-thin over time through competition-induced mortality. This mortality would not be used for commercial wood products and fuel build up, that leads to potential for fire and insect infestations, would not be addressed through management actions. Habitat within the Critical Habitat Unit (CHU) would remain on its present course of succession and future management options for the unroaded block would be retained. No harvest would occur near the goshawk nest site.

Alternative 3 offers another option to achieve project objectives. This alternative harvests fewer acres in the unroaded area and within the Critical Habitat Unit (CHU) than Alternative 2. It achieves similar volume to Alternative 2 but on fewer acres. This is accomplished through use different silvicultural prescriptions than Alternative 2. Instead of thinning older stands that range in age from 110-150 years old, about 43 acres of these stands would be regenerated (clearcut leaving snags and 15% of the area in green tree retention zones in addition to other protection buffers). Also, about 68 acres of younger stands (75 years old) would still be thinned.

The regeneration prescription on the older units would addresses potential losses from fire, insects and diseases by utilizing imminent competition-induced mortality for use as commercial wood products rather than as abundant, wide-spread down material in these densely-stocked stands. Older stands were selected for regeneration because they have reached culmination of mean annual increment (CMAI) and are less likely to respond to thinning the same way younger stands do. Following harvest these units would be broadcast burned and planted with native species. Growth and vigor of the new stands would be

enhanced through management activities such as pre-commercial thinning, fertilization and commercial thinning on these matrix lands. Growth and yield tables show that managed stands would attain similar size trees to the existing stands in about half the time it took these dense, natural stands to grow to their current size.

The regeneration prescription would contribute more volume per acre than thinning so achieving similar volumes to Alternative 2 would affect fewer acres than thinning alone. Regenerating these units meets silvicultural and other resource objectives differently than Alternative 2.

One of the seven proposed harvest units is partially within the unroaded landscape block and would be regenerated. Road 2047 864 goes through the upper half of this unit, so the portion of the unit below the road is the part that would potentially affect unroaded area values. In addition, one thinning unit is within the Critical Habitat Unit for northern spotted owls. Similarly to Alternative 2, thinning this unit would still retain dispersal habitat here and in time (10+ years), the trees would grow in both diameter and height and tree canopies would close again returning the stand to higher quality suitable habitat than currently exists. This stand would also be less susceptible to losses from fire, insects and diseases with treatment than without. No units are in close proximity to the goshawk nest site in this Alternative.

All but two units are logged with conventional ground-based logging systems. Two, of the more-isolated units are logged with helicopters.

Full-leave, no harvest Riparian Reserves and road access is similar to Alternative 2.

Alternative 4 addresses project objectives in yet another way. This alternative does not harvest any units in the CHU or unroaded block but in order to achieve similar volumes, more units are regenerated than the other action alternatives.

This alternative is similar to Alternative 3, except the units in the CHU and unroaded area are dropped and the prescription for another unit is changed from thinning to regeneration harvest.

No harvest units occur in the unroaded landscape block or near the goshawk nest. Riparian Reserves, road access and logging methods are similar to both Alternatives 2 and 3.

Issues

Significant issues for this project are (a) harvest within a Critical Habitat Unit (CHU) for threatened northern spotted owls, (b) harvest of natural stands, (c) harvest within an unroaded block, (c) fuel buildup and the potential for fire or insect and disease infestations in densely-stocked stands that are experiencing competition-induced mortality, (e) the proximity of operations to a goshawk nest site and (f) economics and disturbance effects of different logging systems.

Non-significant issues, or in this case issues that were addressed through project design, include (a) harvest of old growth, (b) harvest within the Late-Successional Reserve, (c)

impacting the outstandingly remarkable values near a river that is potentially eligible for wild and scenic river status, (d) harvest impacts on the Three Pyramids Special Interest Area, and (e) potential impacts on red tree vole.

Environmental Consequences

In time (10+ years), the trees would grow in both diameter and height and tree canopies would close again returning all of these thinned stands to higher-quality suitable owl habitat than currently exists with less susceptibility to fire, insects and diseases.

Between alternatives there are differences in the effects on northern spotted owl habitat within the Critical Habitat Unit (CHU). Types of stand treatments are similar in proposed units within the CHU, but the number of acres affected varies by alternative. All harvest units in the CHU would retain dispersal habitat characteristics, at a minimum. Stand treatments would degrade or downgrade existing habitat in the short-term (10+ years), but improve it after trees respond to the thinning by increasing diameter and height growth and increasing crown size. Once the canopy closes again, improved suitable habitat would return to these stands and susceptibility to fires, insects and diseases would decrease. Thinning would also introduce diversity into the relatively large block of fire-regenerated second growth with the amount of diversity varying by alternative.

There are also differences between alternatives in the amount of habitat affected for individual, known spotted owls within the analysis area.

All action alternatives harvest in naturally-regenerated stands while the No Action alternative does not. Consequences of harvest in natural stands are similar but vary in degree by proposed harvest prescription and the number of acres treated in each of the alternatives.

Impacts to the unroaded block (which includes about 1,000 acres in the analysis area and about 3,300 acres in adjacent drainages) varies by alternative. Although none of the alternatives propose any road construction in the unroaded block there is still a concern that management activities here would compromise a variety of natural resource attributes including recreation values, water quality, fish and wildlife habitat, natural areas for research, soil health, a refuge from noxious weeds and other invasive non-native plants, etc. The action alternatives harvest varying amounts of timber using both thinning and regeneration prescriptions within the unroaded block. The alternatives would affect natural resource attributes in the unroaded area differently by the type and amount of harvest proposed there.

Fuels treatments vary from no treatment, to thinning to capture mortality, to actively treating fuels through broadcast burning. This when combined with proposed silvicultural treatments affect the degree of risk the stand faces for fire, insects or disease. It also affects habitat components for wildlife species.

Some alternatives treat stands just outside of the required buffer distance from a goshawk nest site and others have no proposed units in close proximity to the nest site. Alternative 2 treats three units just outside the required 650-foot buffer around the nest site while the closest unit in Alternative 3 is at least 2,000 feet and in Alternative 4 is about 2,600 feet from the nest site. There are seasonal operating restrictions during the critical nesting season for these birds for units within ¼ mile of the nest site. Given mitigation measures, the alternatives have varying degrees of potential effects on the goshawk nest site.

Silvicultural stand treatments vary from no treatment, to thinning, to regeneration harvest. All of which address project objectives differently. Thinning focuses more on reducing mortality and enhancing growth in some stands while regenerating stands focuses more on utilizing imminent competition-induced mortality for wood products, reducing fuel loadings and enhancing growth of the next stand. Depending on the type of prescription, the number of acres affected and the types of effects vary. Alternative 2 proposes only thinning but harvests the most acres while Alternative 4 harvests fewer acres and proposes both regeneration harvest thinning. Alternative 3 falls somewhere between the other two action alternatives.

Another consequence is economics and variation of effects on resources by the type of logging system proposed. Alternative 2 uses more helicopter yarding than the other action alternatives. Alternatives 3 and 4 use a higher percentage of ground-based yarding systems than Alternative 2.

Project Location

The project area is situated between the Three Pyramids Special Interest Area (SIA) and the Middle Santiam Wilderness. The legal description is T12S, R5E, sections 19, 28-34. It lies in the Headwaters Middle Santiam River subwatershed (6th field) within the Middle Santiam watershed in Linn County, Oregon. The planning area boundary contains 3,292 acres, and includes most of the South Pyramid Creek drainage (7th field) except for private lands in sections 31 and 33 and the Three Pyramids SIA. The sub-watershed lies between 2,000 feet elevation near the Middle Santiam River and 5,618 feet elevation on the Middle Pyramid Peak (see Figure 1).

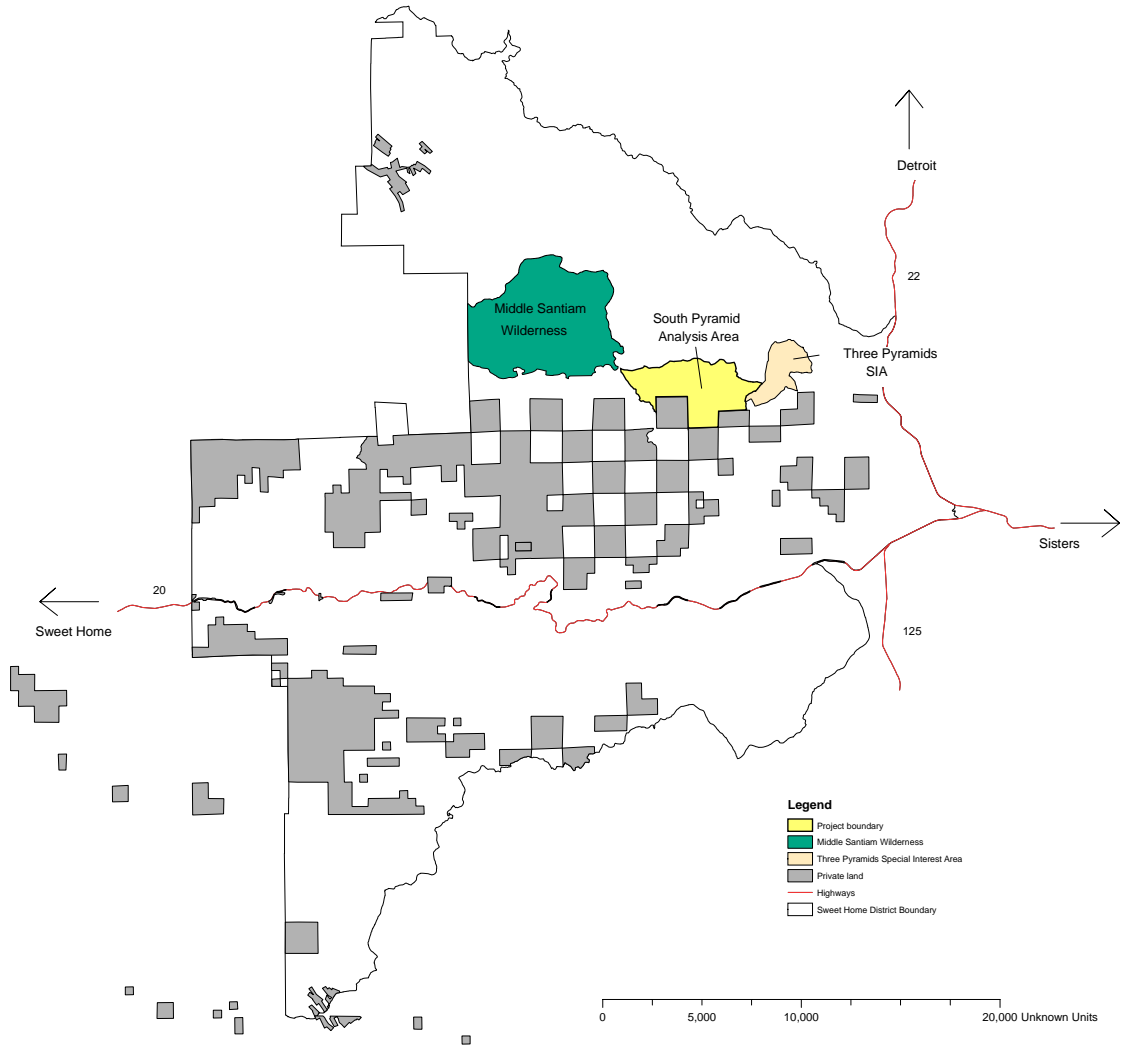


Figure 1: Vicinity Map

Decision

The Sweet Home District Ranger, who is the deciding official for this project, will decide how best to achieve the purpose and need for this project based on the presentation of alternative ways to accomplish the project objectives and the evaluation of the environmental consequences of implementing the various alternatives in this document.

The decision would include consideration of the following: (a) which silvicultural treatments for overstocked, mid-seral, naturally regenerated stands in General Forest – Matrix management allocations best meet project objectives and other resource needs, (b) how best to address management in the unroaded block, (c) how best to manage habitat within the CHU, (d) what type of fuels treatment best addresses concerns about the potential for fire, insects and diseases in these stands with high competition-induced mortality, (e) how best to protect the goshawk nest and (f) the best mix of logging systems to meet project objectives and other resource considerations.

This decision would also require information regarding heritage resources which is exempt from public disclosure under the Freedom of Information Act (FSM 6271.2). In order to make an informed decision, this information would be made available to the decision-maker for consideration in the decision.

The decision being made affects long-term stand health and vigor on General Forest-Matrix lands in the South Pyramid analysis area as well as wildlife habitat quality.

Introduction

This section includes information on the document structure, the background leading up to the proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal, how the public responded and identifies the issues addressed in the analysis.

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts

- **Introduction:** The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal, how the public responded and what issues were addressed in the analysis.
- **Comparison of Alternatives, including the Proposed Action:** This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures and provides a summary table of the environmental consequences associated with each alternative.
- **Environmental Consequences:** This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the No Action Alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.
- **Agencies and Persons Consulted:** This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- **Appendices:** The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Sweet Home Ranger District Office in Sweet Home, Oregon.

Background

Existing Condition of the Timber Stands

The 13 stands being considered for treatment during this entry are roughly 75-150 years old and have regenerated naturally following fire. Most of these stands are on southwesterly and southeasterly aspects where fires likely burned fairly hot. These stands came in densely and those densities persisted throughout the life of these stands causing loss of crown depth, slowed growth, and competition-induced mortality. Currently relative densities range from .67 to .96, with the average being .85. Relative Density Index relates the current size of trees and their density per unit area with a theoretical maximum density for that tree species which is expressed as 1.0.

The stands average 111 years old, 14 inches in diameter and 84 feet tall. They occur between 3,400' and 4,000' elevation on slopes that range from 14% to 45%.

Plant communities in the analysis area are mostly Pacific silver fir at the higher elevations and western hemlock at the lower elevations.

The stands being considered for treatment are composed of about 60% Douglas-fir, 25% western hemlock and 15% true fir and other species. As elevation increases more true firs are present.

Stand vigor and growth is declining in these units. Some trees have begun to die due to overcrowding and competition between trees for nutrients and light as evidenced by 25-30 percent competition-induced mortality in some units.

The table on the following page summarizes basic stand information for each of the proposed harvest units.

Table 1 Basic Stand Information for the Proposed Harvest Units

Unit #	Age	Average Diameter (DBH) in inches	Average Height in feet	Trees Per Acre	Species Composition (for trees greater than 7 inches in diameter)			Canopy Ratio (%)	Relative Density	% Dead Trees
					% Douglas-fir	% western hemlock	% true fir / cedar			
1a	85	13	67	300	53	26	21	25-35	.67	27
1b	85	13	67	300	53	26	21	25-35	.67	27
2a	83	12	80	430	55	26	18	35-45	.91	1
2b	83	12	80	430	55	26	18	35-45	.91	1
4a	117	13	76	390	58	35	8	35-45	.85	14
4b	117	13	76	390	58	35	8	35-45	.85	14
4c	93	13	70	410	80	8	11	45-55	.90	15
6a	121	16	105	300	52	27	21	35-45	.95	30
8a	146	15	80	320	64	25	11	25-35	.96	0
8b	146	15	104	320	54	24	22	45-55	.96	25
9a	148	14	110	280	66	25	9	25-35	.76	0
24	75	13	65	430	64	26	9	No Info.	.85	No Info.
27	148	14	110	280	65	27	7	No Info.	.76	No Info.
Averages	111	14	84	342	61	25	13	35-45	.85	14

The Place

The South Pyramid analysis area is about 3,292 acres in size and lies just north of a large area of checkerboard ownership which is a mixture of private and federal timberlands. To the northwest is the Middle Santiam Wilderness Area and to the east is the Three Pyramids Special Interest Area. The northern boundary of the analysis area follows the southern boundary of Quartzville Late-Successional Reserve. Echo Mountain Roadless Area lies to the southwest of the analysis area and there are two 100-acre Late-Successional Reserves just to the south and east of the analysis area and one along the northwestern boundary.

The analysis area lies within the General Forest-Matrix management allocation which is overlaid by a network of Riparian Reserves along stream courses. There is a goshawk nest in the southeastern portion of the area.

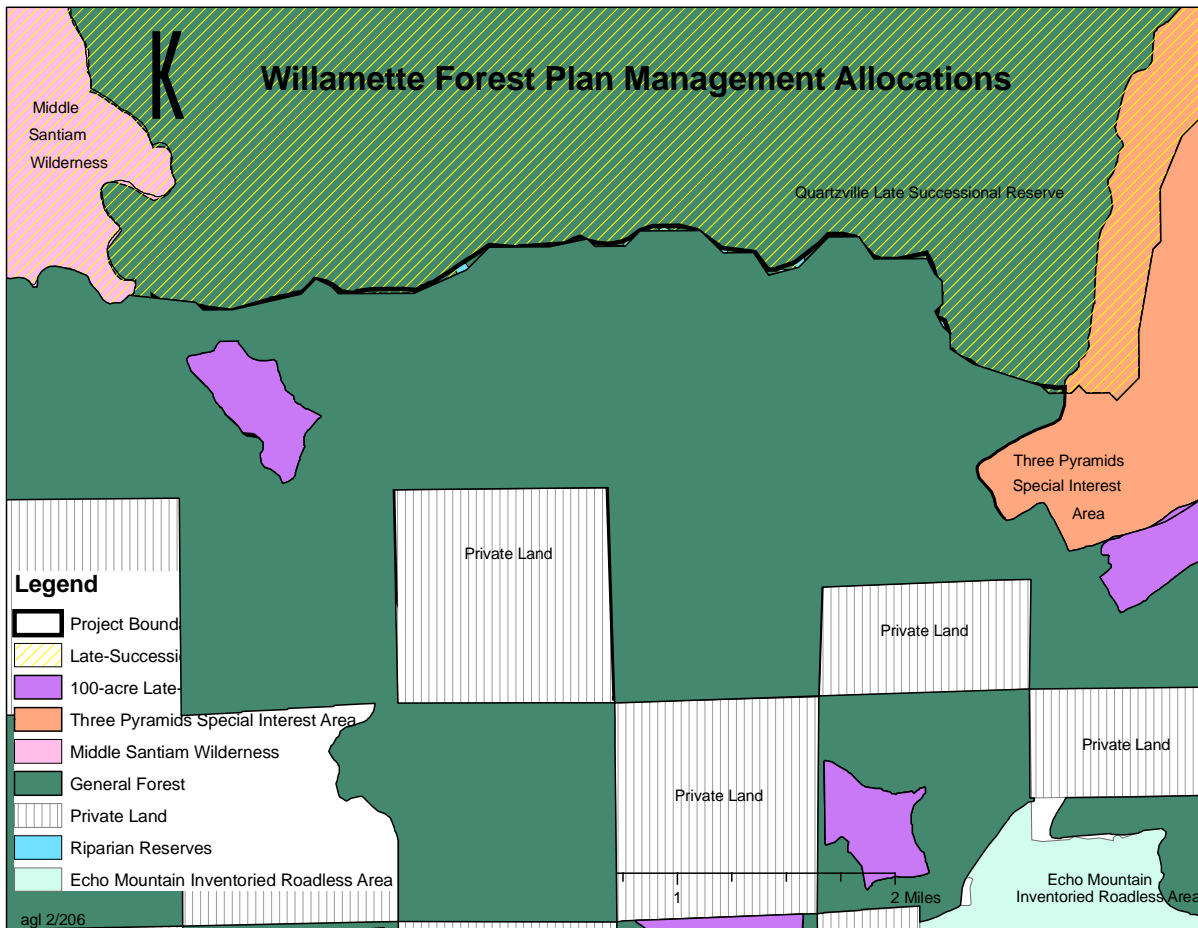


Figure 2: The Place

The Place Continued

About a mile east of the 2047 road, just outside of the road systems that branch off the 2047 road is a relatively large block of land that currently does not contain roads. This area has no official designation but will be referred to as the unroaded block in this analysis. This unroaded block (about 1,000 acres within the analysis area) adjoins the Three Pyramids Special Interest Area and other unroaded blocks in the adjacent drainages for a total of about 4,300 acres.

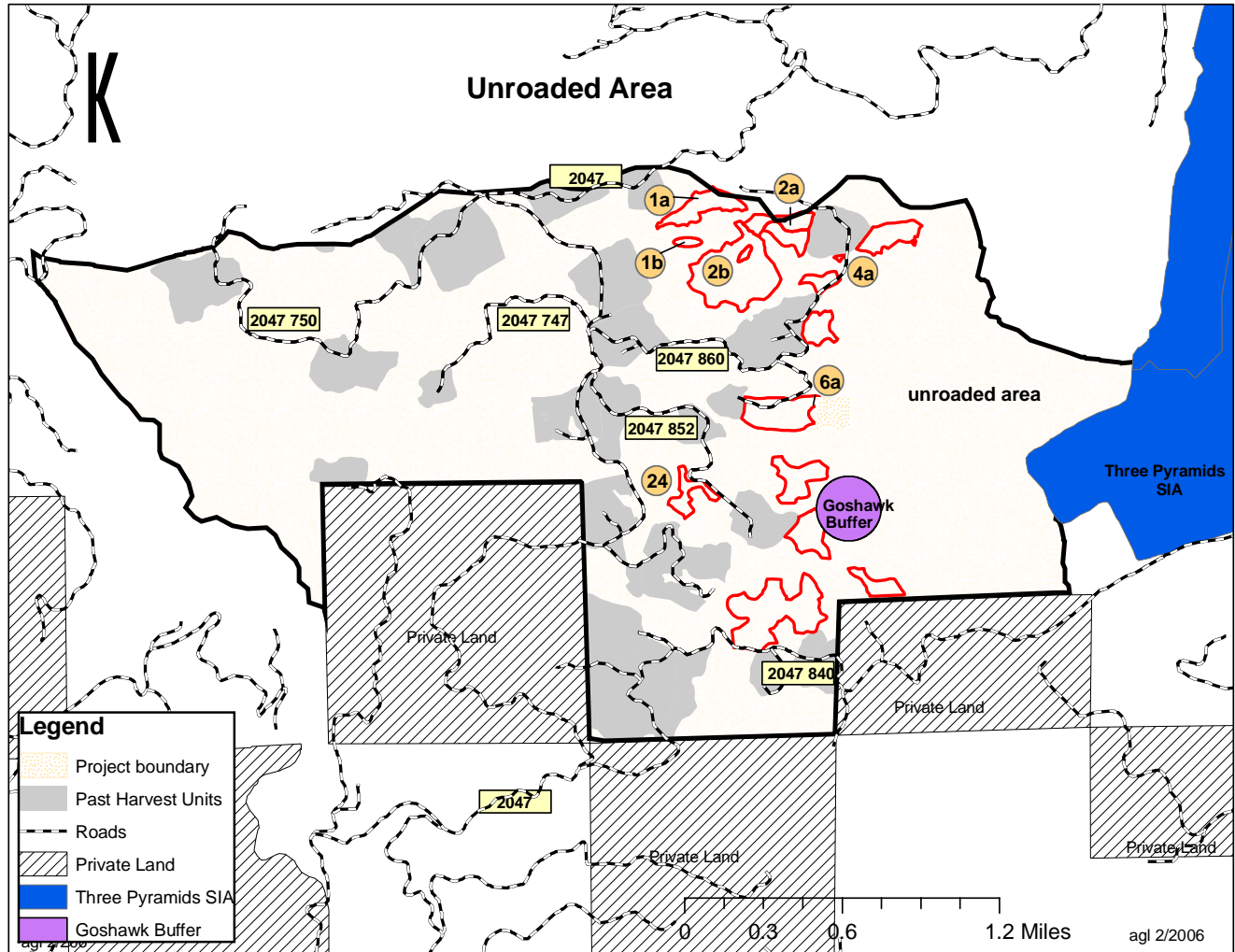


Figure 3 Unroaded Block (not an Inventoried Roadless Area)

Management Direction

Willamette Forest Plan: This environmental assessment tiers to and relies upon the analysis in the 1990 Final Environmental Impact Statement for the *Willamette National Forest Land and Resource Management Plan* (Willamette Forest Plan) and the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (NW Forest Plan) which amended the Willamette Forest Plan and others in 1994.

The amended Willamette Forest Plan provides resource management direction, defines various management areas (MA's), describes desired conditions for these management areas and outlines standards and guidelines under which lands and resources administered by the Willamette National Forest are managed. The relevant Willamette Forest Plan Management Areas for this project are General Forest-Matrix, 100-acre Late-Successional Reserves, and Riparian Reserves (see figure 4 Management Allocations).

General Forest - Matrix:

Approximately 3,162 acres in the project area are in the General Forest – Matrix management allocation. These lands consist of the forested lands, physically suited for growing trees and production of multiple uses such as timber, wildlife habitats, water quality, soil productivity, recreation, forest access, and cultural sites. Direction for silvicultural treatments is outlined in the Forest-wide Standards and Guidelines for Timber Management (FW-176 to FW 183). The primary management goal here is to produce an optimum and sustainable yield of timber based on the growth potential of the land that is compatible with multiple use objectives and meets environmental requirements for soil, water, air and wildlife habitat quality. In addition, this area can provide many opportunities for public use and enjoyment.

The *NW Forest Plan* established Matrix management allocations as areas where timber harvest and other silvicultural activities would be conducted on suitable and available lands not formally designated for other management purposes. The Matrix objectives include (a) production of timber and other commodities, (b) providing connectivity between LSRs and (c) providing habitat for a variety of organisms associated with both late-successional and younger forests (USDA and USDI, 1994, p. B-1).

“Most timber harvest and other silvicultural activities would be conducted in that portion of the Matrix with suitable forest lands, according to standards and guidelines. Most of the scheduled timber harvest (that contributing to the probable sale quantity (PSQ) not taking place in Adaptive Management Areas) takes place in Matrix. The Matrix includes nonforested areas, and forested areas that are technically unsuitable for timber production and therefore do not contribute to PSQ” (USDA and USDI, 1994, p C-39).

100-acre Late Successional Reserves

The 100-acre Late Successional Reserves are located around known spotted owl activity centers. In these areas 100-acres of the best northern spotted owl habitat is retained as close to the nest site or owl activity center as possible. Management around this area is designed to reduce risks of natural disturbance to owl habitat.

Riparian Reserves

Riparian Reserves are one of the components of the Aquatic Conservation Strategy outlined in the NW Forest Plan. Riparian Reserves serve to: (1) restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands at the watershed and landscape scales; (2) protect habitat for fish and other riparian-dependent species and (3) restore currently degraded habitats.

Riparian Reserves were intended to “provide an area along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis” (USDA, USDI, p. A-5). They also serve to “improve travel and dispersal corridors for many terrestrial animals and plants, provide for greater connectivity within the watershed,” and serve as connectivity corridors among Late-Successional Reserves. (USDA and USDI. 1994, p. A-5 and B-13).

Riparian Reserve management areas usually include at least the water body, inner gorges, all riparian vegetation, 100-year floodplain, landslides, and landslide-prone areas. The widths of the reserves are based on some multiple of a site-potential tree, or a prescribed slope distance, whichever is greater.

The following summary highlights the direction in the NW Forest Plan for Riparian Reserve management allocations. (Refer to the NW Forest Plan for more details and specific direction). This direction was adhered to in the development of this project.

- Management activities must be consistent with Aquatic Conservation Strategy (ACS) Objectives (USDA and USDI. 1994, p. 11). Proposed activities were designed to be consistent with ACS objectives. No harvest is planned within Riparian Reserves.
- The Aquatic Conservation Strategy in the Northwest Forest Plan included a requirement to prepare comprehensive watershed analyses for all fifth field watersheds. It also stated that watershed analysis should be completed prior to construction of new roads or landings in Riparian Reserves. A watershed analysis was completed for the Middle Santiam Watershed in April 1996. No road construction or landings are proposed in Riparian Reserves.
- “Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needs to attain Aquatic Conservation Strategy Objectives” (USDA and USDI. 1994, p. C-32). No silvicultural activities would take place in Riparian Reserves in this proposal.
- Minimize road and landing locations in Riparian Reserves. No roads are planned and no landings occur in Riparian Reserves.
- “Active silvicultural programs would be necessary to restore large conifers in Riparian Reserves. Appropriate practices may include ...thinning densely-stocked young stands to encourage development of large conifers...These practices can be implemented along with silvicultural treatments in upland areas, although the practices would differ in objective and consequently design.” (USDA and USDI. 1994, p. B-31). None of the alternatives proposed thinning to encourage development of large conifers within the Riparian Reserves.

2001 Amendment to Willamette Forest Plan: In January 2001, the Willamette Forest Plan was further amended by the, *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDA and USDI, 2001) which amended a portion of the NW Forest Plan, and thus the Willamette Forest Plan, by adopting new standards and guidelines for Survey and Manage and Protection Buffer species, and other mitigating measures.

Second 2004 Amendment to Willamette Forest Plan: In March 2004, another *Record of Decision Amending Resource Management Plans for Seven Bureau of Land Management Districts and Land and Resource Management Plans for Nineteen National Forests Within the Range of the Northern Spotted Owl*, amended a portion of the Northwest Forest Plan, and thus the Willamette Forest Plan, by clarifying the proper spatial and temporal scale for evaluating progress toward attainment of Aquatic Conservation Strategy (ACS) objectives and by providing clarification that no project level finding of consistency with ACS objectives is required.

Other Resource Guidance / Information

Middle Santiam Watershed Analysis (1996) is incorporated by reference and is available for public review at the Sweet Home Ranger District office. As recommended by the Aquatic Conservation Strategy in the NW Forest Plan, a comprehensive watershed analysis was completed for the Middle Santiam watershed in 1996. This project lies within the area studied in this watershed analysis and the South Pyramid subwatershed was identified as one of the more appropriate locations in the watershed for timber harvest this decade.

NW Forest Plan Temperature TMDL Implementation Strategies (September 2005) is incorporated by reference and is available for public review at the Sweet Home Ranger District office. This document evaluated the Aquatic Conservation Strategy objectives outlined in the NW Forest Plan and developed a tool called the “Sufficiency Analysis” to ensure water quality standards are met on 303 (d) listed water quality impaired streams. The document “provides a basis for analyzing stream shade, effects of shade on stream temperature, and management of riparian areas to meet water quality and broader objectives embodied in the NW Forest Plan Aquatic Conservation Strategy (ACS)” (USDA and USDI. 2005, p. 4). The “Sufficiency Analysis” was used to analyze project impacts on stream temperatures for this project. This analysis is incorporated by reference into this document and is available for public review at the Detroit Ranger District office of the Willamette National Forest (see Environmental Consequences and Appendix H).

The Willamette Forest Roads Analysis, 1998 as amended in 2003: This analysis established a goal of developing a network of Key Forest Roads to provide sustainable access to National Forest System lands for administration, protection, and utilization in a manner consistent with Willamette Forest Plan guidance and within the limits of current and likely funding levels” (USDA. 2003,p. 2). This analysis identified three roads in the analysis area as being Key Forest Roads. They are: 2047, 2047 747 and 2047 840. These roads are part of a larger system of roads thought to be the minimum needed to meet anticipated management objectives and public access needs.

Non-key roads are “candidates for some form of treatments that stabilizes their erosion potential and reduces their impact on the resources. These roads would be considered for closure, stabilization, or, if unneeded decommissioning...” (USDA. 2003, p. 4)

Wild and Scenic Rivers Act, 1968: The Forest Plan identified segments of the Middle Santiam River as eligible candidates for Wild and Scenic River status (USDA 1990, pp E-61-64). The segment within the planning area was recommended for a Scenic classification, with potential anadromous fish habitat and old-growth habitat as Outstandingly Remarkable Values (ORV’s).

Proposed actions have been designed to maintain the Outstandingly Remarkable Values for this stream, so as not to preclude potential Wild and Scenic River designation.

Critical Habitat Unit (CHU OR-15) The U.S. Fish and Wildlife Service designated Critical Habitat Units (CHU) across the range of the northern spotted owl to identify lands that were considered essential for the

conservation and recovery of this listed species. The physical and biological features (referred to as primary constituent elements) that support suitable habitat and dispersal of northern spotted owls are essential to the conservation of the species (USDI 1992).

CHU (OR-15) overlaps a portion of the planning area and contains several proposed harvest units either wholly or partially.

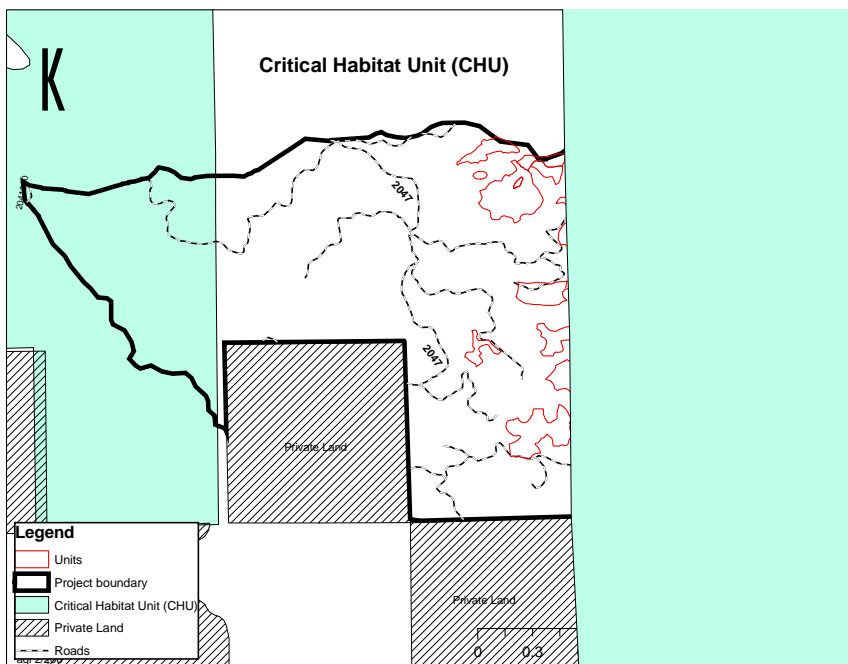


Figure 5 Critical Habitat Unit

Area of Concern The Santiam Area of Concern (AOC) was identified by the US Fish and Wildlife Service in the vicinity of Santiam Pass, encompassing portions of the Detroit, McKenzie, and Sweet Home Ranger Districts. It overlaps the Critical Habitat Unit (CHU) in the same area. This AOC is believed to potentially limit the dispersal of spotted owls in both north/south and east/west directions, due to habitat fragmentation from past timber harvest on public and private lands. While additional timber harvest can occur within the AOC, a minimum of 50% of each quarter township must minimally provide dispersal habitat for spotted owls.

Although the AOC overlaps the planning area, no harvest is proposed within the AOC.

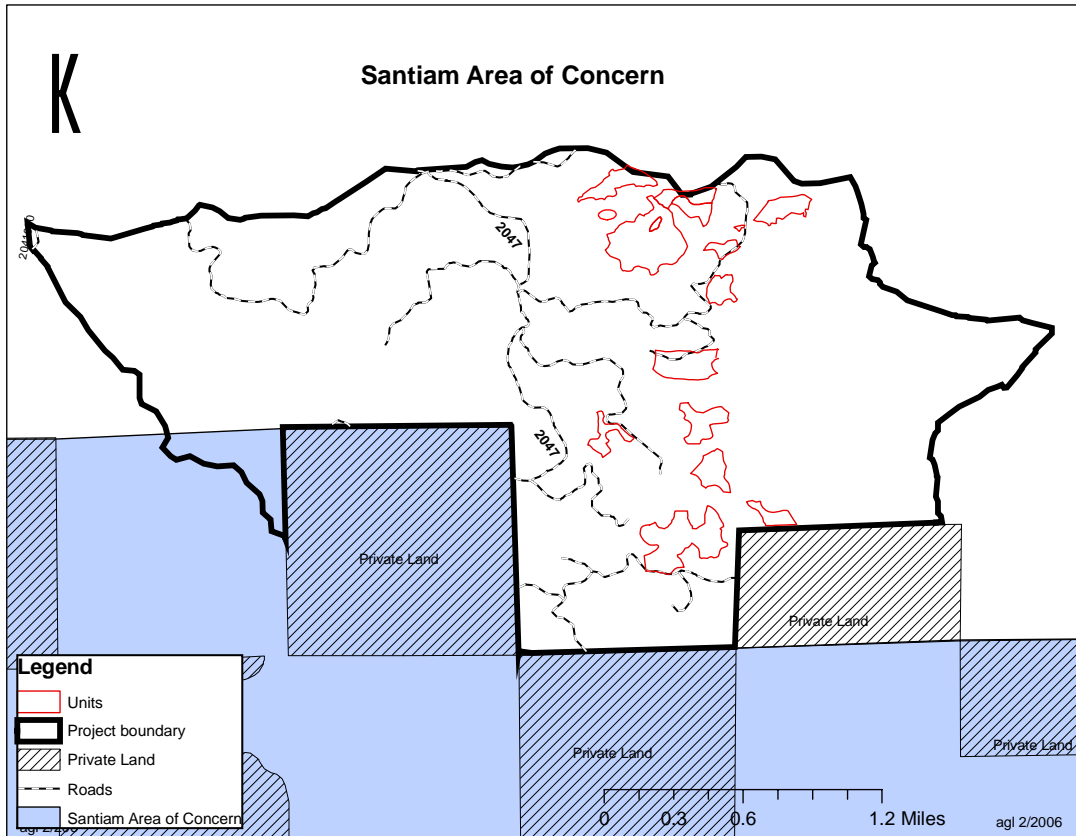


Figure 6 Area of Concern

Purpose and Need for Action

The Sweet Home Ranger District of the Willamette National Forest is proposing South Pyramid Timber Sale to be offered in fiscal year 2007 with one or more sales resulting from this analysis. The **purpose** of this project is to:

1. Contribute approximately 8,000 to 9,000 CCF (hundred cubic feet) of wood fiber toward the District's timber target for fiscal year 2007
2. Enhance growth and vigor of the stand and/or to reduce future losses from fire, insects and diseases.
3. Utilize imminent competition-induced mortality for use as commercial wood products and reduce long term fuel buildup

This action responds to the goals and objectives outlined in the Willamette Forest Plan, and helps move the project area towards desired conditions described in that plan for General Forest – Matrix management allocations.

Two **needs for action** have been identified for this project as follows:

1. Meet District timber targets assigned through the Forest budgeting process.

The Sweet Home Ranger District is assigned a portion of the Willamette National Forest timber target and given a budget to accomplish that target. Depending on how much harvest volume is assigned, one or more projects are proposed to meet the goals. The South Pyramid project, which proposes to contribute between 8,000 and 9,000 CCF (hundred cubic feet), is one of several projects designed to meet Sweet Home's fiscal year 2007 timber targets.

This project is planned on General Forest-Matrix lands. The amended Willamette Forest Plan clearly intends for most timber sale projects to occur on these lands (USDA and USDI. 1994, p. C-39). The goal here is to produce an optimum and sustainable yield of timber, based on the growth potential of the land that is compatible with multiple use objectives and meets environmental requirements for soil, water, air and wildlife habitat quality.

Probable Sale Quantities are partially determined by total suitable and available acres for timber management. Suitability and availability of an area for harvest has a lot to do with whether standards and guidelines outlined in the amended Willamette Forest Plan can be met for the project in a given area and in a given time frame. The South Pyramid Creek drainage is one of the General Forest-Matrix areas on the Sweet Home Ranger District where timber harvest could occur and meet Forest Plan standards and guidelines for other resources. Table 2 shows the acres of suitable and available lands in the analysis area.

Table 2: Suitable and Available Acres

South Pyramid Analysis Area Summary	Acres
Total area within South Pyramid Analysis Area	3,292
Acres not suitable or available for harvest (unsuited soils, 100-acre LSR, goshawk nests, previously harvested, etc)	2,334
Total Suitable and Available Acres in General Forest-Matrix Lands	958

The Middle Santiam Watershed Analysis (1996) also supports the selection of this planning area for future timber harvest and recognizes the commodity emphasis from matrix lands in this drainage (USDA 1996, p. 76).

2. Improve health and vigor of densely-stocked, mid-seral stands that are experiencing stagnation and mortality in a management area where the primary management goal is to produce an optimum and sustainable yield of timber that is compatible with other resource objectives.

Approximately half of the area that is suitable and available for timber management in the South Pyramid planning area is dominated by 75-150 year old trees which have naturally regenerated after wildfires. Most of these stands are overstocked, having a Relative Density Index (RDI) of 0.6 or greater and some have surpassed their Culmination of Mean Annual Increment (CMAI – maximum annual growth rate).

Relative Density Index relates the current size of trees and their density per acre with a theoretical maximum density for that tree species. Given limited growing space (light, water and nutrients) available on a given site, the amount of growing space that an individual tree has is determined by the size and number of trees growing around it. As trees grow larger, they eventually occupy all their growing space and crowd out other trees that are not growing as well. As stands reach their maximum density there is greater competition for light, water and nutrients and tree growth begins to slow. In extreme cases of stand competition, growth in both diameter and height is restricted and trees stagnate, staying virtually the same size for years. Eventually high stand densities result in mortality and commercial fiber value is lost if not harvested. Tree diameter growth tends to drop significantly after RDI exceeds 0.55 (Drew and Flewelling, 1979). The zone of imminent competition-mortality occurs at relative densities between 0.55 and 1.0 (Drew and Flewelling, 1979).

Stands being considered for treatment with this proposal have RDI's that range from 0.67 to 0.96 with the average being 0.85 (see Table 1). Recommended optimum density for managing Douglas-fir to maximize gross production is within the range of .4 to .55 relative density (Drew and Flewelling, 1979). Densities lower than .4 can be used when greater diameter growth is desired for various resource objectives. Economics also plays into the decision of thinning densities based on the cost of harvest entries and how

frequently entries will occur. Managed yield scenarios for Douglas-fir modeled for the current Willamette National Forest Plan generally results in a post-thinning relative density ranging from .3 to .35.

The District would forgo potential stand growth and timber yield by leaving high stand densities on these General Forest-Matrix lands for extended periods. Stands at high relative densities are also at greater risk of fire, insect or disease infestations and volume losses (Keen, 1936; Westveld, 1954; Waring and Pitman, 1980).

From a diverse habitat perspective, stands with high relative densities take longer to produce large diameter trees and lose crown depth and canopy complexity than stands with lower densities (Oliver, 1990). More diverse habitat conditions benefit many forest species. These stands are also slower to produce larger diameter trees and crowns over time, reducing their potential habitat value for some animal species.

Forest calculations of PSQ presume that fiber productivity on Matrix-General Forest lands is realized through healthy growth rates. This assumption does not hold true for stands having a high RDI. The younger-overstocked stands would quickly respond to thinning with improved growth rates. Thinning the older-overstocked stands would reduce imminent competition-induced mortality and in some cases would also produce stand growth and yield increases over the next 40 years but not as quickly as the younger stands (Williamson, 1982). Improved growth rates and fiber production on some of the older stands could also be achieved by regeneration harvesting and starting over.

Proposed Action

Proposed Action: The Sweet Home Ranger District of the Willamette National Forest proposes to commercially thin 189 acres of overstocked, mid-seral (75-150 year old), natural, stands in the South Pyramid planning area. Use of a thinning prescription is being proposed to (a) increase-growing space for remaining trees, (b) reduce imminent mortality from competition which is contributing to high fuel loadings in these stands as well as the potential for fire, insects and diseases, (c) add diversity to densely-stocks stands that became established here after wildfires, (d) at a minimum maintain dispersal habitat within the Critical Habitat Unit for northern spotted owls and (e) maintain future management options in the unroaded block.

A total of 12 units (of the 13 stands under consideration) would be thinned yielding about 8,882 CCF (hundred cubic feet) of timber toward the District's harvest targets. Harvest would be accomplished using a combination of ground-based and helicopter logging systems.

Thinning would reduce relative densities from .67 to .96 down to approximately .27 to .41. Canopy closures would be reduced to about 40% - 60% of current levels.

About 105 acres of thinning is proposed on seven units within the unroaded block east of road 2047. Units here range in size from 6 to 38 acres. No new road construction would be required to access these units and units were located near the outer edges of the unroaded block to preclude effects on the interior portions of this area.

A 650-foot no-harvest buffer would be maintained around a goshawk nest site in the southern portion of the analysis area. Logging restrictions would be applied on three units within ¼ mile of the nest site from April 1 through July 30 to avoid disturbance of goshawks during nesting season.

Full-leave, no harvest Riparian Reserves would be retained on all streams, wetlands and unstable areas. In addition there are no-harvest buffers around special habitats, sensitive plant populations, unsuited soils, heritage sites, etc.

About 800 feet of a currently closed, temporary operator's spur road would be re-opened at the end of road 2047 860 to facilitate harvest operations. Following harvest operations, this road and main skid trails used in ground-based yarding systems would be ripped and closed. No new system-road construction is required for this alternative, but about 27 miles of road maintenance would be required along haul routes (22 miles) and local roads accessing harvest units (5.4 miles). Maintenance includes spot rocking, brush cutback to provide a safe site distance, felling snags that pose a safety hazard to travel, road blading, ditch cleanout, culvert catch basin cleanout and replacement of a 4-foot section of damaged inlet to a ditch relief pipe on road 2047 852.

Slash would be treated using a variety of techniques such as handpiling, yarding of tops and crushing.

Project Implementation Date: The Sweet Home Ranger District, Willamette National Forest, is proposing the South Pyramid Timber Sale to be offered in fiscal year 2007 with one or more sales resulting from this analysis.

Scope of Analysis and Project Consistency with the Forest Plan: Standards and Guidelines and land allocations of the amended Willamette Forest Plan have guided the design of the proposed action and other

alternatives. The proposed action would occur on Matrix–General Forest lands and is consistent with management objectives for this allocation.

Decision Framework

The Sweet Home District Ranger, who is the deciding official for this project, would review the information presented in this Environmental Assessment including its analysis of the environmental consequences of the various alternatives, proposed mitigation to minimize anticipated effects and other supporting documentation as a basis for making the following decisions regarding this project:

The deciding official would use this Environmental Assessment to decide whether to implement an action alternative or the “No Action” alternative. Selection of an action alternative would include decisions on the following items:

- Which silvicultural treatments for overstocked, mid-seral, naturally regenerated stands in General Forest – Matrix management allocations best meet project objectives and other resource needs
- How best to address management in the unroaded block
- How best to manage habitat within the CHU
- What type of fuels treatment best addresses concerns about the potential for fire, insects and diseases in these stands with high competition-induced mortality,
- How best to protect the goshawk nest and
- The best mix of logging systems to meet project objectives and other resource considerations.

This decision would also require information regarding heritage resources which is exempt from public disclosure under the Freedom of Information Act (FSM 6271.2). In order to make an informed decision, this information would be made available to the decision-maker for consideration in the decision.

The decision being made affects long-term stand health and vigor on General Forest-Matrix lands in the South Pyramid analysis area as well as wildlife habitat quality.

Public Involvement

Scoping

The proposal was listed in the Schedule of Proposed Actions (SOPA) the first time in 1998 and most recently in 2006. The purpose of the SOPA is to provide an early and informal notice of proposed projects on the Forest. This is done so that the public is aware of upcoming activities, can indicate their interest in specific projects, and become involved early in the environmental analysis process. To spread the word about upcoming projects, the Willamette National Forest sends its quarterly mailer “Forest Focus” containing the SOPA to over 100 individuals, agencies, groups and/or industry representatives. The SOPA is also available on the Forest website.

When scoping began for this project in the fall 1998 it was larger in scale and included the harvest of late-successional habitat and new road construction. A public meeting with interested persons was held in Corvallis, Oregon in 1998 to explain the proposed action and to solicit public comments. Two field trips to the planning area were also conducted with members of the public, who expressed interest in understanding this project, to examine stand conditions, treatment options and resource issues.

In March 2006 another scoping letter was sent out to members of the public regarding this project. This letter resulted in 11 comments.

To date, the District has received 83 letters sharing thoughts and concerns about this project. The public discourse on this project and within written comments received from interested publics raised no additional substantive issues that had not already been identified during internal IDT scoping meetings. The majority of public comments received during the scoping process focused on three interests:

- Protecting old growth habitat (*which is not being proposed in this action*)
- Protecting unroaded landscape characteristics, and
- Eliminating harvest of natural stands on public lands

All correspondence and full text of the letters are available in the analysis file for South Pyramid Timber Sale at the Sweet Home Ranger District office.

Consultation

During the scoping of issues and concerns, as part of the public participation process, letters were mailed to tribal governments of the Confederated Tribes of Grand Ronde Community and the Confederated Tribes of Siletz Indians on February 9, 2004. No issues were raised regarding the proposed project as a result of that mailing. For additional information on consultation with tribal governments, other agencies, etc. see Consultation and Coordination section of the document beginning on page 181.

Issues

To help focus planning efforts, the interdisciplinary team (IDT) used comments from the public and other agencies and information they gained from field reconnaissance to identify issues for this project.

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)..." A list of non-significant issues and reasons regarding their categorization as non-significant may be found in the discussion that follows.

Significant issues for this project include:

- **Harvest of natural stands on public lands**

Members of the public have expressed concern with stand management in naturally-regenerated stands. They feel that the value of natural stands comes from habitat function and processes that have not been altered by management actions and that these stands would develop a full complement of habitat and ecosystem functions without interference by humans. Management of natural stands is presumed to alter habitat and/or ecosystem function since silvicultural treatments may not fully duplicate the ecological effects of natural disturbances in the life-cycle of the stand.

Evaluation criteria: Acres of natural stands harvested

- **Sale activities in an unroaded block (note: this is not an Inventoried Roadless Area)**

About 1,000 acres of the South Pyramid analysis area east of road 2047 is unroaded. Unroaded areas, such as this, are valued for a variety of resource attributes including water quality, fish and wildlife habitat, recreation values, soil protection, etc.

In the adjacent drainages there is another 3,300 acres that is not roaded. About 1,877 acres of the 3,300 acres adjacent to the planning area is protected in the Three Pyramids Special Interest Area, where timber harvest is precluded. Most of the rest of the area has no formal management designation that protects its unroaded nature.

This area is composed primarily of naturally-regenerated, mid-seral and mature forest habitat. Several proposed harvest units affect this area.

More than 30 years after RARE I and II there is still interest in management of Roadless Areas and other lands that do not contain roads (unroaded areas).

Evaluation Criteria: This analysis would use two criteria to describe potential project effects on large unroaded block values. These two criteria closely mirror the public's concerns and desires for large

- Loss of late-successional habitat acres
- Loss of interior unroaded acres

- **Northern Spotted Owls**

Northern spotted owls (*Strix occidentalis*) are strongly associated with late-successional forest habitat (USDA and USDI 1994) and prefer it over other habitat conditions. Late-successional forest provides all three types of suitable habitat (nesting, roosting, and foraging habitat or NRF habitat) for spotted owls and also functions as dispersal habitat. Typical late-successional forest includes multi-layered closed canopies, large diameter trees, and high concentrations of dead and down woody material.

This project could affect habitat within the home range (1.2 mile radius) of three known owl sites. One owl site is located within the Quartzville Late-Successional Reserve (LSR), one owl site is managed as a 100-acre Late-Successional Reserve LSR and includes the best habitat near the Middle Santiam River, and the third owl site on Matrix lands would be protected with a 330-foot radius no-harvest buffer as required by Forest Plan Standard & Guideline FW-171. Timber harvest would not occur within any of these three protected areas.

Proposed harvest units currently provide both suitable and dispersal habitat. Canopy closure within the units is high (95%) with moderate levels of snags but limited large, down woody material. Legacy old-growth trees, large snags, and large down wood (remnants left after past fires) are sparsely distributed within many of the units. Most units do not possess multiple canopy layers or have only a few acres with multiple canopy levels.

Potential project effects on northern spotted owls are characterized as modification of suitable owl habitat within the home range of known owl sites and/or disturbance to owl sites during the nesting season. Habitat modification can: 1) degrade habitat where the quality is affected but not the functionality; 2) downgrade habitat where the functionality is affected so that it may not support nesting, roosting, or foraging behavior; and 3) remove habitat where habitat is altered and no longer supports nesting, roosting, foraging, or dispersal behavior. Disturbance typically takes the form of equipment noise above ambient levels within 0.25 miles (1.0 mile for blasting and 0.5 mile for aircraft) of owl sites during the nesting season. Disturbance could have a greater impact during the critical nesting period (3/1 - 7/15) than during the remainder of the nesting season (July 15th to September 30th).

Critical Habitat: The U.S. Fish and Wildlife Service designated Critical Habitat Units (CHU) across the range of the northern spotted owl to identify lands that were considered essential for the conservation and recovery of this listed species. The physical and biological features (referred to as primary constituent elements) that support nesting, roosting, foraging, and dispersal of northern spotted owls are essential to the conservation of the species (USDI, 1992). One CHU (OR-15) overlaps a portion of the planning area and contains (wholly or partially) these proposed harvest units #4a-c, 6a, 8a-b, 9, and 27.

Area of Concern: An Area of Concern (AOC) has been identified in the vicinity of Santiam Pass, encompassing portions of the Detroit, McKenzie, and Sweet Home Ranger Districts. It overlaps the CHU

in the same area. This AOC is believed to potentially limit the dispersal of spotted owls in both north/south and east/west directions, due to habitat fragmentation from past timber harvest on public and private lands. While additional timber harvest can occur within the AOC, a minimum of 50% of each quarter township must minimally provide dispersal habitat for spotted owls.

This project does not propose harvest units within the AOC however several proposed units (8b, 9, 24, and 27) are located within a half-mile of this AOC boundary (Figures 6, 7, 8 and 9). Removing or downgrading habitat adjacent to the AOC though timber harvest would potentially expand the width of non-dispersal habitat limiting northern spotted owl dispersal through the AOC.

Evaluation Criteria: Short-term modification of northern spotted owl habitat within the project area measured by acres of habitat downgraded, degraded or removed.

- **Northern Goshawk**

Northern goshawk (*Accipiter gentilis*) is an Oregon Department of Fish and Wildlife sensitive species that is rare in the Willamette National Forest. Goshawks are large forest hawks that prefer large patches of late-seral forests with large trees and dense canopy closure (Csuti, Blair et al. 1997). One active nest site was located within the planning area in 1998. Using June 1996, Region 6 protocol additional surveys were done in 2003 and 2004 to relocate the nest and verify use. In 2003 surveys, no birds were found. In 2004 a single adult was located during two successive surveys of this area.

Following recommendations to protect goshawk nest sites in Matrix and Adaptive Management areas on the Willamette National Forest using the eastside screen direction, a 650 foot (30 acre) no-harvest buffer was established around the nest site (USDA. 1994a, p. 9-17). In addition a ¼ mile logging restriction zone would be implemented to avoid disturbance during nesting season (April 1 – July 31).

Evaluation criteria: Proximity of harvest units to nest site and type of treatment of harvest units.

- **Economic and Disturbance Effects of Logging Systems**

Three logging systems: helicopter, cable yarding and tractor/skidder, are frequently used in the Cascades for harvesting trees. With more focus being directed toward thinning younger stands, a processor-forwarder system has become an alternative ground-based system for gentle and moderate terrain. Processor-forwarders can also handle slightly steeper slopes than tractor/skidder.

Operating costs, environmental effects, and future access benefits are notably different among these logging systems, and are considered when designing unit prescriptions or comparing alternatives.

Helicopters are generally the most expensive system and become more so during thinning operations. Cable logging systems are cheaper than helicopters, but often require new roads to access landing sites. Tractor/skidder and processor-forwarders are the least expensive logging systems, but again are confined to gentle terrain (less than 30% slopes) and can't operate far from road systems. Processor-forwarders tend to be slightly more expensive and versatile than tractor/skidder operations. Processor-forwarders also generate cost savings by eliminating a cutting crew to fell and buck trees. However, they are limited to harvesting smaller trees (less than 24 inches) due to the size of their cutting head.

Logging systems also vary in their physical site impacts. Helicopter logging creates the least impact on soil properties, Riparian Reserves and residual live trees. Cable yarding systems generally require partial suspension of logs (front end of logs are off the ground) and use lateral yarding (cross-slope) corridors to place logging impacts within a small number of narrow yarding corridors (typically 10-20 feet wide). Cable systems may also require logging corridors through Riparian Reserves in order to access isolated parcels. Cable systems create more soil disturbance than helicopter operations, though the total area of soil disturbance is relatively small (less than 10% of harvest acres). Helicopter logging systems do require much larger landings (up to 1 acre) to operate. Finally, helicopter systems, due to low site disturbance potential and reduced road needs, create the least risk for spreading noxious weeds off road corridors.

Ground-based systems typically disturb more acres with equipment and log haul than cable or helicopter logging systems, though processor/forwarders mitigate soil disturbance by placing logging debris (branches and tops) in front of them on skid trails. While differences in soil disturbances exist between the four logging systems, all would be within Forest Plan standards and guidelines through implementation of various mitigation measures to minimize soils effects.

In thinning operations, logging systems can negatively affect residual live trees and standing snags. Cable yarding systems have less flexibility in selecting leave trees or green tree retention areas due to their need to use defined yarding corridors. Damage to residual trees from cable yarding can be mitigated during operations by leaving rub trees along the edges of corridors that are subsequently removed. Ground-based systems have similar effects on residual trees, but have more flexibility to select leave trees or retention areas. Helicopter logging has the lowest impact on residual green trees and is very flexible in selecting leave trees.

Conversely, helicopter logging can have a higher impact on standing snags. The Occupational Safety & Health Administration (OSHA) requires the felling of any dead trees in a work area, if they potentially could fall and injure workers during logging operations (felling, yarding, or from the wind forces of helicopters). Helicopters large enough to lift log loads can develop rotor wind velocities up to 90 miles per hour. The risk of losing standing snags is generally lower with cable or ground-based systems than helicopter systems.

Finally, logging systems can affect future access for fire suppression and administrative projects differently due to their creation of new roads. Administrative projects include tree planting, animal control, competing vegetation or noxious weed control, and resource monitoring. Early suppression of wildfires is critical in reducing resource damage and limiting suppression costs. Control costs increase exponentially once fires become greater than 5 acres.

Helicopter logging generally creates no new road access, and therefore no access benefits for future needs. Cable and ground-based logging systems often improve access to harvest units with some new road construction.

Table 3: Comparison of Logging System Effects

Criteria	Helicopter	Cable	Processor/ Forwarder	Tractor/Skidder
Operating costs per CCF *	\$350	\$270	\$190	\$150
Type of terrain can operate in	Gentle to Steep	Gentle to Steep	Gentle (<30%)	Gentle (<30%)
Operating proximity to roads	Farthest Proximity	Close Proximity	Close Proximity	Close Proximity
Potential for Soil Disturbance/Compaction	Low	Moderate	Moderate	Moderate-High
Log suspension capabilities	Full	One-end to Full	One-end	One-end
Flexibility in selecting leave trees	High	Moderate	Moderate-High	Moderate-High
Potential impacts on standing snags	High	Moderate	Moderate	Moderate

* Figures represent logging costs from stump to central landing where logs can be loaded onto trucks.

CCF means one hundred cubic feet.

**Landings on existing roads are enlarged for helicopter operations.

Evaluation Criteria: This analysis would use average logging costs per CCF and harvest acres by logging system to evaluate alternatives (the acres of ground-based logging would act as a proxy to measure potential for ground disturbance).

Non-significant issues

The following issues were identified as being non-significant for the purposes of this project. Generally, these issues were mitigated by standards and guidelines provided by the *Willamette National Forest Land and Resource Management Plan*, addressed through resource prescriptions, or decided upon by laws and regulations.

These resources are addressed because of their proximity to the proposed project or they were raised during the scoping process, however they generally would not be affected (or negligibly affected) by the proposed action or other action alternatives.

Non-significant issues also include those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made or 4) conjectural and not supported by scientific or factual evidence.

- **Old growth stands**

Older late-successional forest (often called old-growth) provides habitat for a multitude of species, including lichens, fungi, bryophytes, vascular plants, and many species of vertebrate and invertebrate animals. It provides optimal elk thermal cover and habitat for threatened, endangered and sensitive species. Even relatively small patches of late-successional forest may function as travel corridors between larger habitat patches or serve as primary habitat for species with small ranges (e.g. invertebrate species). Species that have limited mobility for dispersal or require mycorrhizal associations require habitat connectivity for maintaining genetic diversity. Intact mature forest also resists invasion from non-native weedy vegetation.

Timber harvest and road construction in old-growth forest reduces habitat for many species dependent on these old-growth conditions. Late-successional habitat is directly lost when harvested or compromised by edge effects from adjacent harvest areas. Old-growth is valued and many citizens oppose the harvesting of old-growth forests.

Reason for not being considered a significant issue: The proposed action and all action alternatives do not include harvest of old growth habitat and are not expected to influence existing old growth habitat. Existing remnant old growth trees and patches within mid-seral harvest units would be retained as legacy habitat.

- **Harvest in Late-Successional Reserve (LSR)**

The project area is located adjacent to and south of a Late-Successional Reserve (LSR) (figure 2). No harvest is proposed in the LSR, although there are two units proposed adjacent to this allocation.

One 100-acre LSR occurs within the planning area to protect a known owl site. This LSR is located next to the Middle Santiam River within the eligible Wild and Scenic River Corridor. Two additional 100-acre LSRs are located nearby, but outside of the planning area.

Reason for not being considered a significant issue: No harvest is proposed within any of these 100-acre LSRs. The closest proposed harvest units are more than a ¾ mile from the closest 100-acre LSR.

- **Edge Effects on Late-Successional Reserves**

Dividing landscapes into allocations focused on specific resources can create boundaries separating very divergent objectives. Edge effects created by harvest units or roads on adjacent Late-Successional Reserve (LSR) habitat are a consequence of Forest Plan allocations. The loss or degradation of interior habitat is one potential edge effect. Research suggests that habitat degradation may occur through changes in air and soil temperatures, relative humidity, and wind velocities can result in forest habitat due to adjacent timber harvest (Chen, 1991). Depending on site conditions, some changes have been measured up to 720 feet from regeneration harvest boundaries. Windthrow in the LSR during severe winter storms is another potential edge effect from adjacent harvest. In this project, only Units 1a and 2a are located close to the Quartzville LSR boundary. Only Unit 1a is being considered for regeneration harvest, in Alternative 3.

Reason for not being considered a significant issue: The Forest Plan's LSR strategy acknowledges the effects of harvest activities on adjacent habitat by making most LSR's large enough to withstand these effects or more catastrophic landscape events like wildfires. The scale of one 13-acre harvest unit is too small to create significant or cumulative effects on the 84,000-acre Quartzville LSR.

- **Wild and Scenic River Corridor**

The Forest Plan identified segments of the Middle Santiam River as eligible candidates for Wild and Scenic River status (USDA 1990, pp E-61-64). The segment within the planning area was recommended for a Scenic classification, with potential anadromous fish habitat and old-growth habitat as Outstandingly Remarkable Values (ORV's).

Reason for not being considered a significant issue: This project does not propose any harvest units within ¼ mile of the river corridor so none of the identified Outstandingly Remarkable Values, including scenic quality, would be adversely impacted by any of the action alternatives.

- **Three Pyramids Special Interest Area**

The Three Pyramids SIA forms the eastern boundary of the planning area. It was established by the Forest Plan to protect sensitive rock garden habitat and popular recreation opportunities. Just to the west of this SIA and within the planning area are several large rock outcroppings, some of which support sensitive plant species. These rock outcroppings are classed as special habitat areas and protected with no-harvest buffers.

Reason for not being considered a significant issue: This project does not propose harvest units against the SIA boundary or the buffers around these rock outcroppings.

- **Red Tree Vole**

Surveys were completed during the summer of 2002 using regional Survey Protocol for the Red Tree Vole (version 2.0). No red tree vole nests were located. Members of the public completed additional and unsolicited surveys during the fall of 2002 and submitted nest material from two potential red tree vole nests reportedly collected in units 6 and 8a. The two submitted samples were validated as inactive red tree vole nests. Additional agency surveys were completed near these two potential sites, but no active nests were located.

Reason for not being considered a significant issue: Further sampling conducted through tree climbing in the spring of 2003 also did not locate any active nests.

Alternatives, including the Proposed Action

This chapter describes and compares the alternatives considered for the South Pyramid project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., helicopter logging versus the use of skid trails) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of erosion or cost of helicopter logging versus skidding).

Alternatives

Alternative 1 - No Action

The No Action alternative provides a basis for comparison to evaluate changes in the existing condition associated with the action alternatives and is also a viable option to be selected by the deciding official.

This alternative addresses project objectives to varying degrees by taking no action. Contributions to the district's harvest targets are addressed though delaying those offerings to a future date. The No Action Alternative would utilize self-thinning over time through competition-induced mortality to alter growing space in these densely-stocked, naturally-regenerated, second growth stands as a way of addressing stand growth and vigor. Finally, mortality in these stands would not be used for commercial wood products and fuel build up, would not be addressed through management actions.

Natural tree mortality would create snags and down wood in the stands and would begin to create openings in the stands over time.

Habitat within the Critical Habitat Unit (CHU) for northern spotted owls would remain on its present course of succession. These stands would continue to provide habitat for northern spotted owls and other species dependent on this habitat unless they fall victim to wildfires, insects, or diseases because of their increased vulnerability to these events caused by abundant competition-induced mortality.

Not harvesting or constructing roads in the unroaded block would retain the unroaded character of the area. Due to ownership patterns in the watershed, road densities in the No Action alternative would not change, except for roads that eventually grow closed due to a decline in funding sources for road maintenance.

No harvest would occur near the goshawk nest site.

Alternative 2 - The Proposed Action – Thinning Only

Alternative 2 focuses on commercially thinning overstocked, mid-seral, natural stands to improve stand vigor and growth and minimize competition-induced mortality while maintaining dispersal habitat in the Santiam Area of Concern, avoiding harvest of old growth and retaining future management options in the unroaded block.

A total of 12 units totaling 189 acres would be thinned to 40% - 60% of existing canopy closure, yielding about 8,882 CCF (hundred cubic feet) of timber toward the District’s harvest targets. Harvest would be accomplished using a combination of ground-based and helicopter logging systems.

Unroaded Block: About 105 acres of thinning is proposed on seven units within the unroaded block east of road 2047. Units, ranging in size from 6 to 38 acres, were located near the outer edges of the unroaded block to minimize impacts on the interior of this area. No new road construction would be required to access these units.

CHU: Eight units, totaling about 31 acres are all or partially within the Critical Habitat Unit (CHU) for northern spotted owls. All of these units would be thinned.

Snags: Existing snags would be retained whenever possible during logging and other land management activities. In addition to existing snags, 1.2 green trees per acre (TPA) would be retained for wildlife trees. Douglas-fir and western redcedar are the preferred species for wildlife trees. They should be greater than 18 inches in diameter or the largest size available within the stands being treated. After the sale, some wildlife trees would be topped to create snag habitat in and adjacent to the timber sale units.

Coarse Woody Material: Existing down woody material would be retained whenever possible during logging and other land management activities. In addition, two green trees per acre of average diameter within the stand would be retained during harvest operations and felled afterwards for coarse woody material.

Fuel treatments: All units in Alternative 2 would receive fuel treatments to reduce logging slash to meet Willamette Forest Plan Standards and Guidelines for fuel loading as outlined in Table 23. Fuel treatments include: (a) handpiling and burning piles within 66 feet of major roads, Late-Successional Reserve (LSR) boundaries and private land boundaries, (b) yarding tops attached to the last log in areas thinned by helicopter. Tops will be processed at the landing, piled, made available for firewood and then burned and (c) crushing slash in ground-based yarding units. There is one helicopter landing on private land, tops yarded from units served by this landing would be treated at a nearby rock pit. Alternative biomass utilization would occur if a market exists for wood fiber or firewood. Piles would be burned in accordance with Oregon State Smoke Management regulations.

Table 4: Acres in Unroaded Block and CHU

Unit No.	Unit Size in Acres	Acres in Unroaded Block	Acres in CHU
1a	13	0	0
2a	8	0	0
2b	49	0	0
4a	4	0	3.7
4b	8	8	4.8
4c	11	11	11
6a	21	18	1.8
8a	13	13	1.2
8b	6	6	6
9	38	38	0.4
24	7	0	0
27	11	11	2.0
Total	189	105	30.9

Riparian Reserves: Full-leave, no-harvest Riparian Reserves would be left along stream courses, wetlands, and unstable areas as outlined in the table below. No harvest treatments would occur in these areas as outlined in Table 5, below.

Stream Classification	Plant Association	NW Forest Plan Riparian Reserve Management Allocation Width	No-Harvest Buffers along these streams
Fish-bearing streams	Western hemlock	344 ft. either side of the stream channel	344 ft. either side of the stream channel
	Pacific Silver Fir	300 ft. either side of the stream channel	300 ft. either side of the stream channel
Perennial non-fish-bearing streams, wetlands and unstable areas	Western Hemlock	172 ft. either side of the stream channel	172 ft. either side of the stream channel
	Pacific Silver Fir	150 ft. either side of the stream channel	150 ft. either side of the stream channel
Intermittent streams	Western Hemlock	172 ft. either side of the stream channel	172 ft. either side of the stream channel
	Pacific Silver Fir	150 ft. either side of the stream channel	150 ft. either side of the stream channel

Note: all stream buffers are measured from the trees nearest the stream, not the water’s edge, and occur on either side of the stream.

Connected actions

Roading: About 800 feet of a currently closed, temporary operator’s spur road would be re-opened at the end of road 2047 860 to facilitate harvest operations. This road is outside of the unroaded area. Following harvest operations, this road and main skid trails used in ground-based yarding systems would be ripped and closed. No new system-road construction is required for this alternative, but about 27 miles of road maintenance would be required along haul routes (22 miles) and local roads accessing harvest units (5.4 miles).

Maintenance activities include spot rocking, brush cutback to provide a safe site distance, felling snags that pose a safety hazard to travel, road blading, ditch cleanout, culvert catch basin cleanout and replacement of a 4-foot section of damaged inlet to a ditch relief pipe on road 2047 852.

Portions of the haul routes for this project are covered by easements with Willamette Valley Lumber and Timber Services Companies. These haul routes are in both the Harter Mountain/Lava Lake and Harter Mountain/Latiwi Creek Right-of-Way Construction and Use Agreement areas.

Yarding: Careful consideration was given to appropriate logging systems to accomplish treatment objectives. Depending on topography, soil conditions, accessibility, suspension requirements to meet ecological needs, cost-benefit ratio, etc. a combination of helicopter (128 acres) and ground-based equipment (61 acres) were selected to harvest the units (Refer to Table 7 and Appendix A for individual unit prescriptions).

There are six helicopter landings and six ground-based landings that would be used to log these harvest units. None of the landings are located in Riparian Reserves. One helicopter landing is located on private land. A temporary land use agreement from Timber Services Company would be necessary to allow use of this landing to conduct logging operations.

There are full leave buffers on all streams. No stream crossings are needed for ground-based systems. Helicopters may fly over streams to get to landings, but logs would be fully suspended above the tree canopies.

Mitigation Measures Specific to this Alternative

Mitigation measures would be implemented to minimize anticipated resource impacts of the proposed action. Mitigation common to all alternatives are summarized in Table 16.

Mitigation specific to this alternative include a 650 foot, no-harvest buffer around a known goshawk nest site in the southern portion of the analysis area. Logging restrictions would be placed on three units within 1/4 mile of the nest site from April 1 – July 30 to avoid disturbance during nesting season. This restriction applies to units 8a, 8b and 27.

Post-Sale Opportunities

Funding would be collected from this timber sale to implement mitigation measures outlined in the upper portion of the Table 6. If additional funding is available, non-mitigation, post-sale activities listed on the bottom portion of the table below would be implemented as money allows. These non-mitigation, post-sale activities are listed in priority order for available funding and include: (a) stand improvements such as pre-commercial thinning in adjacent plantations to enhance species diversity and increase the growth rate of dominant trees, (b) fertilization of nearby managed stands to promote growth, (c) trail reconstruction, (d) firewood, (e) pruning trees to add value to wood provided by these stands in the future, (f) cleaning debris off of landings, on open roads, used during sale operations to improve their usefulness as dispersed camping sites, (g) closing roads and (h) placing mineral blocks for big game (see also Appendix B)

Table 6: Alternative 2 Mitigation and Post-Sale Activities

Type of Project	Type of Action
Mitigation Measures Funded by this Project	
1) Weed control	Connected
1) Snag creation	Connected
1) Down woody material	Connected
1) Subsoiling in harvest units	Connected
1) Monitoring sensitive species	Connected
1) Native seeding of roads	Connected
Non-Mitigation, Post-Sale Activities to be Funded in Priority Order as Funding is Available From this Project	
2) Firewood	Similar
3) Pre-commercial thinning	Similar
4) Fertilization of managed stands	Similar
5) Dispersed recreation site enhancement	Similar
6) Fertilize natural and thinned stands	Similar
7) Pruning	Similar
8) Trail reconstruction	Similar
9) Mineral blocks	Similar

Table 7: Alternative 2 Unit Summary

Unit	Unit Size in Acres	Harvest Prescription	Target Canopy Closure After Thinning	Species Selection	Volume CCF (hundred cubic feet)	Yarding			Planned Fuels Treatment
						Suspension Requirements	Ground-based Acres	Helicopter Acres	
1a	13	Thin - 16' spacing	40%	Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	552	Partial, some cable	13		Handpile 66 feet along LSR boundary (1 acre)
2a	8	Thin – 16' spacing	40%	Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	394	Partial	8		Handpile 66 feet along LSR boundary (1 acre)
2b	49	Thin – 16' spacing (protect survey and manage plants in rock area)	40%	Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	2498	Partial		49	Yard tops attached

Table 7: Alternative 2 Unit Summary

Unit	Unit Size in Acres	Harvest Prescription	Target Canopy Closure After Thinning	Species Selection	Volume CCF (hundred cubic feet)	Yarding			Planned Fuels Treatment
						Suspension Requirements	Ground-based Acres	Helicopter Acres	
4a	4	Thin – 14’ spacing	50%	Leave all cedar	185	Partial, some cable	4		Handpile 66 feet along 860 spur (1 acre)
4b	8	Thin – 16’ spacing	50%	Leave all cedar	406	Partial, some cable	8		Handpile 66 feet along 860 spur (1 acre)
4c	11	Thin – 16’ spacing	50%	Leave all cedars	500	Partial, some cable		11	Yard tops attached
6a	21	Thin – 14’ spacing	60%	Leave all cedars	902	Partial, some cable	21		Handpile along 864 spur within 66 feet of road (4 acres)
8a	13	Thin – 14 ‘ spacing - do not harvest trees larger than 34”stump dia.	60%	Leave all cedars	395	Ground-based/Cable		13	Yard tops attached
8b	6	Thin – 16’ spacing	50%	Leave all cedars	352	Partial, some cable		6	Yard tops attached

Table 7: Alternative 2 Unit Summary

Unit	Unit Size in Acres	Harvest Prescription	Target Canopy Closure After Thinning	Species Selection	Volume CCF (hundred cubic feet)	Yarding			Planned Fuels Treatment
						Suspension Requirements	Ground-based Acres	Helicopter Acres	
9	38	Thin – 16’ spacing	50%	Leave all western redcedar and incense cedar. Other coniferous species would be removed to release cedar.	2145	Partial		38	Yard Tops within 66 feet of road 840
24	7	Thin – 14’ spacing	50%	Leave all cedars.	153	Partial	7		Handpile 66 feet along 852 spur (1 acre)
27	11	Thin – 16’ spacing - do not harvest trees larger than 34” stump dia.	50%	Leave all cedars	400	Partial		11	Yard tops attached
Total	189				8,882		61	128	

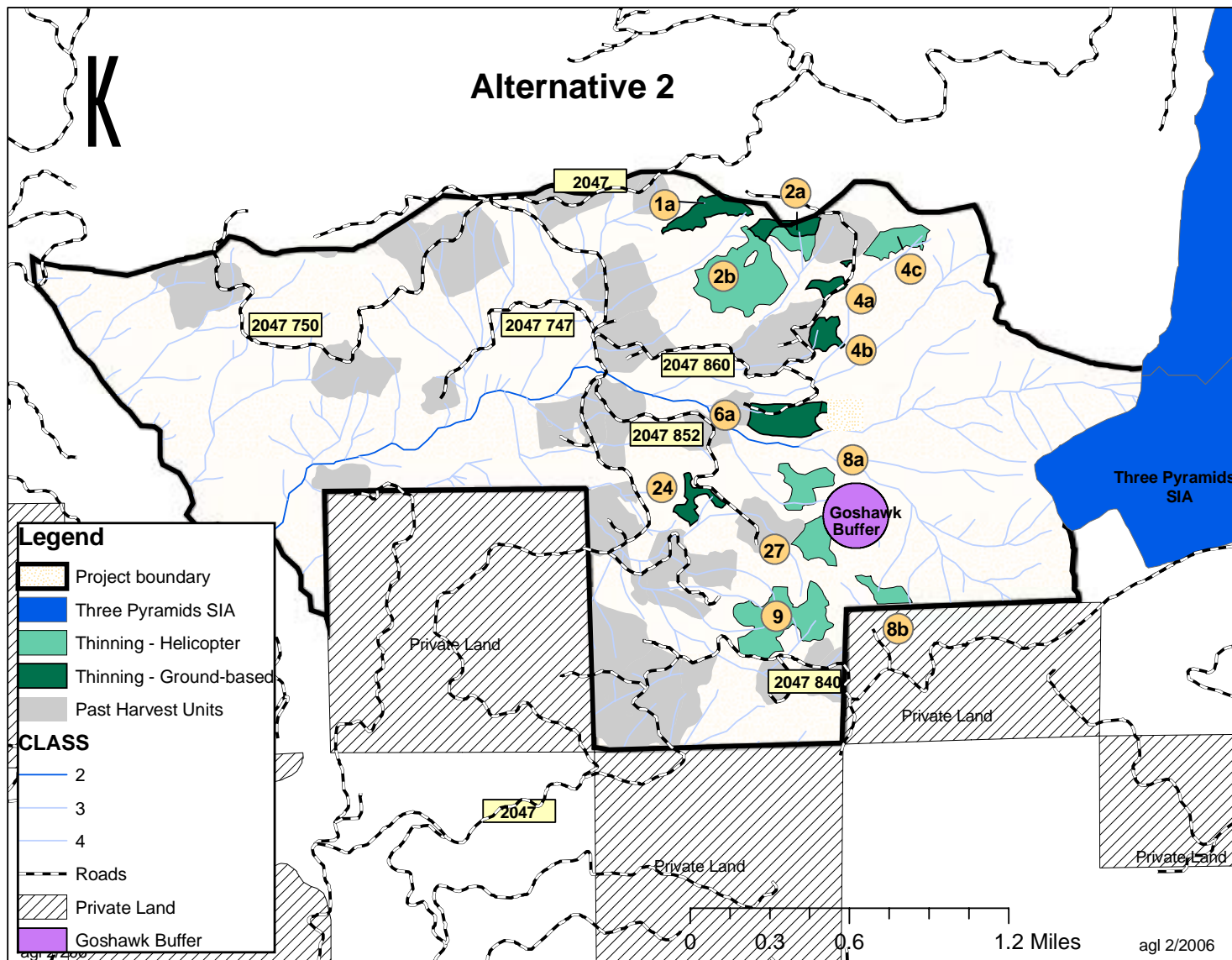


Figure 7 Alternative 2 Map

Alternative 3 - Regeneration Harvest and Thinning

Alternative 3 meets project objectives by harvesting volume in the range proposed for this action, but on fewer acres than Alternative 2. In addition, this alternative harvests only one unit (6a) in the unroaded landscape block and one unit (4a) in the Critical Habitat Unit (CHU). To get the proposed volumes, three units (#1a, 1b, 6a) would be harvested using a regeneration prescription on a total of 43 acres. All other units (#2a, 2b, 4a, 24) for this alternative would be thinned to 40 or 50% residual canopy closure, for a total of 68 acres.

A total of 7 units totaling 111 acres would be thinned and regenerated yielding about 8,034 CCF (hundred cubic feet) of timber toward the District’s harvest targets. Harvest would be accomplished using a combination of ground-based and helicopter logging systems.

Unroaded Block: About 18 acres of regeneration harvest is proposed on one unit within the unroaded block east of road 2047. This unit was located near the outer edges of the unroaded block to minimize impacts on the interior of this area. No new road construction would be required to access this unit.

CHU: A portion of one unit, totaling about 3.7 acres lies within the Critical Habitat Unit (CHU) for northern spotted owls. This unit would be thinned.

In the short-term (about 10 years) it would retain dispersal habitat, at a minimum. In the long-term habitat quality would improve here and would become suitable habitat.

Goshawk Nest Site: No units are proposed near the nest site.

Green Tree Retention: At least 15 percent of the area associated with each regeneration harvest unit would be retained intact. Only matrix lands count toward this retention area. To the extent possible, green tree retention areas should include the largest, oldest, live, decadent or leaning trees, and hard snags near the unit.

Snags: Existing snags would be retained whenever possible during logging and other land management activities. In addition to existing snags, 1.2 green trees per acre (TPA) would be retained for wildlife trees in thinning units and 4.5 TPA would be retained in regeneration units. Douglas-fir and western redcedar are the preferred species for wildlife trees. They should be greater than 18 inches in diameter or the largest size available within the stands being treated. After the sale, some wildlife trees would be topped to create snag habitat in and adjacent to the timber sale units.

Coarse Woody Material: In all units existing down woody material would be retained and protected to the greatest extent possible during logging and fuel treatment activities.

Unit No.	Unit Size in Acres	Acres in Unroaded Block	Acres in CHU
1a	19	0	0
1b	3	0	0
2a	8	0	0
2b	49	0	0
4a	4	0	3.7
6a	21	18	0
24	7	0	0
Total	111	18	3.7

Two green trees per acre of average diameter within the stand would be retained during harvest operations in thinning units. These trees would be felled afterwards for coarse woody material.

In all regeneration units 240 linear feet of logs per acre would be retained that are at least 20 inches in diameter and 20 feet or greater in length. These logs should be left in green-tree retention areas as much as possible, to provide the appropriate microclimate for various organisms that use this substrate.

Fuel treatments: All units in Alternative 3 would receive fuel treatments to reduce logging slash to meet Willamette Forest Plan Standards and Guidelines for fuel loading as outlined in Table 23. Fuel treatments include: (a) handpiling and burning piles within 66 feet of major roads, Late-Successional Reserve (LSR) boundaries and private land boundaries, (b) yarding tops attached to the last log in areas thinned by helicopter. The tops will be processed at the landing, piled, made available for firewood and then burned and (c) crushing slash in ground-based yarding units and (d) broadcast burning.

Riparian Reserves: Full-leave, no-harvest Riparian Reserves would be left along stream courses, wetlands, and unstable areas as outlined in the table below

Table 9: Alternative 3 Riparian Reserve Prescriptions

Stream Classification	Plant Association	NW Forest Plan Riparian Reserve Management Allocation Width	No-Harvest Buffers along streams
Fish-bearing streams	Western hemlock	344 ft. either side of the stream channel	344 ft. either side of the stream channel
	Pacific Silver Fir	300 ft. either side of the stream channel	300 ft. either side of the stream channel
Perennial non-fish-bearing streams, wetlands and unstable areas	Western Hemlock	172 ft. either side of the stream channel	172 ft. either side of the stream channel
	Pacific Silver Fir	150 ft. either side of the stream channel	150 ft. either side of the stream channel
Intermittent streams	Western Hemlock	172 ft. either side of the stream channel	172 ft. either side of the stream channel
	Pacific Silver Fir	150 ft. either side of the stream channel	150 ft. either side of the stream channel

Note: all stream buffers are measured from the trees nearest the stream, not the water's edge, and occur on either side of the stream.

Connected actions

Roading: About 800 feet of a currently closed, temporary operator's spur road would be re-opened at the end of road 2047 860 to facilitate harvest operations. This road is outside of the unroaded area. Following harvest operations, this road and main skid trails used in ground-based yarding systems would be ripped and closed.

No new system-road construction is required for this alternative, but about 27 miles of road maintenance would be required along haul routes (22 miles) and local roads accessing harvest units

(5.4 miles). Maintenance activities include spot rocking, brush cutback to provide a safe site distance, felling snags that pose a safety hazard to travel, road blading, ditch cleanout, culvert catch basin cleanout and replacement of a 4-foot section of damaged inlet to a ditch relief pipe on road 2047 852.

Portions of the haul routes for this project are covered by easements with Willamette Valley Lumber and Timber Services Companies. These haul routes are in both the Harter Mountain/Lava Lake and Harter Mountain/Latiwi Creek Right-of-Way Construction and Use Agreement areas.

Yarding: Careful consideration was given to appropriate logging systems to accomplish treatment objectives. Depending on topography, soil conditions, accessibility, suspension requirements to meet ecological needs, cost-benefit ratio, etc. a combination of helicopter (52 acres) and ground-based equipment (59 acres) were selected to harvest a total of 7 units, yielding about 8,034 CCF (hundred cubic feet) of timber (refer to Table 11 and Appendix A for individual unit prescriptions).

There are two helicopter landings and five ground-based landings that would be used to log these harvest units. None of the landings are located in Riparian Reserves.

There are full leave buffers on all streams. No stream crossings are needed for ground-based systems. Helicopters may fly over streams to get to landings, but logs would be fully suspended above the tree canopies.

Table 10: Alternative 3 Mitigation and Post-Sale Activities

Mitigation measures

Mitigation measures would be implemented to minimize anticipated effects. Table 16 summarizes mitigation measures common to all alternatives.

Post-Sale Opportunities

Funding would be collected from this timber sale to implement mitigation measures outlined in the upper portion of the Table 10. If additional funding is available, non-mitigation, post-sale activities listed on the bottom portion of the table below would be implemented as money allows. These non-mitigation, post-sale activities are listed in priority order for available funding (see also Appendix B).

Type of Project	Type of Action
Mitigation Measures Funded by this Project	
1) Tree Planting	Connected
1) Reforestation exams	Connected
1) Animal damage control	Connected
1) Replanting	Connected
1) Weed control	Connected
1) Snag creation	Connected
1) Felling down woody material	Connected
1) Subsoiling in harvest units	Connected
1) Monitoring sensitive species	Connected
1) Native seeding of roads	Connected
Non-Mitigation, Post-Sale Activities to be Funded in Priority Order as Funding is Available From this Project	
2) Firewood	Similar
3) Pre-commercial thinning	Similar
4) Fertilization of managed stands	Similar
5) Dispersed recreation site enhancement	Similar
6) Fertilize natural and thinned stands	Similar
7) Pruning	Similar
8) Trail reconstruction	Similar
9) Mineral blocks	Similar

Table 11: Alternative 3 Unit Summary

Unit	Unit Size in Acres	Harvest Prescription	Target Canopy Closure After Thinning	Species Selection	Volume (CCF)	Yarding			Planned Fuels Treatment
						Suspension Requirements	Ground-based Acres	Helicopter Acres	
1a	19	Clearcut with reserve trees		Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	1934	Partial, some cable	19		Broadcast burn
1b	3	Clearcut with reserve trees		Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	305	Partial		3	Broadcast burn
2a	8	Thin – 16' spacing	40	Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	394	Partial	8		Handpile 66' along LSR boundary (1 acre)
2b	49	Thin – 16' spacing	40	Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	2498	Partial		49	Yard tops attached
4a	4	Thin – 14' spacing	50	Leave all cedar	185	Partial, some cable	4		Handpile 66' along 860 spur (1 acre)
6a	21	Clearcut with reserve trees		Leave all cedar	2565	Partial, some cable	21 – limit number and size of skid roads		Broadcast burn
24	7	Thin – 14' spacing	50	Leave all cedar	153	Partial	7		Handpile 66' along 852 spur (1 acre)
Total	111				8034		59	52	

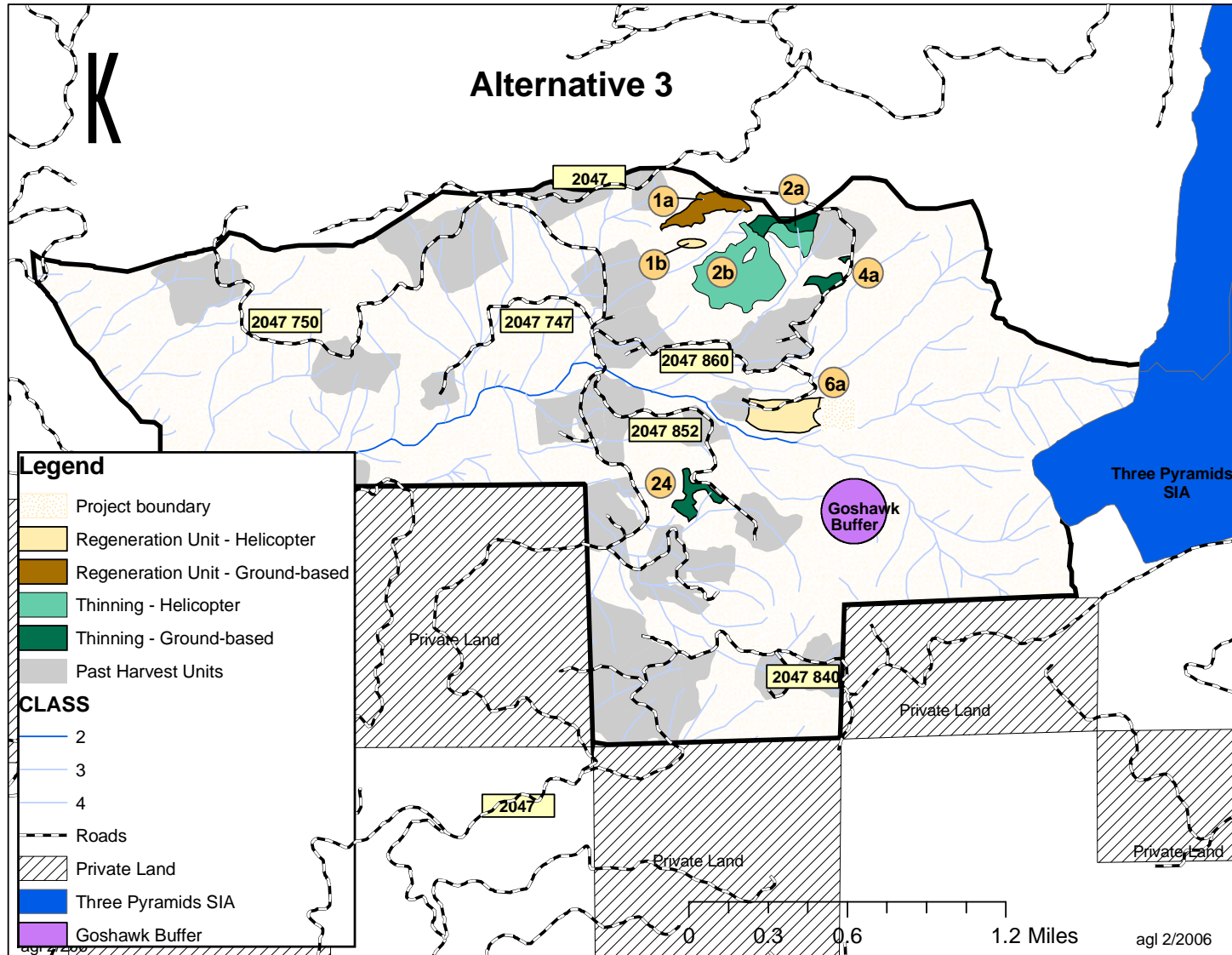


Figure 8: Alternative 3 Map

Alternative 4 – Regeneration Harvest and Thinning

Alternative 4 meets project objectives by harvesting volume in the range proposed for this action, but on the fewest number of acres of any action alternative. To get the proposed volumes, three units (1a, 1b, and 2b) would be harvested using a regeneration prescription on a total of 71 acres. The remaining units (2a and 24) would be thinned to 40% or 50% residual canopy closure, for a total of 15 acres.

A total of 5 units totaling 86 acres would be thinned and regenerated yielding about 7,588 CCF (hundred cubic feet) of timber toward the District’s harvest targets. Harvest would be accomplished using a combination of ground-based and helicopter logging systems.

No harvest or road construction is proposed within the unroaded block east of road 2047, in the Critical Habitat Unit (CHU) for the northern spotted owl, or near the Goshawk nest site.

Green Tree Retention: At least 15 percent of the area associated with each regeneration harvest unit would be retained intact. Only matrix lands count toward this retention area. To the extent possible, green tree retention areas should include the largest, oldest, live, decadent or leaning trees, and hard snags near the unit.

Snags: Existing snags would be retained whenever possible during logging and other land management activities. In addition to existing snags, 1.2 green trees per acre (TPA) would be retained for wildlife trees in thinning units and 4.5 TPA would be retained in regeneration units. Douglas-fir and western redcedar are the preferred species for wildlife trees. They should be greater than 18 inches in diameter or the largest size available within the stands being treated. After the sale, some wildlife trees would be topped to create snag habitat in and adjacent to the timber sale units.

Coarse Woody Material: In thinning units existing down woody material would be retained and protected to the extent possible during logging and fuel treatment activities. In addition, two green trees per acre of average diameter within the stand would be retained during harvest operations in thinning units. These trees would be felled afterwards for coarse woody material.

In all regeneration units 240 linear feet per acre of logs that are at least 20 inches in diameter and 20 feet or greater in length would be retained.. Existing large, woody material on the ground would be retained and protected to the greatest extent possible during yarding and fuels treatment. Downed logs would be left as much as possible in green-tree retention areas to provide the appropriate microclimate for various organisms that use this substrate.

Table 12: Unit Acres in Unroaded Block and CHU

Unit No.	Unit Size in Acres	Acres in Unroaded Block	Acres in CHU
1a	13	0	0
1b	3	0	0
2a	8	0	0
2b	49	0	0
24	7	0	0
Total	80	0	0

Fuel treatments: All units in Alternative 4 would receive fuel treatments to reduce logging slash to meet Willamette Forest Plan Standards and Guidelines for fuel loading as outlined in Table 23. Fuel treatments include: (a) handpiling and burning piles within 66 feet of major roads, Late-Successional Reserve (LSR) boundaries and private land boundaries, (b) crushing slash in ground-based yarding units and (c) broadcast burning.

Riparian Reserves: Full-leave, no-harvest Riparian Reserves would be left along stream courses, wetlands, and unstable areas as outlined in the table below.

Table 13: Alternative 4 Riparian Reserve Prescriptions

Stream Classification	Plant Association	NW Forest Plan Riparian Reserve Management Allocation Width	No-Harvest Buffers on Streams
Fish-bearing streams	Western hemlock	344 ft. either side of the stream channel	344 ft. either side of the stream channel
	Pacific Silver Fir	300 ft. either side of the stream channel	300 ft. either side of the stream channel
Perennial non-fish-bearing streams, wetlands and unstable areas	Western Hemlock	172 ft. either side of the stream channel	172 ft. either side of the stream channel
	Pacific Silver Fir	150 ft. either side of the stream channel	150 ft. either side of the stream channel
Intermittent streams	Western Hemlock	172 ft. either side of the stream channel	172 ft. either side of the stream channel
	Pacific Silver Fir	150 ft. either side of the stream channel	150 ft. either side of the stream channel

Note: all stream buffers are measured from the trees nearest the stream, not the water’s edge, and occur on either side of the stream.

Connected actions

Roading: About 800 feet of a currently closed, temporary operator’s spur road would be re-opened at the end of road 2047 860 to facilitate harvest operations. This road is outside of the unroaded area. Following harvest operations, this road and main skid trails used in ground-based yarding systems would be ripped and closed.

No new system-road construction is required for this alternative, but about 27 miles of road maintenance would be required along haul routes (22 miles) and local roads accessing harvest units (5.4 miles). Maintenance activities include spot rocking, brush cutback to provide a safe site distance, felling snags that pose a safety hazard to travel, road blading, ditch cleanout, culvert catch basin cleanout and replacement of a 4-foot section of damaged inlet to a ditch relief pipe on road 2047 852.

Portions of the haul routes for this project are covered by easements with Willamette Valley Lumber and Timber Services Companies. These haul routes are in both the Harter

Mountain/Lava Lake and Harter Mountain/Latiwi Creek Right-of-Way Construction and Use Agreement areas.

Yarding: Careful consideration was given to appropriate logging systems to accomplish treatment objectives. Depending on topography, soil conditions, accessibility, suspension requirements to meet ecological needs, cost-benefit ratio, etc. a combination of helicopter (52 acres) and ground-based equipment (34 acres) were selected to harvest a total of 6 units, yielding about 7,588 CCF (hundred cubic feet) of timber (Refer to Table 15 and Appendix A for individual unit prescriptions).

There are two helicopter landings and four ground-based landings that would be used to log these harvest units. None of the landings are located in Riparian Reserves.

There are full leave buffers on all streams. No stream crossings are needed for ground-based systems. Helicopters may fly over streams to get to landings, but logs would be fully suspended above the tree canopies.

Mitigation measures

Mitigation measures would be implemented to minimize anticipated effects of the proposed action. These include restricting harvest operations during times of the year when it would be detrimental to species’ reproductive success, buffering sensitive species and habitats from disturbance during harvest activities, planting trees to reforest regeneration harvest units, reforestation exams, animal damage control, replanting, noxious weed control and monitoring to minimize introduction or spread of these plants, snag and down woody material creation, felling down woody material, closing roads, subsoiling portions of units where ground-based logging systems were used, monitoring sensitive species and seeding disturbed areas with native seed

Table 14: Alternative 4 Mitigation and Post-Sale Activities

Type of Project	Type of Action
Mitigation Measures Funded by this Project	
1) Tree Planting	Connected
2) Reforestation exams	Connected
3) Animal damage control	Connected
4) Replanting	Connected
5) Weed control	Connected
6) Snag creation	Connected
7) Felling down woody material	Connected
8) Subsoiling in harvest units	Connected
9) Monitoring sensitive species	Connected
10) Native seeding of roads	Connected
Non-Mitigation, Post-Sale Activities to be Funded in Priority Order as Funding is Available From this Project	
12) Firewood	Similar
13) Pre-commercial thinning	Similar
14) Fertilization of managed stands	Similar
15) Dispersed recreation site enhancement	Similar
16) Fertilize natural and thinned stands	Similar
17) Pruning about 120 acres	Similar
18) Trail reconstruction	Similar
19) Mineral blocks (about 50)	Similar

to minimize erosion and potential seedbeds for establishment of noxious weeds, and monitoring sensitive species (see specifics in Table 16 and Appendix B).

Post-Sale Opportunities

Funding would be collected from this timber sale to implement mitigation measures outlined in the upper portion of Table 14. If additional funding is available, non-mitigation, post-sale activities listed on the bottom portion of the table below would be implemented as money allows. These non-mitigation, post-sale activities are listed in priority order for available funding.

Table 15: Alternative 4 Unit Summary

Unit	Unit Size in Acres	Harvest Prescription	Target Canopy Closure After Thinning	Species Selection	Volume CCF (hundred cubic feet)	Yarding			Planned Fuels Treatment
						Suspension Requirements	Ground-based Acres	Helicopter Acres	
1a	19	Clearcut with reserve trees		Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	1934	Partial, some cable	19		Broadcast burn
1b	3	Clearcut with reserve trees		Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	305	Partial		3	Broadcast burn
2a	8	Thin – 16’ spacing	40%	Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	394	Partial	8		Handpile 66’ along LSR boundary (1 acre)
2b	49	Clearcut with reserve trees		Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which would be kept.	4,802	Partial		49	Broadcast Burn
24	7	Thin – 14’ spacing	50%	Leave all cedars.	153	Partial	7		Handpile 66’ along 852 spur (1 acre)
Total	86				7588		34	52	

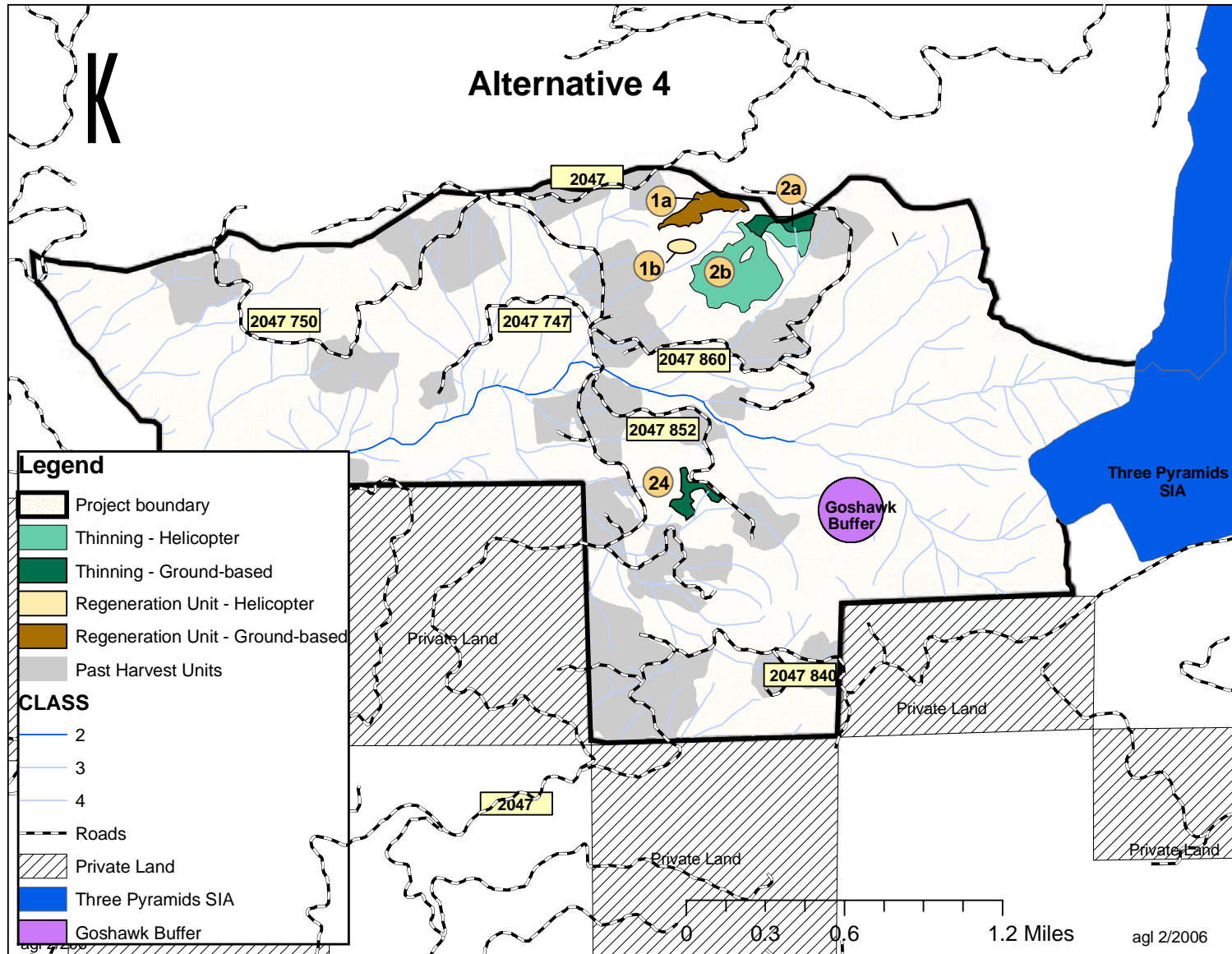


Figure 9 Alternative Four Map

Mitigation Common to All Alternatives

Mitigation measures were developed to ease some of the potential adverse effects the various alternatives may cause. Common mitigation measures that apply to specific units, regardless of alternative, are also listed. The following mitigation measures would be applied to any of the action alternatives unless another mitigation measure is specifically identified in a particular unit prescription in Appendix A: Unit Prescriptions. Common mitigation measures that apply to specific units, regardless of alternative, are also listed.

Table 16: Mitigation Measures Common to All Action Alternatives

Units	Mitigation	Restriction Dates
Special Habitats		
All	<p>Special habitats, including seeps, rock outcrops and gardens, caves, and meadows would be protected in accordance with the Forest Plan and the Special Habitat Management Guide. Protective measures include:</p> <ul style="list-style-type: none"> • No harvest buffers (which may include Green Tree Retention areas but should not include wildlife trees). • Directionally falling trees away from the special habitat areas. <p>In general, no-harvest buffer widths for special habitat are as follows:</p> <ul style="list-style-type: none"> • seeps/springs: 172 feet if greater than 1/4 acre • ponds: 600 feet • caves: 400 feet • rock gardens: 200 feet, if greater than 1/2 acre • rock outcrops: 150 feet if greater than 2 acres • <p>Smaller seeps, rock gardens and outcrops would be buffered commensurate with their size and the adjacent harvest prescription. There should be no direct disturbance to the special habitat or its buffer.</p>	N/A
2a	Dry rock garden with <i>Orobanche pinorum</i> (on Forest Concern List) – leave 200 foot buffer	
4a	Rock garden near top of stand – leave 200 foot buffer	
8a	Several wetlands and seasonal ponds	
8b	Wet meadow and Sitka alder wetland.	
27	Devil’s club seep	

Table 16: Mitigation Measures Common to All Action Alternatives

Units	Mitigation	Restriction Dates
Fuels		
All	Conduct a post-harvest field evaluation to verify actual fuel loadings. Reduce fuel loading in harvest units that exceed the maximum levels specified in the Forest Plan. Anticipated fuel treatments by harvest unit are described in alternative summary tables 7, 11 and 15. Units should not possess more than a maximum total fuel loading of 23 tons per acre of down material, distributed in the following classes: <ul style="list-style-type: none"> • 7-11 tons/acre in the 0 to 3 inch diameter class • 8-12 tons/acre in the 3 to 9 inch diameter class 	N/A
Air Quality		
All	Conduct fuel burning to meet air quality requirements specified by State of Oregon Smoke Mgmt. Plan	During burning season
Soils and Geology		
1a, 2a, 4a, 4b, 6a, 24	Ground-based equipment should operate in the dry season, generally this is considered May through October, unless otherwise restricted by other resource concerns or if dry conditions occur outside of this season and restriction is waived by Forest Service personnel. Operations will be suspended if rainfall or precipitation results in pooling of water in skid trails or landings.	Generally restricted from operations November - April
1a, 2a, 4a, 4b, 6a, 24	Harvested trees should generally be topped and limbed in the units, rather than at the landing, in order to provide for nutrient recycling and control of ravel and slough on steep side slopes.	N/A
1a, 2a, 4a, 4b, 6a, 24	To minimize soil disturbance, ground-based equipment shall generally be limited to slopes less than 30%, unless otherwise directed by Forest Service personnel.	N/A
1a, 2a, 4a, 4b, 6a, 24	Ground-based skidding equipment or forwarders shall stay on designated skid trails. Ground-based skid trails would be pre-designated and pre-approved before use. The Locate Tractor Skid Road (LTSR) clause will be included in the timber sale contract. Skid roads should not exceed 15 feet in width, and where practical the skidder, cat or processor/ forwarder should travel on slash to reduce off site soil erosion and/or lesson soil compaction.	N/A
All	The reopening of temporary, unclassified roads will occur in the dry season, June through October to avoid surface erosion from exposed soil. Open roads will be storm-proofed if they have to sit through extended periods of wet weather.	June-Oct

Table 16: Mitigation Measures Common to All Action Alternatives

Units	Mitigation	Restriction Dates	
Soils and Geology continued			
All	Where practical, at the completion of harvest activities, limbs and woody debris should be placed on areas of exposed soil to reduce the potential for off-site soil erosion, unless these areas are designated for future subsoiling.	N/A	
All	Unclassified or temporary roads used outside the standard operating season, may need to be rocked to reduce the potential for off-site erosion.	Outside of standard operating season	
All	Trees, not designated for harvest in riparian buffers that need to be cut to facilitate harvest operations, should be dropped into the stream if possible to aid in woody debris recruitment.	N/A	
All	Avoid disturbance to the existing down woody debris as much as is practical.	N/A	
1a, 2a, 4a, 4b, 6a, 24	At the completion of harvest activities, tractor skid roads (existing or created) and landings that are not part of the dedicated transportation system or established for other future use, will be adequately scarified and/or subsoiled, unless otherwise waived by the Forest Service.	N/A	
Suspension Requirements		Duff Retention Requirements	
1a, 8b	Partial, some cable	40-60%	N/A
1b, 2a, 2b, 9a, 24, 27	Partial	50-70%	N/A
4a, 4b, 4c, 6a	Partial, some cable	40-60%	N/A
8a	Ground-based/Cable	30-50%	N/A

Table 16: Mitigation Measures Common to All Action Alternatives			
Units	Mitigation	Restriction Dates	
Hydrology/Stream Channels/Water Quality/Riparian			
All	Full-leave, no-harvest riparian buffers are prescribed to minimize sediment delivery to streams and reduce the potential for temperature increases. Buffers measured from the trees nearest the stream rather than the waters edge. Implement Best Management Practices (BMP’s) for all project activities. Utilizing BMP’s for this project specifically addresses direction and guidance in the protection of water quality. Objectives and mitigation for water quality for this project are listed in the following table:	N/A	
	Objective	Mitigation	
	Maintain or improve existing temperature regime along perennial streams in relation to water quality	Designation of riparian management units to maintain and improve shade canopies over stream channels (BMP T-2; T-7; T-8).	N/A
	Continue recovery of downstream riparian and channel conditions	Design units to insure channel bank stability, and provide adequate buffers to reduce sediment inputs and minimize peak flow effects (BMP T-2; T-7; T-8; T-12). Boundaries are placed in such a manner to avoid compromising stability of the channel banks. No trees are cut which attribute to bank stability.	N/A
	Maintain or improve the quality of water for domestic and fisheries users	Designate riparian management units and specific prescriptions for each individual unit adjacent to stream courses requiring protection (BMP; T-7).	N/A
	Maintain natural filtration of surface, overland flow, through post sale activities.	Establish appropriate riparian management units and establish fire lines to ensure maintenance of established buffers, filter strips (BMP T-7; T-8; F-2; F-3).	N/A
All	Maintain or improve channel bank stability.	Establish riparian management units that include channel bank areas and or establish marking prescriptions that prevent any tree attributing to bank stability from being marked (BMP T-2; T-6; T-7; T-8).	N/A

Table 16 : Mitigation Measures Common to All Action Alternatives			
Units	Mitigation	Restriction Dates	
Hydrology/Stream Channels/Water Quality/Riparian			
All	Objective (continued)	Mitigation (continued)	
	Control the amount of sediment leaving the road system.	Utilize appropriate clauses within the contract to ensure that winter haul occurs on roads with adequate surface rock and that erosion control techniques such as mulching of bare soils associated to the road system occur.	N/A
	To protect Riparian Reserves and promote Aquatic Conservation Strategy Objectives directional falling is required next to untreated Riparian Reserves, regardless of the harvest prescription, to avoid felling trees into or yarding through Riparian Reserves.		N/A
Fisheries			
All	No in-stream activities would take place in fish-bearing streams, or other perennial streams near their confluence with fish-bearing streams, outside of the in-water work window. Assure stream crossings allow natural flow of water		July 15 – Aug 30
All	Any project activity that must occur within fish-bearing and other perennial streams must comply with Oregon Department of Fish and Wildlife (ODFW) seasonal restrictions on in-stream work activities. Best Management Practices (BMPs), including placement of sediment barriers, provision of flow bypass, and other applicable measures, would be included in project design as necessary to control off-site movement of sediment.		Must occur between June 1 – Sept. 30
All	To maintain water quality and fish habitat, hauling would be restricted on native-surface roads during the rainy season between November 1 and May 31.		Nov. 1- May 31
All	To minimize erosion and sedimentation, construction and/or maintenance of roads would not be done when soils are saturated or runoff occurs. A stable fill would be constructed across all streams.		N/A
1a, 2a, 4a, 4b, 6a, 24	Designated skid trails would be located outside drainages, seeps, springs and/or concave landforms, which could accumulate and transport overland flow and sediment. Existing skid trails that are outside drainages, seeps and springs that meet the needs of the yarding system should be used wherever possible.		N/A
1a, 2a, 4a, 4b, 6a, 24	Erosion control measures would be implemented as soon as possible after soils have been disturbed.		N/A

Table 16 : Mitigation Measures Common to All Action Alternatives		
Units	Mitigation	Restriction Dates
Fisheries continued		
1a, 2a, 4a, 4b, 6a, 24	All skid trails and landings would be water barred to provide adequate drainage. Water bar location should occur where local terrain facilitates effective drainage of the skid trail or landing. In general, water bars should be constructed every 100 feet on slopes less than 15 percent, and every 50 feet on slopes greater than 15 percent. Water bars should be “keyed in” to the cut bank and have a clear outlet on the down hill side. Where available, slash should be placed on skid trails and landings. Watershed specialists should be consulted on construction of water bars.	N/A
All	In units containing stream channels, all existing large woody debris would be retained within Riparian Reserves to maintain channel stability; provide nutrients and food for aquatic plants and insects, and to provide buffering so as to filter sediment from runoff and maintain water quality.	N/A
Wildlife		
4a, 4b, 4c, 6a, 8a, 9, 24, 27	Northern spotted owl: For activities within a 0.25-mile radius of any known spotted owl activity center, a seasonal restriction on harvest and associated activities would be required between March 1 and Sept. 30 (the BO restricts operations until June 30 but this date was extended by the district wildlife biologist as allowed under the BO). This term and condition may be waived by the wildlife biologist in a particular year if nesting or reproductive success surveys conducted according to the Service-endorsed survey guidelines reveal that spotted owls are non-nesting or that no young are present that year. Waivers are valid only until March 1 of the following year. (USDI, 1998a)	March 1 – Sept. 30
2b, 4c, 8a, 8b, 9, 27	Northern spotted owl: Helicopter operations are prohibited within ½ miles of known nest sites during the nesting period. This restriction will apply until non-nesting is verified (USDA. 1990, p. IV-73, FS-173). This term and condition may be waived by the wildlife biologist in a particular year if nesting or reproductive success surveys conducted according to the Service-endorsed survey guidelines reveal that spotted owls are non-nesting or that no young are present that year. Waivers are valid only until March 1 of the following year.	March 1 – Sept. 30
All	Every effort will be made to retain remnant old-growth trees, snags, down wood, and trees exceeding 30 inches DBH on all harvest units. If safety concerns warrant falling of snags they will be left on site.	N/A
All	Elk habitat: Maintain all existing year-round road closures. Close temporary spur roads after completing project operations. Restrict road building and logging activities two days prior to and during Cascade elk rifle season (mid-October).	Mid-October

Table 16 : Mitigation Measures Common to All Action Alternatives							
Units	Mitigation						Restriction Dates
Wildlife continued							
All	Peregrine Falcon: If peregrine falcons are discovered during the course of harvest operations, restrict logging operations from January 15th to July 31st or until non-occupancy or non-breeding status can be determined if a nest site is located prior to operations.						Jan. 15- July 31
Units	Required Mitigation Measures						Restriction Dates
	Sensitive Botanical Species						
	Species Name	Number of Sites	Status	No Harvest Buffer Widths (ft) Alternative 2	No Harvest Buffer Widths (ft) Alternative 3	No Harvest Buffer Widths (ft) Alternative 4	
1a	<i>Nephroma</i>	1	Sensitive species	150	300	300	N/A
2a	<i>occultum</i>	1		150	150	150	
1a	<i>Pseudocyphallria rainierensis</i>	1	Sensitive species	150	300	300	N/A
8a		1		150	150	N/A	
6a	<i>Albatrellus ellisii</i>	1	Manage known sites	150	300	N/A	N/A
6a	<i>Polyozellus muptiPLEX</i>	1	Manage known sites	150	300	N/A	N/A
Vegetation - General							
All	Residual Tree Protection: No thinning during sap flow to protect remaining trees from damage during logging operations, unless approved by District Silviculturist						Apr 30-June 30

Table 16 : Mitigation Measures Common to All Action Alternatives		
Units	Mitigation	Restriction Dates
Invasive Plants		
All	Pre-treat existing weed sites	N/A
	Survey to locate noxious weed populations and remove individuals and populations, where possible, in harvest units and along adjacent road systems.	N/A
	Existing weed sites of meadow knapweed, false brome and Scotch broom would be buffered from thinning activities to prevent weed seed from being transported throughout the harvested area.	N/A
	All road construction and logging equipment would be pressure washed prior to working in the area.	N/A
	Obtain gravel for road construction and reconstruction from a weed-free rock sources.	N/A
	Minimize areas of soil disturbance during all harvest activities. Seed all disturbed areas with native species, including landings and subsoiled skid roads, to reduce weed establishment.	N/A
	Berm, gate, or rip and seed re-opened road to reduce disturbance and incoming weed seed due to vehicular traffic.	N/A
Recreation		
8a	Maintain a 100-foot no-harvest buffer on both sides of the South Pyramid Creek Trail east of Forest Road 2047. Place warning signs at trail access points on roads when helicopter operations are active over the trail.	When helicopter operations are active over trail.
1a, 2a, 2b, 4c, 8a, 9	Avoid logging or hauling operations during weekends from July 4th through Labor Day weekend. A weekend is defined as starting at 5pm on Friday and ending at 7pm on Sunday.	Weekends July 4 – Labor Day
Roads		
All	All system roads can be hauled on during any season, except when prohibited by other resource mitigation measures. The timber purchaser is responsible for repairing any road damage that occurs during logging operations. Some roads in the planning area may have limited strength (degradation may occur sooner due to the depth of surfacing or other characteristics). This does not apply to local spur roads.	N/A
	Rip, seed and re-close temporary operator’s spur that was reopened for harvest activities. Waterbar, seed and fertilized disturbed areas on skid roads as needed.	N/A
All	Dry weather haul would be required on native surface spurs	N/A

Table 16 : Mitigation Measures Common to All Action Alternatives		
Units	Mitigation	Restriction Dates
All	All haul roads would be maintained in stable condition. Watering the road surface would be used if roads become excessively dusty during the summer.	N/A
Heritage		
All	Protect known heritage sites. In order to extend protection to heritage resources which have not yet been discovered, but which may be uncovered during the course of project activities, contract clause CT6.24 or a similar clause must be included in all project prospecti and contracts. The contract clause outlines the procedures to follow in the event heritage resources are inadvertently discovered or disturbed during project activities. Basically, if material is inadvertently discovered, suspend operations and consult the District Archaeologist. Protect known eligible sites.	N/A
	If historic trails are found during unit layout, the District Archaeologist would determine the most appropriate protection. Protection can range from complete avoidance to mitigation procedures that conserve historic or scientific values (FW-271, pgs. IV-87-88, USDA 1990).	N/A
	No equipment would be allowed off the road within the site area during project operations for staging, turn-arounds, or refueling. Project activities that might occur outside of the area defined in the heritage resource inventory schema must be coordinated with the district archaeologist prior to initiation. This includes the establishment of harvest landings, helicopter landings, guy-line equipment anchors, slash burning and silvicultural treatments.	N/A
	Changes to the current unit configurations and/or the addition any new units would require consultation with the District Archaeologist in order to protect known and unknown heritage resources.	N/A
All	Prior to cultivating skid roads after harvest activities, a re-entry survey must be conducted in those areas deemed high probability for the occurrence of heritage resources. Coordination with the district archaeologist is essential to ensure the protection of heritage resources.	N/A

Comparison of Alternatives

Table 17: Comparison of Alternatives

Parameters	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Need 1: Contribution to Probable Sale Quantity (ccf = hundred cubic feet)	0 ccf	8882 ccf	8034 ccf	7588 ccf
Need 2: Improving Growth and Yield Potential (acres)				
Thinning	0	189	68	15
Regeneration	0	0	43	71
Harvest of natural stands (acres)	0	189	111	86
Harvest Acres in Unroaded Block (acres)	0 acres	105 acres	18 acres	0 acres
Loss of late-successional habitat	0 acres	0 acres	0 acres	0 acres
Loss of Interior Unroaded Acres	0 acres	0 acres	0 acres	0 acres
Northern spotted owl				
Removed	0	0	61	24
Habitat degraded	0	266	119	23
Habitat downgraded	0	48	0	0
Goshawk Nest Site – proximity of units to nest	0 units	3 units within ¼ mile	Closest unit about ½ mile	Closest unit about 2/3 mile
Goshawk Nest Site – type of treatments of units in proximity to nest	No treatment	All three thinning units – helicopter logging	Closest unit is regeneration unit – helicopter logging	Closest unit is thinning – ground-based logging
Logging Costs	\$0	\$676,375	\$774,105	\$923,930
Acres by Logging System				
Ground-based	0	61	59	34
Helicopter	0	128	52	52
Associated Costs per CCF	\$0	\$127 per ccf	\$113 per ccf	\$137 per ccf
Cost/Benefit Ratio	0	1.96	2.2	1.82
Soil Compaction Potential – (12% of ground-based harvest acres)	0 acres	3% of 189 acres	6% of 111 acres	5% of 86 acres

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). The following alternatives were considered, but eliminated from detailed consideration for the reasons stated.

New Road Construction in the Unroaded Landscape Block

Most large unroaded blocks (>1000 acres) possess challenging terrain for extensive road systems. The unroaded block is one of the few areas left where road construction options are quite simple. Despite favorable terrain conditions, the District Ranger directed the interdisciplinary team (IDT) not consider alternatives at this time that build permanent roads into the heart of the unroaded block, in order to maintain future options for managing this large unroaded block.

Extensive Harvest in the Unroaded Block

For the same rationale stated above (managing large unroaded blocks), the District Ranger asked the team to drop proposed units in the heart of the unroaded block, even though such units could have been logged without new road construction.

Large Regeneration Harvest Units

While large (>40 acres) regeneration harvest units have clear economic benefits due to operational efficiency and have historically been created on this forest, they are viewed today by the public as having greater impacts on habitat and social values of forests. The South Pyramid planning area offered enough opportunities to meet project objectives without having to create large regeneration harvest units for this project.

Regeneration Harvesting Late-Successional Habitat

The IDT initially considered harvesting several leave blocks of late-successional habitat in the planning area as part of an alternative that harvests few acres and completely avoids harvest in the unroaded block. A leave block is natural forest sandwiched between existing plantations. Selected leave blocks for this project were small and had been reduced by windthrow damage and salvage in the past. These blocks offered no interior habitat value. The District Ranger asked the team to forgo harvesting late-successional habitat for this project due to the current public sensitivity over harvesting old-growth habitat.

Harvest in Riparian Reserves

Local landscape processes and riparian functions were considered with recommendations from the Middle Santiam Watershed Analysis to determine appropriate ways to achieve Aquatic Conservation Strategy (ACS) objectives in Riparian Reserves within the planning area. The Interdisciplinary Team concluded that due to the age and existing condition of the stands in the Riparian Reserves no additional enhancement treatments were needed to meet ACS objectives at this time. The stands are naturally progressing towards late-successional characteristics and creating woody material to provide streams with organic material. It was also determined that the interim Riparian Reserve widths should be applied to the area.

Environmental Consequences

This section describes the existing condition of the resources and the anticipated environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the No Action Alternatives that provides a baseline for evaluation and comparison of the other alternatives that follow.

The cumulative effects discussed in this section include an analysis and a concise description of the identifiable present effects of past actions to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the proposed action and its alternatives may have a continuing, additive and significant relationship to those effects. The cumulative effects of the proposed action and the alternatives in this analysis are primarily based on the aggregate effects of the past, present and reasonably foreseeable future actions. Individual effects of past actions have not been listed or analyzed and are not necessary to describe the cumulative effects of this proposal or alternatives (CEQ Memorandum, Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, June 24, 2005).

Several resource sections make reference to resource reports that are in the appendix. These resource reports provide more in-depth information than is presented in the environmental consequences section of this document (see also Appendix K for additional cumulative effects information).

Past, Present and Reasonably Foreseeable Future Actions

The following summary focuses on past, present and future actions within the Headwaters Middle Santiam subwatershed (6th field) of which the South Pyramid analysis area is a part. Table 18 displays the total area in this watershed, how many acres have been harvested by decade on National Forest System Lands and how many acres are on other ownerships and how many of those areas are estimated to have been harvested. Following the table is a map of previous harvest. Although the decade of harvest is not known on these lands, it is estimated that nearly all have been harvested in the last several decades.

Table 18: Summary of Past Activities in Subwatershed

Item	Headwaters Middle Santiam
Total Acres in Subwatershed	20,792
Harvest by Decade on National Forest System Lands	
1941-1950	42
1951-1960	1,189
1961-1970	612
1971-1980	1,151
1981-1990	1,038
1991-2000	852
Total Acres Harvested on NF System Lands	4,884
Acres of National Forest System Land	14,110
Acres of Other Ownership	6,682
Estimate Acres harvested on Other Ownership Lands in last 40-60 years	6,000+

Harvest by Decade on National Forest Lands in Headwaters of Middle Santiam Subwatershed

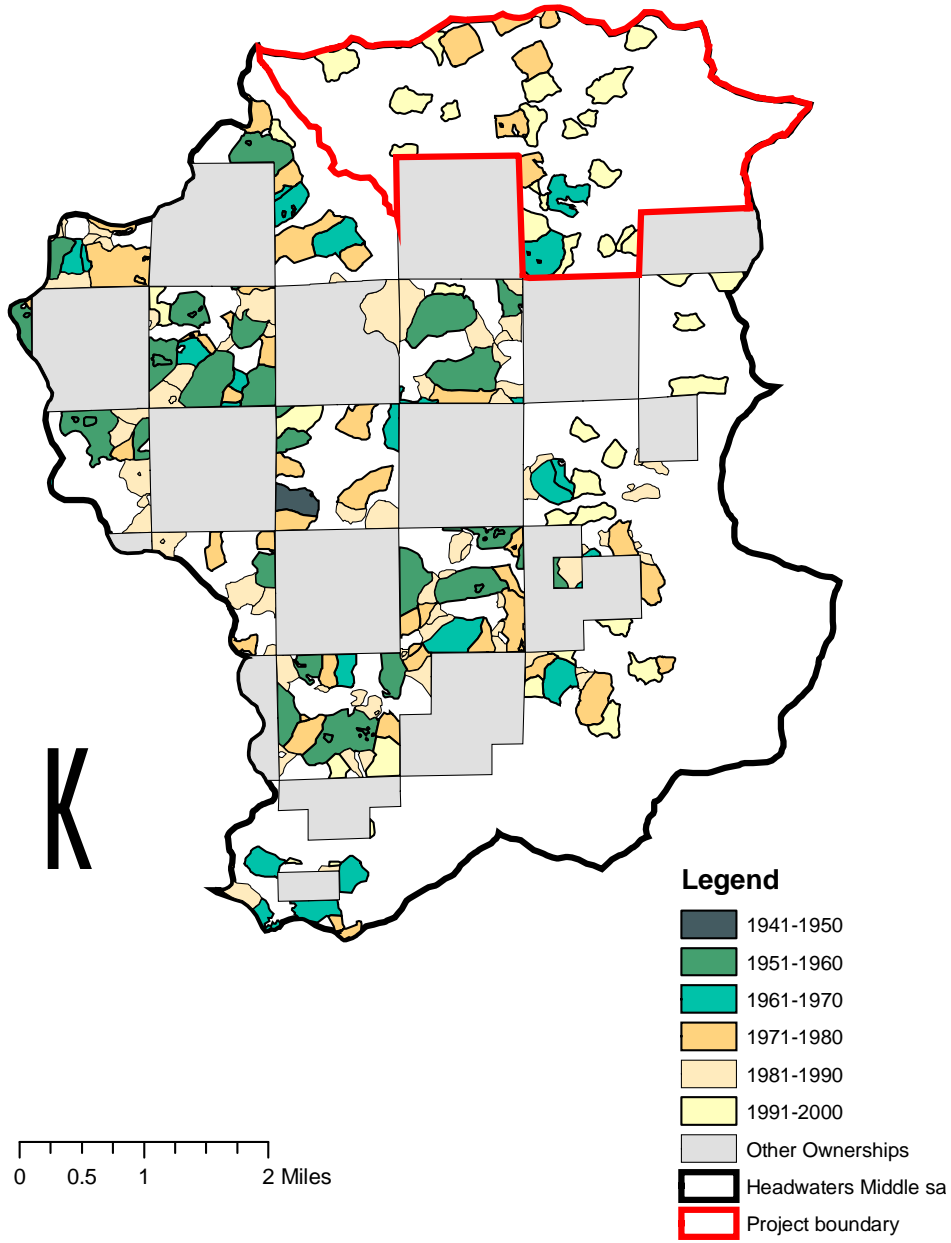


Figure 10: Past harvest activities

In the foreseeable future, the Sweet Home Ranger District is likely to plan pre-commercial and commercial thinning of managed stands in this subwatershed. In contrast, no harvest of natural stands is currently planned beyond the South Pyramid Timber Sale. However, there is always a potential that windthrown trees from natural and managed stands would be salvaged in the next 10 years. Such salvage would likely be confined to existing road prisms, unless a sizable stand area (over 5 acres) is substantially affected (half of the trees).

Actual future commercial thinning acres are difficult to estimate. The subwatershed has approximately 1120 managed stand acres potentially suitable and available for commercial thinning. Approximately 520 managed stand acres are currently listed on the District's 5-year action plan for commercial thinning (Ethyl and Holman) in this subwatershed. Typically one-third of proposed harvest acres have been dropped as special habitats and Riparian Reserves. Thinning would likely reduce stand densities to an average 40-60% canopy closure depending on site-specific resource concerns. These managed stands are accessible by existing road systems created by past harvest operations; therefore, very little road construction is anticipated to complete thinning activities.

Any road construction connected to future thinnings would create short, temporary spurs to landing sites. Future thinnings could also reopen bermed spurs. Both new and reopened spurs of this nature are closed after harvest operations are complete. By in large, future public harvest would not increase road densities in the Upper Middle Santiam subwatershed, though future sales could fund more road closures.

Another 1,200 acres of young managed stands in the subwatershed are prime candidates for pre-commercial thinning (PCT). PCT operations reduce stand densities to approximately 200-250 trees per acre. This work does not require new road construction or reconstruction to complete. Current appropriated budgets have only been able to accomplish 10% of PCT thinning needs. Funding from commercial thinning sales and the PL106-393 Title II funding program could accomplish another 10% of available acres over the next 10 years.

On slightly over 6,600 acres of private land in this subwatershed, some commercial thinning and regeneration harvest would likely occur in the foreseeable future. (No private acres lie within the South Pyramid project area, though two private parcels of young plantations form part of its boundary). All private land harvest would occur in managed stands. How much private harvest would occur is difficult to estimate, but given the landowner's even-flow harvest strategy, harvest could affect 12-15% of private lands in this subwatershed in the next decade. Regeneration harvesting would likely be more common than commercial thinning on these private lands. Thinning by the landowner has so far been limited to gentle terrain near roads that can be completed with ground-based equipment. Prescriptions have been conservative by thinning from below and retaining 60-70% canopy closure. In contrast to public lands, very little pre-commercial thinning occurs on these private lands.

Private land harvest would also rely heavily on the existing road system, requiring very little new road construction. The private landowner in this subwatershed routinely closes (berms or gates) short local spurs when they are not needed for harvest activities.

Commercial harvest operations on both public and private lands can be expected to create fuel reduction activities, such as slash burning. Most slash reduction would occur as pile burning, though broadcast burning

could occur on steeper private land after regeneration harvest. Slash piles are created with tractor or manual labor.

In addition to harvest operations described above and its related activities, road and trail maintenance are activities also likely to occur in the foreseeable future in this subwatershed. Road maintenance includes right-of-way brushing, removal of windthrown trees in roadways, and ditch cleaning where necessary. Trail work includes similar work but on a smaller scale and is completed with hand labor. Finally, a limited amount of noxious weed control would occur along roads in this subwatershed. This work would be completed by hand labor, or limited spot chemical application through an existing forest-wide contract.

Extensive timber harvest, mostly regeneration harvesting, has occurred on both public and private lands in this watershed. In order to access harvest areas, an extensive road system was developed. For some resources these past activities are still contributing to cumulative effects and for some resources they are not (see following discussion and Appendix K).

Physical Resources

Special Habitats

Introduction – Special Habitats

Special habitats are nonforested areas including, meadows, ponds, caves, rock gardens, talus and cliffs. These sites are important reservoirs of biodiversity and provide habitat for a wide variety of plants, fungi, and animals, many of which are not found in forested areas. In fact, while special habitats cover only about 5% of the area in the Cascades Range, 85% of native flowering plants are found in these areas (Hickman 1976). In addition, special habitats provide habitat for many species currently on the Region 6 Sensitive Species List (see also Appendix D).

Analysis Methods – Special Habitats

Special habitats are inventoried during the course of vegetation typing and project area survey for sensitive botanical species. Special habitats identified during this inventory are mapped and stored in GIS files.

Desired Future Condition – Special Habitats

The desired condition for special habitats is to minimize direct and indirect influence from project disturbance, and to maintain microclimatic and site conditions within the historical range of conditions. A large part of maintaining the integrity of special habitats is to preclude the introduction and establishment of non-native invasive weeds.

Existing Condition - Special Habitats

The South Pyramid planning area contains approximately 120 acres of special habitats. Most of these acres are in large rock gardens on the east end of the planning area. The earth-slump topography of the area has created numerous small wetlands and seasonal ponds, most of which are less than a one-half acre in size.

Many of the proposed units in the South Pyramid planning area contain special habitats as outlined in Table 19 below. These special habitats provide habitat for different plant communities and contribute species diversity to the area, which is otherwise fairly uniform. Small wetlands and meadows are the most common special habitats in the area.

Table 19: Special Habitats in or near Proposed Harvest Units

Unit No.	Special Habitats
2a	Dry rock garden with <i>Orobanche pinorum</i> (on Forest Concern List)
4a	Rock garden near top of stand
8a	Several wetlands and seasonal ponds
8b	Wet meadow and Sitka alder wetland.
27	Devil’s club seep

Environmental Consequences – Special Habitats

Alternative 1 – No Action

The No Action alternative would have no impact on special habitats.

Alternatives 2, 3, and 4

Proposed harvest unit design took into account recommended mitigation to protect special habitats. No special habitats occur in proximity to landings. These habitats are buffered from physical disturbance in all action alternatives (refer to Table 16 Mitigation Measures Common to All Alternatives and Appendix A, Unit Prescriptions). Buffers should be sufficient to protect the microclimate and prevent invasive weed introduction. Therefore, no direct, indirect, or cumulative effects on special habitats are anticipated as a result of implementation of any alternative.

Conclusions and Rationale for Conclusions – Special Habitats

Given that mitigation measures are implemented, no detrimental effects to special habitats are anticipated from any action alternative. The rationale for this conclusion is that there would be no direct or indirect physical disturbances to special habitats and recommended buffers are of sufficient size to maintain microclimate and site conditions of the habitats.

Consistency with Direction and Regulations – Special Habitats

Special habitats in all action alternatives would be protected in accordance with recommendations from the NW Forest Plan and Willamette National Forest Special Habitat Management Guide.

Fuels Management and Wildfires

Introduction – Fuels Management and Wildfires

Fire has long been a natural component of the forest ecosystem. A legacy of fire suppression has affected the structure and composition of the current forest conditions. Conifer stands generally have become denser, mainly in small and medium size classes of shade-tolerant and fire-sensitive species. Vertical fuels have become more continuous, contributing to spatially homogeneous forests. The increased density of young trees together with increased fuels from fire suppression and tree mortality has created condition favorable to more intense and severe fire. Sustaining resources is predicated on having healthy, resilient ecosystems. In fire adapted ecosystems, some measure of fire use at appropriate intensity, frequency and time of year should be included in management strategies intended to protect and sustain watersheds, species, and other natural resources over the long term” (Protecting People and Sustaining Resources in Fire- Adapted Ecosystems- A Cohesive Strategy, USFS Response to GAO Report 99-65, 10/13/2000).

Analysis Methods – Fuels Management and Wildfires

Fuel Profile analysis was completed using ocular and photo series interpretation methods (Maxwell et, al. 1980). Values were then referenced to the Fire Behavior Prediction Systems Fuel Models 1-13 (Anderson, 1982).

The predicted fuel loading from harvest activities was generated using fuel prediction tables (Brown, et al.1977, 1980). Stand exam data and estimated tree removal volume was used to predict the 0-3 inch diameter fuel loading in tons per acre.

Prescribed fire smoke emissions were calculated using First Order Fire Effects Model (FOFEM) version 5.0. FOFEM calculates particulate matter in both the 2.5 and 10 micrometer size class (PM 2.5 and PM 10). The Oregon State Implementation regulates PM 2.5 and PM 10 levels in special Protection zones or Class 1 Airsheds and highly regulated.

Desired Future Conditions – Fuels Management and Wildfires

The desired condition is to promote sustainable vegetative structure and species composition that correlates with the natural fire regime. The goal is to move towards reducing fuel loadings that support low intensity fires rather than high intensity stand-replacing events. In forests that have not experienced fire for many decades, multiple fuel treatments- that is-decreasing stand density, reducing surface fuels and removing ladder fuels may be required to significantly reduce the probability that extreme fire behavior would occur. Fuel treatments can be designed to restore forest conditions to more resilient conditions than currently exist.

Existing Condition – Fuels Management and Wildfires

The South Pyramid Project Area is represented primarily by Fire Regime III, mixed frequency and mixed severity. Fire Regime refers to the rate of fire occurrence within a given area in a given period of time. Severity refers to the amount of replacement in the dominant overstory.

Present forestry practices have probably had a negligible effect on the Fire Regime in the analysis area. The large number of roads and managed stands have increased accessibility for fire suppression efforts, and

provided fuel breaks through much of the area. The size of smaller fires has been kept artificially low, and the opportunity for these fires to become large stand-replacing fires has been greatly reduced.

The current, fragmented landscape supports various fire regimes and intensities on a localized scale. The resulting condition probably reflects an alteration in the distribution, composition and extent of plant communities that had adapted to the pre-management fire regime. Fuel profiles in the watershed are affected by three elements: silvicultural treatments, fires and time. All three have played a role in the present fuels profile associated with the watershed. Historically large, stand replacing fires have played a major role in this watershed, and would most likely continue to do so.

Fire Regime Condition Class (FRCC) describes the degree of departure of current vegetation from the historic fire regime (Hann et, al.2003). FRCC 1, 2 and 3 rank the degree of departure from the historic range of variability as described in the table below.

Table 20: Fire Regime Condition Class Definitions

FRCC	Departure of Fire Regime from Historic Range	Risk of losing key ecosystem components	Alteration of vegetation attributes from historic range
1	Near historic range (departure is not more than one return interval)	Low	Functioning within the historic range
2	Moderately altered; moderate change in size and intensity has resulted	Moderate	Moderately altered
3	Significantly altered; dramatic changes in fire size and severity has resulted	Severe	Significantly altered

Much of the South Pyramid Project Area can be categorized as a FRCC 1. This means that the area is not outside of the historical range of variability for fire intervals, or more than one fire cycle has not been missed. However, given the age of trees within much of the Middle Santiam watershed, one can conclude that the area is nearing the end of the current fire return interval.

Additionally, some areas currently have above average fuel loading, 15-59 tons per acre. An elevated risk of high-severity fire due to the fuel loadings exists across the landscape. Continuous canopy closure and increased fuel due to fire suppression create a potential for large, severe fire. FRCC 1 may understate the potential for loss of vegetation attributes due to large fires.

Fuel Models: The majority of this project planning area is represented by Fire Behavior Prediction System Fuel Model 10 (FM). Fuel Model 10 constitutes 75% of the acres (heavy timber litter/understory). This profile can be found in stands that were or were not previously harvested. Fires burn in surface and ground fuels with greater intensity than other fuel models. Only under severe weather conditions involving high temperatures, low humidity’s, and high winds do the fuels pose fire hazards. About 25% of the acres are represented by a mixed conifer stand with a heavy concentration of down and standing woody component. Ground fire behavior is higher in intensity than Fuel Model 8 or 9 because of the heavier fuel loading. Torching trees (fires in the crowns of trees) occurs more frequently.

The table below describes the predicted fire behavior for various Fuel Models (Anderson 1982).

Table 21: Predicted Fire Behavior in Fuel Models 8, 9, 10 and 11

Fuel Model – fuel conditions defined by quantity and arrangement (Anderson 1982)	Desired Fuel Models		Existing Fuel Models	
	8	9	10	11
Flame Length (ft) –Flame lengths affect firefighters’ ability to suppress fires. At four-foot flame lengths, hand crews generally are able to attack fires safely, while dozers may be used in fires having flame lengths up to eight feet. Flame length also indicates severity, since long flame lengths can signal that a fire is in the crowns of trees. Predicted flame length can be modeled using software.	1 - 2	2 - 3	4 - 5	3.5
Rate of Spread (ft/hr)	105	495	521	396

Environmental Consequences – Fuels Management and Wildfires

Introduction: Fire is influenced by weather, topography and fuels. Management activities can influence the amount of fuels on the landscape but have little influence over weather or topography.

The following table displays the acres of harvest and fuel treatments for each of the proposed alternatives.

Table 22: Comparison of Harvest and Fuel Treatment Prescriptions by Alternative

Activity	Alternative 1	Alternative 2 Acres	Alternative 3 Acres	Alternative 4 Acres
Thinning	0	189	68	15
Regeneration Harvest	0	0	43	75
Acres of Slash Treatment	0	140	97	78
Acres of Untreated Slash	0	49	14	12

*Direct and Indirect Effects - Fuels Management and Wildfires***Alternative 1: (No Action)**

Under Alternative 1, no activity-generated fuels would be created and forested stands in the area would continue on a path of natural succession. Slow growing and weakened trees would die and contribute to the fuel buildup on the forest floor. Fuel loadings would continue to increase due to insect and disease-caused tree mortality, forest succession, including further in-growth of understory trees and vegetation.

Over time, the increasing fuel loads could be associated with greater fire intensity and severity, and increased rates of spread if a fire were to occur here. Fire occurrence would continue on the landscape only under uncontrolled, wildfire conditions and these would be suppressed.

Alternative 2 – Proposed Action

Under Alternative 2, proposed fuel treatments would include handpiling and burning, and yarding tops to landings. In units to be logged with ground-based equipment the slash would be crushed with equipment during logging to reduce fuel depth.

The proposed thinning of 189 acres reduces the number of trees per acre and creates a separation in the canopy that can make stands less susceptible to sustaining a crown fire. Ladder fuels would be reduced as harvest operations remove the smaller trees.

Surface fuels would increase immediately following harvest and before fuel treatments are completed. Light to heavy levels of logging slash would be generated with levels dependant on the degree of thinning that takes place (40% to 60% residual canopy closure). Fire behavior in the thinned units would increase slightly for 2-4 years. In time surface fuels would begin to decompose, thus decreasing potential fire behavior.

Fuel treatments such as hand piling and burning would occur in areas of highest risk for human-caused fires, adjacent to major roads. On 61 acres activity-generated fuels would be crushed by ground-based yarding equipment on skid roads. This would reduce fuel depth and decrease the rate of spread and flame length of fires. On the remaining 128 acres, yarding tops attached and burning them on the landings would remove the small diameter fuels and decrease the surface fuel loadings on the units. These fuel treatments reduce the probability of fire in the highest risk areas.

Some surface fuels would remain untreated on all harvest units resulting in increased fuel loadings on an estimated 49 acres. Increased fuel loads affect fire behavior by increasing the intensity and residence time of fire. This will increase the difficulty of control in the event of wildfire.

Fuel loadings in untreated areas would be within the maximum acceptable levels outlined in the Willamette Forest Plan (1990), but would be toward the upper end of the acceptable fuel loadings (see Table 23). Since thinning would likely occur over a period of years, not all of the activity-generated fuels would be on the ground all at once; therefore, untreated fuel would be in varied stages of height and decomposition. Moderate to heavy precipitation in this area accelerates the decomposition processes and over time, reduces the risk of large fire growth associated with untreated fuel buildup.

Table 23: Maximum Acceptable Post-Harvest Fuel Loadings in Untreated Areas

Diameter (at the small end)	Tons/Acre
0-3"	7-11
3"- 9"	8-12
Totals	15-23

Alternative 3

Under Alternative 3 fuel treatments would include handpiling and burning along major transportation routes, yarding tops to landings where they would be piled and burned, crushing slash during logging with ground-based equipment to reduce fuel depths and broadcast burning in the regeneration units.

The proposed thinning of 68 acres would decrease the number of trees per acre and create a separation in the canopy that can make stands less susceptible to sustaining a crown fire. Ladder fuels would be reduced as harvest operations remove smaller trees.

Surface fuels would increase immediately following harvest and before fuel treatments are completed. Light to heavy levels of logging slash would be generated with levels dependant on the degree of thinning that takes place (40% to 60% residual canopy closure). Fire behavior in the thinned units would increase slightly for 2-4 years after harvest. In time surface fuels would begin to decompose, thus decreasing potential fire behavior. Crushing slash and piling along roads would decrease fuel depths and potentially reduce fire behavior.

As in Alternative 2, some surface fuels would remain untreated in approximately 14 acres of thinned units resulting in increased fuel loading. The effects of these untreated fuels are similar to those described in Alternative 2, but would occur on fewer acres.

In the 43 acres of regeneration harvest the proposed fuel treatment is to broadcast burn. This would reduce the amount of activity-generated fuels and create openings for tree planting.

Alternative 4

Under Alternative 4 fuel treatments would include handpiling and burning piles along major transportation routes, reducing fuel depth by crushing slash with ground-based equipment during logging and broadcast burning.

The 15 acres of proposed thinning would decrease the number of trees per acre and fewer trees creates a separation in the canopy that can make stands less susceptible to sustaining a crown fire. Ladder fuels will be reduced as harvest operations remove smaller trees.

Surface fuels would increase immediately following harvest and before fuel treatments are completed. Light to heavy levels of logging slash would be generated with levels dependant on the degree of thinning that takes place (40% to 60% residual canopy closure). Fire behavior in the thinned units would increase slightly

for 2-4 years. In time surface fuels would begin to decompose, thus decreasing potential fire behavior. Crushing slash and piling along roads would decrease fuel depths and reduce potential fire behavior.

As in Alternative 2, some surface fuels would remain untreated in approximately 12 acres of thinned units resulting in increased fuel loadings. The effects of these untreated fuels are similar to those described in Alternative 2, but would occur on fewer acres.

In the 71 acres of regeneration harvest the proposed fuel treatment is to broadcast burn. This would reduce the amount of activity-generated fuels and create openings for planting.

Cumulative Effects Fuels Management and Wildfires

Area

Cumulative effects were evaluated 3,292 acres of the South Pyramid planning area.

Actions Contributing to Cumulative Effects

Approximately 264 acres of pre-commercial thinning (see Appendix B) would contribute to cumulative effects (see Appendix K for more cumulative effects information).

Cumulative Effects

Approximately 734 acres were regeneration harvested in the planning area over the past 30 years (see Appendix K). These managed stands were broadcast burned after the logging which removed most of the smaller fuels and logging slash from the units. As a result, the current fuel loading within these units is within the Forest Plan standards.

There are no present or on-going management activities in the planning area that affect fuels.

About 264 acres of precommercial thinning are planned and reasonably foreseeable future actions in the planning area. These acres will be thinned two to five years following the harvest treatments proposed in the action alternatives. The standard fuels treatments for precommercial thinning is to pull the cut trees 30 to 60 feet away from roads. As a result, the fuel loadings within these precommercial thinning units may exceed the Forest Plan standard for 0-3 inch fuels on a per acre basis for 2 to 3 years following treatment. After that, natural decomposition reduces the fuel loading.

There would be no cumulative effects on fuel loading in the planning area from any of the action alternatives based on past and present activities. However, the future planned precommercial thinning and the proposed action alternatives would create cumulative impacts on fuel loadings in the project area.

For Alternative 2, the amount of untreated fuels would be 49 acres from this entry plus 264 acres of precommercial thinning slash resulting in 313 acres of untreated fuels. The potential cumulative effect would be greater risk of a wildfire that would be difficult to control due to flame length and intensity on these acres. The actual acres of increased risk would likely be less than this however because the timber harvest would be spread over two to three years and the precommercial thinning would occur following the harvest so untreated fuels in the harvest areas would have already decomposed, lowering the fuel loading, by the time the precommercial thinning activities were implemented.

For Alternatives 3 and 4, the increased acres of untreated fuels would be 278 acres (14 acres from this entry plus 264 acres of precommercial thinning) and 276 acres (12 acres from this entry plus 264 acres of precommercial thinning) respectively. Effects would be similar to Alternative 2.

Conclusions – Fuels Management and Wildfires

Past management activities, fire suppression and lack of management in some areas has changed the forest stand characteristics, landscape structure and fuel loadings by removing the principal agents of change and renewal.

The current, fragmented landscape supports various fire intensities as the decrease or increase of vegetation responds differentially to fire. The resulting condition probably reflects an alteration in the distribution, composition and extent of plant communities that had adapted to the pre-management fire regime.

The proposed actions result in an increase of fuel loadings that are generated by logging slash, which would decrease over time. The canopy bulk density of the stands would decrease with the proposed actions through reduced stand density. Thinning units would have an overall short term (3-5 years) increase of fuel loadings while regeneration units would have an overall decrease in loadings.

Alternative 1- No Action would result in fuel models that increase fire intensities and are arranged in large contiguous patches which increase resistance to control within the project area. This alternative would increase the risk of fire spreading outside the project area to adjacent Forest Service lands.

The action alternatives would provide a variety of fuels treatments, which reduce fire intensities within the project area. Alternative 4 proposes the least amount of silvicultural treatments by focusing management onto fewer acres. This would also lessen the amount of activity-generated fuels and the need for fuel treatment. The fuel models in these units would be highest and the fire behavior would also be more intense until prescribed fire treatments are implemented. Location of fuel treatments is an important aspect in the prevention of fires spreading outside the project area.

Monitoring – Fuels Management and Wildfires

Post treatment monitoring procedures would consist of fuel profile ocular and photo series interpretation methods (Maxwell et, al. 1980). Values would then be referenced to the Fire Behavior Prediction Systems Fuel Models 1-13 (Anderson, 1982) to ensure resource objectives had been met.

Consistency with Direction and Regulations – Fuels Management and Wildfires

Fuel treatments are consistent with direction in the amended Willamette Forest Plan.

Air Quality

Introduction – Air Quality

The State of Oregon has delegated authority for attainment standards set by the 1990 Clean Air Act and the 1977 Clean Air Act and its amendments. To do this, the state developed the Oregon Smoke Management Plan. The Forest Service has adopted this plan for National Forest lands in Oregon.

The Oregon Smoke Management Plan establishes designated areas that are principal population centers and Class I Airsheds, including wilderness areas and other sensitive airsheds. One purpose of the Smoke Management Plan is to protect air quality in these high priority areas.

Analysis Methods – Air Quality

Prescribed fire smoke emissions were predicted using the estimates from the debris prediction tables and First Order Fire Effects Model (FOFEM) version 5.0. This model calculates particulate matter (PM) emissions in both the 2.5 and 10 micrometer size class (PM 2.5 and PM 10) based on the amount of fuel consumed. The Oregon State Implementation Plan regulates PM 2.5 and PM 10 levels in special Protection zones or Class I Airsheds.

Fuel inputs used to determine smoke emissions, were from the predicted post harvest data and based on a percentage of fuels that would most likely be consumed given the prescribed fire window. On average, 80% of the fine fuels (0-1 inch diameter) would be consumed, 60% of the 1-3 inch diameter fuels would be consumed, and only about 20% of the 3 inch and greater fuels would be consumed.

Desired Future Condition – Air Quality

Maintain air quality for the protection and use of the National Forest resources, and meet or exceed applicable federal and state standards and regulations (36 CFR 219.27 (a) (12)).

Existing Condition – Air Quality

The closest designated area for smoke concerns is the Willamette Valley, which lies 30-40 miles to the west of the planning area. Prevailing winds in this area during the normal burning season are generally southwesterly and carry smoke away from the Willamette Valley.

The closest Class I airsheds are the Mt Jefferson, Middle Santiam, Mt. Washington and Three Sister wilderness area (11, 2, 10, 18 miles respectively). Burning is not allowed during the restricted period of July 1 through September 15 in order to avoid smoke impacts in these wilderness areas.

Environmental Consequences – Air Quality

Direct and Indirect Effects – Air Quality

Alternative 1

There are no impacts to air quality in the No Action Alternative, however, the stands would continue to store more biomass as they grow and postpone the release of smoke (if a fire were to occur) to the driest time of the year when the impact to people is the greatest. In the event of a wildfire, air quality impacts are considerably higher than management ignited prescribed fire. Acreage used for the No Action Alternative was the total planning acres (3,292 acres) in the South Pyramid Project Area. Wildfire smoke emissions are not short term and can last for months, as witnessed by the nearby B&B Fire in 2003. Smoke could impact the adjacent wilderness areas with significant negative effects on air quality and visibility, or intrude on at least one of the designated areas. The most likely time for a large wildfire to occur is between July 1 and September 15, which coincides with outdoor recreation activities and high public use of the National Forests.

Alternative 2

Air quality in the designated areas would be affected by forest-land fuel treatments, such as application of fire to reduce fuels and burning hand, grapple or landing piles. These effects however would be short term, 3-6 days. By adhering to Oregon Department of Environmental Quality (DEQ) smoke management guidelines this project would minimize the risk that either action alternative would exceed smoke management standards for the neighboring airsheds.

Alternative 3

Alternative 3 poses a greater short-term risk to air quality than Alternative 2 due to more smoke created by broadcast burning fuels in regeneration harvest units (43 acres) than by handpiles in thinned units. Fuels in thinning units would be handpiled and generate less total smoke per treatment acre than regeneration harvest units. By adhering to Oregon Department of Environmental Quality (DEQ) smoke management guidelines this project would minimize the risk that either action alternative would exceed smoke management standards for the neighboring airsheds.

Alternative 4

Alternative 4 poses a greater short term risk to air quality than both Alternatives 2 and 3 due to greater smoke created by broadcast burning fuels in regeneration harvest units (71 acres). Fuels in thinning units would be handpiled and generate less total smoke per treatment acre than regeneration harvest units. Fuels analysis and local experience show a higher likelihood for treating fuels in regeneration harvest units than thinning units. By adhering to Oregon Department of Environmental Quality (DEQ) smoke management guidelines this project would minimize the risk that either action alternative would exceed smoke management standards for the neighboring airsheds.

All Action Alternatives

Smoke emissions will be short duration and mitigation measures will reduce the quantity of emissions during prescribed burns. Past management activities do not cumulatively add to air quality impacts from the proposed treatments.

The following table illustrates the estimated total PM 2.5 and PM 10 emissions (2.5 and 10 microns in diameter respectively) of particulate matter for broadcast and hand pile burning by alternative. The calculations are based on the pounds of particulate matter per ton of slash for prescribed burning in the Western Cascades fuel types. Average tons per acre (TPA) burned do not include landing piles due to the wide variability in landing pile characteristics, primarily size and shape.

Table 24: Summary of Potential Particulate Matter Emissions by Alternative

Particulate Matter (PM) (diameter - measured in microns)	Alternative 1 No Action- Wildfire	Alternative 2	Alternative 3	Alternative 4
PM 2.5	599 tons	41 tons	42 tons	32 tons
PM 10	706 tons	48 tons	49 tons	38 tons

Using prescribed burning for fuels treatment creates PM-10 emissions (very small particles in smoke) that can cause severe respiratory problems and visibility concerns. It is important to note these emission levels do not occur all at one time. Usually prescribed fire operations occur one unit at a time (in one day). For example, a 6-acre broadcast unit predicted to have 20 tons/acre of 0-3 inch diameter fuel post harvest would emit particulate matter in the range of 3.7 tons/unit of PM 10 and 2.9 tons/unit of PM 2.5.

The significance of emission level changes is based on the weather. During periods of atmospheric stability (inversions) particulate matter is not dispersed and debris burning would not occur. However, during atmospheric instability, vertical mixing allows particulate matter to disseminate and the emissions from debris burning are readily dispersed. Typically prescribed broadcast burning would occur in the spring when the snow has melted off and fuels are dry enough to burn and may last through July 1st. Burning resumes September 15th and after dry, east winds events have ended. Generally, both hand piles and landing pile burning occurs in the fall when the seasonal rains control and extinguish the burning.

Public use of the wilderness is highest between July 1 and September 15, not during the prescribed fire season. The affects of prescribed burning on air quality would therefore be of minimal impact to the public and meet air quality standards.

Cumulative Effects – Air Quality

Area

The area considered for cumulative effects on air quality are the critical airsheds which contains the planning area.

Actions Contributing to Cumulative Effects

Very few fuel-creating operations are currently taking place on public or private lands within the subwatershed and future precommercial thinning operations etc. in the area would generate comparable effects to air quality as the proposed action for this project. Because the total acres of fuels treated during any one season is expected to be low over the next 10 years and because Oregon Department of Environmental Quality (DEQ) controls the burn windows for both public and private lands, the cumulative risk of exceeding Oregon DEQ smoke management guidelines is low. Road and trail maintenance activities over the next 10 years would have no significant effects on air quality (see Appendix K for more cumulative effects information).

Conclusions and Rationale for Conclusions – Air Quality

All burning operations would comply with the Oregon Visibility State Implementation Plan (SIP) and the Oregon Smoke Management Plan and these plans are designed to meet Clean Air Act standards. Properly executed controlled burning is expected to produce fewer total emissions with minimal impacts. Smoke emissions would be short duration and mitigation measures would reduce the quantity of emissions during prescribed burns. Past management activities do not cumulatively add to air quality impacts from the proposed treatments.

Consistency with Direction and Regulations – Air Quality

Proposed fuel treatments meet standards and guidelines in the Willamette Forest Plan. All burning would be done in compliance with the Oregon Smoke Management Plan and the Oregon Visibility State Implementation Plan (SIP). These plans have a number requirements designed to meet the Clean Air Act standards, reduce the amount of smoke produced, and reduce the impact on the designated and wilderness areas. All burning operations would be planned through the Oregon Smoke Management System, FASTERACS.

Soils and Geology

Introduction – Soils and Geology

Soils: The soil resource helps to (a) sustain biological activity, diversity, and productivity by providing habitat for plants, animals and other organisms; (b) regulate water flow; (c) filter and protect the quality of water and other resources; (d) store and cycle nutrients and (e) provide structural support for plants.

Geology of the Area: The Pyramid Creek subwatershed, located within the upper Middle Santiam landform block, lies completely within the Western Cascades physiographic region, and is composed primarily of older Tertiary lava flows, tuffs and breccias generally from 32 million to 17 million years old. Also included within this strata are mudflow deposits, tuffaceous sedimentary rocks and volcanic conglomerates (Walker and Duncan, 1989). The sedimentary portion of the assemblage forms a prominent escarpment along the northern boundary of the watershed from Knob Rock east to Trappers Butte. In addition, younger andesite and basalt flows generally form a broad crescent-shaped cap on the higher elevation main ridges. This flow unit lies unconformably on the older Tertiary deposits and ranges in age from 17 million to 10 million years old. Overlying these broad upland deposits are even younger, ridge capping basalt flows of the early High Cascade volcanic sequence that range in age from about 10 to 1 million years (Walker and Duncan, 1989).

The surface expression of these rock formations has been extensively modified by erosion, especially with glacial activity and slope instability. Glacially-derived soils are common to the higher elevation tablelands, especially at the headwaters of Pyramid and South Pyramid Creek. Ice cap glaciers probably covered the High Cascade platform to the east of this watershed many times during the Pleistocene, sometimes with sheets of ice hundreds of feet thick. During the early and most extensive glacial periods, valley glaciers surged away from the large ice mounds along the Cascade crest and traveled west down the Pyramid drainage as they acted as outlets for excess ice accumulation for the large ice platforms to the east. More recent glaciations were likely much smaller and localized valley glaciers carved cirques on the north and east aspects of the higher peaks. However, evidence for much of this is scanty, as it has been obscured by subsequent large-scale slope instability.

The rocks and strata of the older volcanics weather to form deep colluvial and residual soils that can give rise to unstable soils. Stabilized slump earth flow features, such as sag ponds, bench and scarp topography, and disrupted drainages are common throughout this project area. It seems likely that slump / earthflow instability has been a significant factor in slope development and stream channel morphology for the last several thousand years, perhaps since the end of the Pleistocene. In many drainages, localized areas of active instability still remain as remnants of these once mighty earth flow systems.

This complex relatively recent geologic history has produced a myriad of diverse landforms and soils. In general soils on these side slopes have been stable and productive for at least several hundreds of years. Soils formed either directly on the underlying volcanic bedrock, on the extensive glacial deposits, or on the jumbled combinations of the two formed in the slump complexes. Both types have similar size gradations that range from silt loams to gravelly or cobbly sandy loams. Depth to bedrock, when it is present, is usually around 5 to greater than 10 feet. The various landtypes are generally well drained where permeability is rapid in the surface soils, and rapid to slow in the subsoil. Because of high infiltration rates, overland flow is generally

uncommon. In the proposed units, side slopes range from near zero to about 80%, but are generally less than 40%. Offsite erosion is generally not a concern because of the extensive vegetative ground cover and usually gentle side slopes.

Much of this drainage was burnt in an extensive stand replacement fires approximately one hundred to two hundred years ago. Some areas were likely reburnt or underburnt in fires since then. These fires consumed considerable amounts of the above-ground organic matter, and a wide range in the above-ground tonnage of decomposing organic matter now exists. The older timber harvest plantations display a commensurate removal of above ground nutrient matter similar to the large fires. More recent timber harvest has generally retained about as much organic matter as is displayed in the less intensive fire regimes.

Analysis Methods – Soils and Geology

On numerous days throughout the 1998 and 1999 field seasons, the district geologist conducted field reconnaissance of potential harvest units for the South Pyramid project. The major portion of this aspect of the field investigation was directed at distinguishing the various identifiable landtype components within the study area and mapping them on the photo overlays. The information was then transferred to registered overlays in order to represent the data on a standard map base. Too large to be included with this report at a meaningful scale, a complete copy of the remapped SRI landtypes for this particular project area is on file at the GIS (Geographic Information Systems) facility on the Sweet Home Ranger District. In general, the field investigation confirmed some of the original 1973 SRI designations, but considerable refinement and subdivision of the various boundaries were developed. Many of the landtypes have several components which were not separated in the original SRI because of the small mapping scale that was utilized (one-inch-equals-one-mile). The geologist's field investigation of landtypes and their specific attributes formed the basis for the site-specific recommendations and mitigations for this project.

Desired Future Condition – Soils and Geology

The desired future condition for soils is to maintain and enhance long-term soil productivity and stability.

Existing Conditions – Soils and Geology

The proposed units are located on stable, productive terrain with few regeneration problems. Unsuitable, unregenerable soils have been avoided during project planning through harvest unit design etc. The potential for insufficient survival with regeneration harvest is not a concern. Potentially or actively unstable terrain has been located with the soil mapping process and has generally been avoided in project design. Given the retention of a live intact root mat with the thinning alternative and other mitigations, the potential for management induced slope instability though present, is low. All units show considerable potential for regeneration of conifer and brush. With standard mitigation measures, the potential for excessive disturbance and off-site erosion is within tolerances outlined in Willamette Forest Plan

Road development in this subwatershed is less extensive than adjacent areas, and large blocks of unroaded forest still remain near the project area. The roads that have been constructed are generally located on stable benches, flats or ridges. Few if any sidecast roads exist, and most road cuts and fills are heavily vegetated.

Existing, rocked roads access almost all units. In most cases, ditches and cut banks are overgrown with vegetation and show little or no active erosion. Most routes have ditch-relief culverts, though some may need maintenance. Occasionally, a few water bars may also be present. Most roads have solid subgrades, which are suitable for dry season haul with perhaps a little spot rocking in a few critical areas. Extended season or wet weather haul may require additional rocking of some local access roads.

Environmental Consequences – Soils and Geology

Direct and Indirect Effects – Soils and Geology

Alternative 1 - No Action

Since no harvest is planned under this alternative, there would be no adverse effects on the soil resource in the planning area.

Fire is a natural ecological component of the Cascade Range ecosystem. Fire recurrence intervals of 100 to 200 years are apparent in the natural system, with shorter intervals recorded in some critical high lightning areas. Fire suppression in the last century has interrupted that natural cycle in much of the West Cascades. No Action is not considered beneficial for long-term soil productivity. Overstocked stands would rapidly see density increase, growth slow, and mortality rise. Fuel accumulations from blow down, snow down, and bug kill provide an ever-increasing amount of fuel loading. The actual thinning or harvest of these units is not as much concern as the concomitant slash and natural fuel accumulation and the potential for wild fire. Considerable evidence has shown that uncontrolled fire at high fuel loadings can significantly increase fire severity and cause nutrient loss, and potentially permanent soil damage.

Some opportunities to address existing compaction from past harvest operations may be foregone under this alternative.

Action Alternatives

The major short-term impacts to soil productivity from harvest activity, as discussed in the Willamette Forest Plan (1990), include displacement, compaction, nutrient loss, and instability. In most situations, preventing soil impacts is the most effective and feasible way of ensuring long-term (post harvest) soil productivity. The following section discusses how the various alternatives may affect the soil resource.

Soil Displacement: Logging suspension requirements and pre-designation of skid roads for ground-based yarding and other mitigation measures outlined in Table 16 would help ensure protection of the soil resource from excessive disturbance or displacement in all action alternatives. Soil Displacement is not expected to exceed that analyzed in the Willamette Forest Plan.

Compaction: The major cause of compaction is ground-based skidding equipment.

Monitoring of past operations has shown that when designated skid roads are properly utilized in conjunction with line pulling and directional falling, compaction from ground-based operations remains between 9 and 12% of harvest acres which is well within the 20% limit (BMP T-11, USDA 1988). All action alternatives utilize ground-based yarding. Compaction on about 9 -12% of units can be expected at the completion of yarding activities. Since these are unmanaged stands, no legacy compaction exists. In

addition, some of the compaction expected through use of ground-based systems during this entry would be mitigated by subsoiling of landings and primary skid roads.

Nutrient Loss: The duff and litter layer is needed to minimize nutrient loss and protect against surface erosion. These layers, with large woody material, also contribute to ectomycorrhizal formations, soil moisture retention, and the soil's contribution to the forest ecosystem. Burning handpiles of logging slash would likely affect duff and litter layers on less than 2% of harvest acres in the action alternatives. Broadcast burning in Alternatives 3 and 4 would likely affect duff and litter layers on 43 and 75 acres respectively. The timing of burning would be done to meet objectives for duff retention requirements that fall within standards and guidelines in the Willamette Forest Plan and fall within the range of natural variability.

Another aspect of long term nutrient availability and ectomycorrhizal formation is the amount of larger woody material retained on site. Management activities would be planned to ensure adequate nutrient cycling (FW-085). On typical thinning, hand piles number about 40 per acre and occupy about 20 square feet per pile for a total of about 800 square feet per acre or about 1.8% per acre. Burning the piled slash may develop sufficient heat to affect the underlying soil. However, pile burning is usually done in the spring or winter months when duff and soil moistures are higher, and this helps reduce the heat effects soil. Consequently, burning in this manner is considered a minor effect when considering the limited overall acreage involved and is not cumulatively significant.

Mitigation measures for duff retention outlined in Table 16 would ensure that soil nutrient loss does not exceed acceptable levels when units are broadcast burned.

Instability: The present topography of the project area is predominately the result of large scale slope instability from slump/earthflows that occurred many hundreds to thousands of years ago. These slumps have now stabilized and very little actively unstable ground remains in the project area. For example, the 1996 storm brought few changes to the landscape. Only a couple of small shallow soil failures (less than one quarter acre) were observed near the project area from that storm. Potentially unstable soil areas generally involve small (less than one tenth acre) soil pockets on steep sideslopes along incised drainages. These areas were avoided as part of the location of proposed units, except for Unit 27 in Alternative 2.

Unit 27 is bisected by a distinct band of soils that is, in part, considered potentially highly unstable, not unsuited. This designation includes landtypes that are prone to debris chute or small slope failures, and root strength is commonly a stabilizing factor. In this particular instance, a steeper, but narrow, slope break extends through the unit. It appears that after the catastrophic fires that established this stand, an occasional small soil failure moved off this slope and dropped to the bench below. Important points are as follows:

- These failures were limited in size, usually less than 1/20 of an acre
- They contained from 50 to 150 cubic yards of soil material
- They extended down slope approximately 50 to 150 yards and stopped on a stable bench
- They restabilized and were naturally regenerated with Douglas fir second growth
- They occur intermittently within a specific and distinct band of soil on which Unit 27 sits
- Tree root strength and evapotranspiration play an important role in maintaining slope stability.

Unit 27 is proposed for thinning which is viewed as promoting long-term slope stability. Thinning promotes tree growth. Crowns increase in size and root systems expand. These factors all promote greater slope stability. Field review of previously thinned units has shown no increase in slope instability in either

the uplands or Riparian Reserves. An intact root mat would be maintained throughout the unit. In addition, critical areas on the steeper, sensitive slope would either not be marked for thinning or only marked lightly. Thinning and removal of suppressed trees would promote a stand with greater root and crown growth. Leave trees would become larger, more vigorous, and stress resistant. Existing rates of evapotranspiration would be maintained and increase over time. These factors should maintain or enhance long-term slope stability in this sensitive area.

Transportation System: Existing, rocked roads access almost all units. In most cases, ditches and cut banks are overgrown with vegetation and show little or no active erosion. Most routes have ditch relief culverts, though some may need maintenance. Occasionally, a few water bars may also be present. Most roads have solid subgrades, which are suitable for dry season haul with perhaps a little spot rocking in a few critical areas. Extended season or wet weather haul may require additional rocking of some local access roads.

The current road system in the planning area is stable with functional drainage structures. Routine maintenance on this road system would maintain stability of cut and fill slopes, produce little or no off-site erosion, and improve drainage structures in selected areas.

Alternatives 2, 3 or 4 do not propose new road construction or reconstruction to facilitate logging operations. Road maintenance work for all action alternatives would have minimal adverse effects on soil resources in the planning area. Existing landing areas would likely be expanded to meet the needs of helicopter operations. Alternative 2 would use up to 6 helicopter landings, while Alternatives 3 and 4 would need only 2 landings. Landings and local spurs reopened for logging operations would be ripped, planted with native vegetation, and closed with berms to mitigate effects on soil resources and water quality.

Cumulative Effects – Soils and Geology

Area

The analysis area to determine cumulative effects on the soil resource was on a unit by unit basis.

Methodology - Soils

At this time, no single unit of measure of long-term (post harvest) soil productivity is widely used. Information on the survival and growth of planted seedlings may indicate short-term changes in site productivity. However, the relationship between short-term (life of the timber sale) changes and long-term (post harvest) productivity is not fully understood at present.

Cumulative Effects and Conclusions – Soils and Geology

Past- The proposed harvest units occur in stands that have not been previously harvested. There are no soils effects from past activities in these units.

Present- The direct effects of any action alternative on the soils resource are very limited in scope because project design avoided most of the soils concerns and mitigation measures help assure that long-term soil productivity and stability are maintained.

Reasonably foreseeable: No foreseeable harvest is planned in these units.

Since there have been no past activities in these units and no future activities are planned here, there would be no cumulative effects to the soils resource.

Monitoring – Soils and Geology

Other applicable Standards and Guides and/or Best Management Practices may exist which were not directly referenced in the soils report in Appendix G. Their exclusion does not indicate that they were overlooked or are inapplicable. As project development proceeds, appropriate constraints or mitigations may be added or changed in order to better meet the intent of adequate resource protection or enhancement as directed in the Willamette Forest Plan. As the proposed project is initiated, it would be monitored to evaluate implementation efficiency, prescription adequacy, and to update sale area rehabilitation needs or protection.

The Timber Sale Officer would conduct implementation monitoring at the contract administration phase of the project. The logger would be required to maintain adequate suspension during the harvest process. In addition, numerous other contract requirements dealing with such items as erosion control, hazardous material use, fire restrictions, etc. would be enforced. Duff retention would be monitored as part of any post-sale activity that affects the soil resource.

Consistency with Direction and Regulations – Soils and Geology

Prescriptions for soil protection, watershed considerations and riparian needs of the sub-basin are designed to provide a level of riparian habitat protection and erosion control that is consistent with the standards and guidelines of the Willamette National Forest's Land and Resource Management Plan. On-site sedimentation is anticipated to be within National Forest and Oregon State Guidelines. All prescriptions or mitigation measures are designed to meet or exceed the requirements outlined in the General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988). Standard contract language should provide for sufficient erosion control measures during timber sale operations (BMP T-13). Revegetation of areas disturbed by harvest activities (such as landings, temporary roads, and equipment storage areas) is required with an appropriate grass seed mix (BMP T-14, T-15, and T-16).

Hydrology, Stream Channels, Water Quality and Riparian

Introduction- Hydrology, Stream Channels, Water Quality and Riparian

The proposed project area is a part of the Headwaters Middle Santiam River subwatershed, which is 20,777 acres in size. Elevations range from 2,000 feet near it's confluence with the Middle Santiam River to 5,618 feet at Middle Pyramid Peak. This subwatershed is part of the larger Middle Santiam Watershed and lies in direct line with westerly storm patterns that come up the Middle Santiam.

Analysis Methods - Hydrology, Stream Channels, Water Quality and Riparian

The main method of analysis involved field review of the proposed harvest units, the surrounding area and streams. Field review included walking through and around the perimeter of proposed units. Streams and wet areas encountered were recorded on either a map base or an aerial photo. Field-mapped data was then transferred to integration maps for discussion and development of site-specific prescriptions. Stability, slope, soil types, vegetation, aspect, and juxtaposition of the unit are all considered in developing a prescription that would protect and/or enhance the hydrology, stream channels, water quality and Riparian Reserves found within the project.

Stream, slope, and vegetation conditions were compared to information in the Middle Santiam Watershed Analysis to determine if changes had occurred since the drafting of that document. Conditions appeared to be responding typically for Cascade environments and the only discovery made to modify the watershed analysis determination was the listing of the Middle Santiam River as temperature impaired for summer fish rearing. All prescriptions need to ensure that waters are protected and enhanced through management activities to help the waters of the State recover.

Aggregate recovery protocol and standard observations of past activities within the watershed to determine response to disturbance were used to determine hydrology, stream channel, and water quality responses to proposed actions (regeneration cutting and thinning).

A Region 6 level II stream survey was completed on South Pyramid Creek by Ecosystems Northwest. Information from this report was utilized in the determination of stream conditions downstream of the analysis area.

An interdisciplinary process was then used to develop a proposed action to address the project objectives and alternative ways to accomplish those objectives. The IDT then evaluated the environmental consequences of those actions. All actions were considered in relation to the prescriptions. Risks were evaluated using ARP models, past management track records, and professional judgment.

Desired Future Condition - Hydrology, Stream Channels, Water Quality and Riparian

Conditions desirable for hydrology, stream channels, water quality and riparian areas can best be described in a range of variability. This range has been established through time to represent the natural changes the various elements experience during a wide variety of outside influences. Flood, drought, fire, wind, snow, ice, and land movement all play a natural role in determining the changes to these elements. Add to this natural condition social political drivers and one can see the complexity of stating a Desired Future

Condition. The following bullets are an attempt to discuss the hydrology; stream channel, water quality and riparian portion of this condition.

- Range of flow, discharge, which allows for a variety of species within riparian areas.
- Maintenance of wet areas and hyporheic zones, no net loss.
- Maintenance of flows within historic range, no artificial peaks that exceed range.
- Maintenance of channel conditions that represent natural range.
- Reduction of stream energies through channel complexity. (Adding structure into channel, riparian areas.)
- Recovery and maintenance of historic water temperatures found within the system (encourage riparian development and complexity)
- Broad range of diversity associated with the riverine systems
- Accumulation of woody material on the site.

Opportunities

Opportunities exist to restore the historic wood loading and stream energy of the streams found within the analysis area. Natural recruitment of large wood can accomplish this.

Existing Conditions – Hydrology

A more complete description of the hydrology and water quality within the South Pyramid watershed can be found within the Physical Domain portion of the Middle Santiam Watershed Analysis (pg 19-25). The following discussion relates specifically to areas being proposed for treatment in this analysis.

Average annual precipitation in the project area ranges from 60 inches in the valleys to 120 inches on peaks and ridges. The majority of the precipitation occurs between October and May and falls as rain at the lower elevations (<2000 feet) and snow at the upper elevations (above 3,500 feet). The mid elevations are in the Transient Snow Zone (TSZ) which for this area ranges from 1,500 to 4,900 feet. The TSZ may alternately receive snow or rain. All of the proposed harvest units for this project lie within the TSZ.

The South Pyramid project area hydrology is similar to other documented watersheds in the Western Cascades. Peak flows occur during rain and rain-on-snow events in the transient snow zone. Intense precipitation is episodic and often generates peak flows which are a major disturbance mechanism for stream channels and associated riparian areas. Surface precipitation drives the flow levels of tributary streams to South Pyramid Creek.

Minor, less than 1 acre, wet areas exist which meter some flows to tributary streams. These wet areas are connected to the area's geology. Smaller wet areas associated with the broken topography punctuate the landscape and create vegetative diversity.

Water storage in these watersheds is limited to some deeper upland soils, colluvial deposits, flood plains, earthflow perimeters. These areas create small forested wetlands. Colluvial soils, ancient earthflow terraces, and flood plains act like sponges, retaining water and releasing it slowly during periods of low precipitation. General storage is low due to the shallow and rocky nature of the soils.

Minimum flows within the South Pyramid are regulated by water storage features which allow flow to persist during drought periods. Much of the summer flow comes from water stored in the broad alluvial

floodplains along the main channel of South Pyramid Creek and the colluvial and glacial soils found throughout its tributaries. These storage areas, although limited in number here, provide opportunity for hyporheic interactions with the stream (this is the subsurface movement of water through depositional areas). Proposed units within the project area are adjacent to these types of features.

A snapshot in time, during the time of year when flows are generally low the following was noted: “A discharge of 1.67 cubic feet per second (cfs) was measured on South Pyramid Creek near its confluence with the Middle Santiam River on September 30, 1995 (Mattson K. and Runyon J., 1996)

Vegetation is the primary user of water in the watershed with most use occurring between April and October. Diurnal fluctuations in stream flow are the result of vegetative transpiration rates associated with diurnal changes in light and climatic conditions.

Environmental Consequences: Hydrology

Direct and indirect Effects - Hydrology

Alternative 1 – No Action

Implementation of Alternative 1- No Action would result in slowed tree growth due to competition for water, light and nutrients. As growth slows and tree canopies decrease, transpiration would also decrease. The tree's inability to utilize available water could result in the potential for increased summer flows.

As tree health declines and tree crowns get smaller, their ability to intercept and hold snow decreases. Soil infiltration rates could potentially be affected by the loss of canopy and the drip that occurs from snow interception. Latent heat removes snow and does not allow for the water to infiltrate in the same manner, or at the same rate, that occurs in a healthy tree canopy. Reduced canopies are more exposed to latent heat transfer and rapid snow loss. This reduces the contact time the water stored in the snow has with the soil. (Harr 1981).

Alternative 2 – Proposed Action

With target canopy closures ranging from 40-60%, snow accumulation would increase until such time that canopy closures reaches 70 percent. A short term (5-10 years) increase in discharge during the wet and dry periods would occur from two mechanisms in thinned stands: (a) during wet periods increased snow accumulation would result in small (<1 year return interval) increases in peak flows (Jones, and Grant; 2001) and (b) during dry periods reduced canopy closures would reduce transpiration rates which would account for small increases in summer flows. It is not anticipated that either of these changes would result in detrimental effects (Pike and Scherer 2003).

Utilization of 61 acres of ground-based yarding could result in compaction and capture of runoff and compaction. Hydrology could be affected if rerouting of water occurs from the skidding pattern. The risk of this is low since full-leave no harvest Riparian Reserves would be left.

Helicopter yarding of 128 acres of thinning units is the most protective way of removing trees and would not result in an increased risk to hydrology.

These effects are within the range of natural variation for hydrology. Given that Best Management Practices and timber sale contact requirements would be implemented and given the spatial position of harvest units in the watershed, there are no anticipated hydrologic impacts to downstream beneficial users.

Alternative 3

It is anticipated that there would be slight fluctuations in the hydrology of the area resulting from the removal of vegetation. Although 78 fewer acres would be disturbed under this alternative than with Alternative 2 hydrologic recovery time is greater with this alternative. This is because 43 acres are being regenerated rather than thinned, hydrologic recovery would take approximately 35 years on these acres as opposed to 5-10 years if they were thinned as in Alternative 2.

For the 68 acres proposed for thinning with this alternative, effects would be similar to those discussed under Alternative 2.

Utilization of 59 acres of ground-based yarding could result in compaction and capture of runoff and compaction. Hydrology could be affected if rerouting of water occurs from the skidding pattern. The risk of this is low since full-leave no harvest Riparian Reserves would be left.

Helicopter yarding of 52 acres of thinning units is the most protective way of removing trees and would not result in an increased risk to hydrology.

These effects are within the range of natural variation for hydrology. Given that Best Management Practices and timber sale contact requirements would be implemented and given the spatial position of harvest units in the watershed, there are no anticipated hydrologic impacts to downstream beneficial users.

Alternative 4

Hydrology of the area is anticipated to experience slight fluctuations resulting from the removal of vegetation during the project. Although 103 fewer acres would be disturbed under this alternative than with Alternative 2, hydrologic recovery time is greater with this alternative. This is because 71 acres are being regenerated rather than thinned. Hydrologic recovery would take approximately 35 years on these acres as opposed to 5-10 years if they were thinned as in Alternative 2.

For the 15 acres that would be thinned in this alternative, effects would be similar to those discussed under Alternative 2.

Utilization of 34 acres of ground-based yarding could result in compaction and capture of runoff and compaction. Hydrology could be affected if rerouting of water occurs from the skidding pattern. The risk of this is low since full-leave no harvest Riparian Reserves would be left.

Helicopter yarding of 52 acres of thinning units is the most protective way of removing trees and would not result in an increased risk to hydrology.

These effects are within the range of natural variation for hydrology. Given that Best Management Practices and timber sale contact requirements would be implemented and given the spatial position of harvest units in the watershed, there are no anticipated hydrologic impacts to downstream beneficial users.

All Alternatives

The table below compares the area treated, types of treatments and logging systems on each of the alternatives.

Table 25: Comparison of Alternative Treatments and Logging Systems

Comparison Factor	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Acres Commercially Thinned	0	189	68	15
Acres Regenerated	0	0	43	71
Acres of Ground-based Yarding	0	61	59	34
Acres of Helicopter Yarding	0	128	52	52
Acres of Light Thin (60% canopy left)	0	34	0	0
Acres of Moderate Thin (50% canopy left)	0	85	11	7
Acres of Heavy Thin (40% canopy left)	0	70	57	8

Cumulative Effects - Hydrology

Area

The area considered for hydrologic cumulative effects is the Pyramid planning subdrainage.

Actions Contributing to Cumulative Effects

Past, present and reasonably foreseeable management actions on public and private lands that were considered in the evaluation of hydrologic cumulative effects in this area are timber harvest activities; road construction and trail construction (see Appendix K for more cumulative effects information).

Methodology

Traditionally, projects involving timber harvest on the Willamette National Forest are analyzed for their cumulative impact on the quantity and timing of peak flows and water yields, using an accounting methodology known as Aggregate Recovery Percentage or ARP. The ARP model compares the amount of an analysis area within the transient snow zone that is recovered against a threshold value (Midpoint) that was calibrated for the area during development of the Willamette Forest Plan. The Midpoint values were developed based on the soil, geology, vegetation, climate, and stream channel conditions of each planning sub-drainage, and are intended to represent a minimum safe level of vegetative recovery in the planning sub-drainage to prevent significant alteration of peak flow regimes as a result of management activities. Recovery generally occurs when stand diameters average 8” dbh and crown closures exceed 70%. The transient snow zone is generally considered to include those areas of the forest between the elevations of 1,500 and 4,000 feet respectively (*Note: for the South Pyramid thin area the entire area is considered as transient snow zone*).

Cumulative Effects and Conclusions - Hydrology

Using the Forest’s VEGIS database (1/2006), information about past harvest activities on public lands and estimates of past and ongoing harvest on private lands was gathered. These projects and the present proposal constitute the activities contributing to cumulative effects. No foreseeable future activities are proposed for this area.

Current vegetative conditions combined with past activities, this proposal and ongoing harvest on private lands, in the Pyramid planning sub-drainage, (which contains the South Pyramid Thin analysis area) are well-above desired levels of recovery outlined in the Forest Plan. Table 26 below summarizes the current levels of recovery for the planning sub-drainage affected by the project area, compared to Forest Plan Midpoint ARP levels.

Table 26: Comparison of ARP Values by Alternative and Compared with Existing and Desired Values

Planning Sub-drainage Name	Desired Midpoint ARP value for this area	Existing ARP Value	Alternative 2		Alternative 3		Alternative 4	
			Harvest unit acres	ARP	Harvest unit acres	ARP	Harvest unit acres	ARP
Pyramid Creek 3,868 acres	70%	78 %	189	75.4%	111	75.8%	86	76%

(Data was reviewed on 1/31/2006)

It is anticipated that the proposed actions, when combined with past and reasonably foreseeable actions would not create adverse cumulative effects to the hydrology of the area. The stands in the project area are natural stands greater than 35 years of age, and are at hydrologic recovery. The project would not reduce the hydrologic recovery of the area below the mid-point value. Therefore, the existing water yield and base flow off the project area is expected to be within the range of natural variability (For further information refer to Hydrology Report in Appendix H and cumulative effects in Appendix K)

Stream Channels

Existing Conditions – Stream Channels

A description of the Stream Channels within the South Pyramid watershed can be found within the Physical Domain Chapter of the Middle Santiam Watershed Analysis (pg 20-24). The following discussion relates specifically to the planning area.

Stream channels in the planning area are deeply-incised parallel streams as evidenced by first to third order stream channels here. This pattern of parallel streams is the result of young geologic terraces and earth flow activity shaping the landscape. Soils of glacial and volcanic origin, altered by erosion, created this drainage pattern. These parallel systems join to form a dendritic pattern lower down in the planning sub-drainage.

Stream channels are associated with valley walls greater than 65 percent slope and transition into valley bottoms dominated by terraces. A stepped-valley profile exists. Channel substrate consists of bedrock and boulders in the steeper portions and cobble and gravels in the lower gradient reaches. Channels exhibit very little sinuosity and there are numerous wet areas associated with their margins. Rosgen type Aa+, A, B, and G channels are present within the analysis area.

Headwater channels have low sediment storage capacity due to steep channel gradients. Sediment storage capacity increases as streams transition into the valley regions because of the addition of structure and lower channel gradients. Streams here are generally transport streams although portions of South Pyramid Creek have depositional reaches associated with earthflow and rock outcrops constricting the channel and causing sediment to deposit upstream of the constrictions. Debris torrents have minimal influence in the development of the first and second order stream channels here.

The historic morphological characteristics of stream valleys in South Pyramid project area are similar to existing conditions. The basic stream patterns and channel gradients are largely influenced by the underlying geology. The channels have not changed a great deal since the reference time frames, 100 years ago.

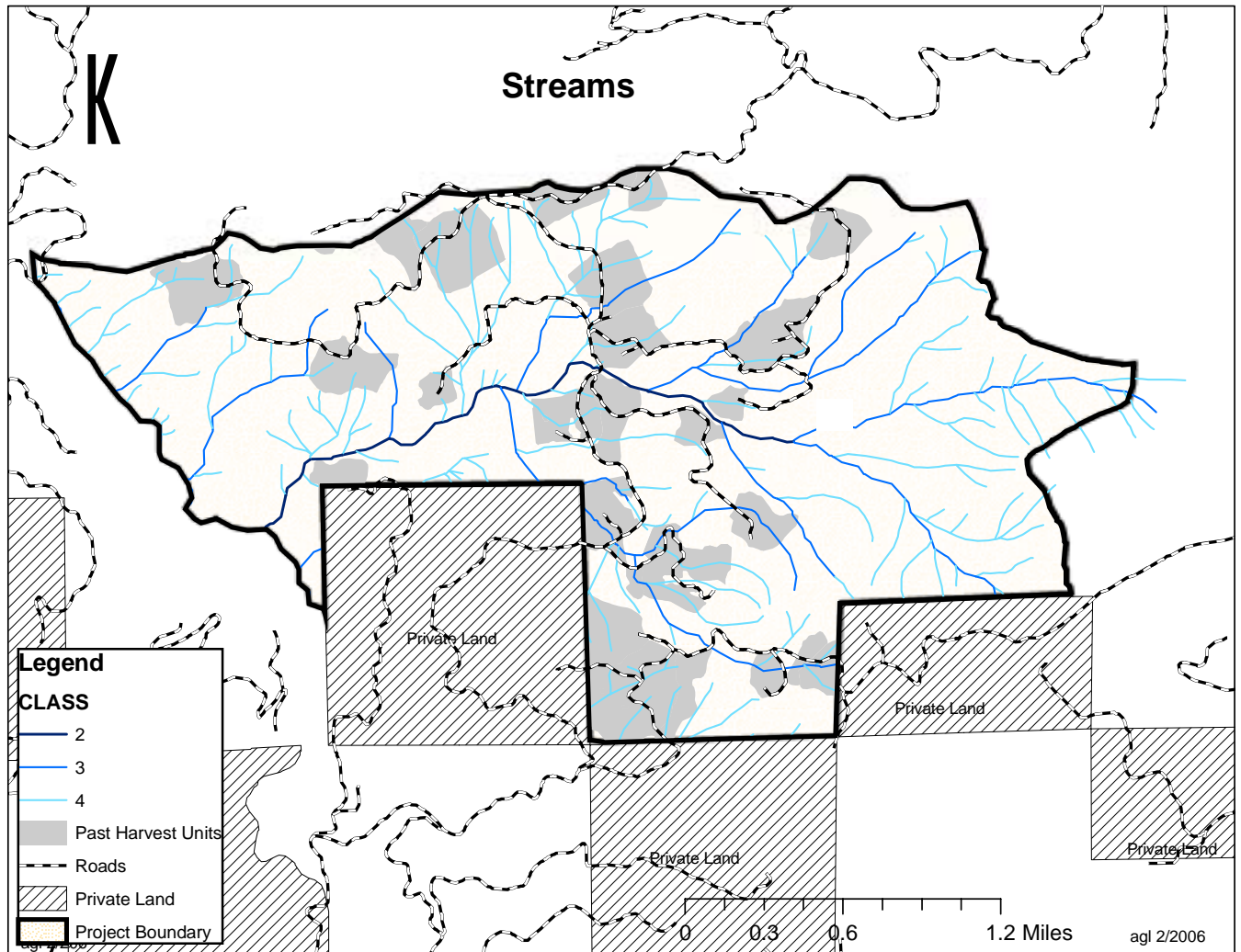


Figure 11: Streams

Environmental Consequences - Stream Channels

Direct and Indirect Effects – Stream Channels

Alternative 1- No Action

Implementation of Alternative 1, would maintain the stream channels in their current conditions. Changes to stream channels occur with the changes in hydrology, vegetation and physical changes. These elements change naturally and artificially through disturbance.

Indirect affects could occur if riparian timber stands decline to the point of increasing the wood load into the stream and creating accelerated bank erosion. These channels do utilize the available wood and create small wetlands associated with the channels. A very low risk from increased wood is anticipated.

Historic (100 years) natural fires in the area have not been detrimental to stream channels. There is low risk of detrimental effects of future natural fires to stream channels due to their geology and gradients.

Alternative 2 – Proposed Action

In Alternative 2, 61 acres (units 1a, 2a, 4a, 4b, 6a, and 24) would be logged using ground-based yarding systems. Using ground-based yarding has the potential to capture water and create additional stream channels. Skid trails, created by yarding timber in these stands, would result in soil compaction on approximately 7 acres. Water flowing down these compacted areas could extend the stream channel network in the area. Mitigation proposed to reduce this effect includes ripping and seeding heavily-compacted skid roads to restore permeability.

Each of the proposed units has its own complexities and would, generally, be yarded away from stream courses/ channels. With full-leave, no-harvest Riparian Reserves, required mitigation measures and implementation of Best Management Practices, there is a low risk of impacts to streams, stream channels or channel networks through implementation of this alternative.

Alternative 3

In Alternative3, 59 acres (units 1a, 2a, 4a, 6a, and 24) would be logged using ground-based yarding systems. Using ground-based yarding has the potential to capture water and create additional stream channels. Skid trails, created by yarding timber in these stands, would result in soil compaction on approximately 7 acres. Water flowing down these compacted areas could extend the stream channel network in the area. Mitigation proposed to reduce this effect includes ripping and seeding heavily-compacted skid roads to restore permeability.

Each of the proposed units has its own complexities and would, generally, be yarded away from stream courses/ channels. With full-leave, no-harvest Riparian Reserves, required mitigation measures and implementation of Best Management Practices, there is a low risk of impacts to streams, stream channels or channel networks through implementation of this alternative.

Alternative 4

In Alternative 4, 34 acres (units 1a, 2a, and 24) would be logged using ground-based yarding systems. Using ground-based yarding has the potential to capture water and create additional stream channels. Skid trails, created by yarding timber in these stands, would result in soil compaction on approximately 4 acres. Water flowing down these compacted areas could extend the stream channel network in the area. Mitigation proposed to reduce this effect includes ripping and seeding heavily-compacted skid roads to restore permeability.

Due to proposed harvest prescriptions stream channels in the area are anticipated to experience slight modifications from increased peak flows. Stream channels downstream of the treatment areas would be the main areas affected by this slight fluctuation in flow.

Each of the proposed units has its own complexities and would, generally be yarded away from stream courses/ channels. With full-leave, no-harvest Riparian Reserves, required mitigation measures and implementation of Best Management Practices, there is a low risk of impacts to streams, stream channels or channel networks through implementation of this alternative.

All Action Alternatives

Anticipated effects are within the range of natural variation for the stream channels. With the utilization of Best Management Practices, contact requirements and spatial position of units in the watershed, there are no anticipated adverse impacts to downstream beneficial users as a result of these changes in the channels.

Cumulative Effects – Stream Channels**Area**

The area considered for stream channel cumulative effects is the Pyramid planning subdrainage.

Actions Contributing to Cumulative Effects

Past, present and reasonably foreseeable management actions on public and private lands that were considered in the evaluation of stream channel cumulative effects in this area included timber harvest activities, road construction and maintenance and trail construction (see Appendix K for more cumulative effects information).

Methodology

The methodology to assess cumulative effects for stream channels includes ARP calculations, an assessment of the watershed condition types for streams found within the project area (“This criterion is intended to address the potential for changes in peak flows during rain-on-snow events, and the associate potential change in the stability of the stream banks and streambed.” (USDA. 1990, p. E-6), a determination of the management prescriptions that should be followed (USDA. 1990, p. E-10 to E-17) and an assessment of the effectiveness of proposed mitigation measures to determine cumulative effects on stream channels.

Cumulative Effects and Conclusions

This watershed contains type 1 and 2 stream channels (USDA, 1990, p. E 10-12). These are very stable channels so there is no recommended ARP for these channels because they are so stable.

It is not anticipated that the proposal would result in any adverse cumulative effects to stream channels (For further information refer to Hydrology Report in Appendix H and cumulative effects in Appendix K)

Water Quality

Existing Conditions – Water Quality

Beneficial uses dependent on aquatic resources in this planning area are: resident fisheries; aquatic non-fish species; riparian-dependent species; water-related recreation; water-related fire suppression and water-related road maintenance needs. Water from this site flows into Pyramid Creek a tributary to the Middle Santiam River and then into Green Peter Reservoir

Water quality parameters critical to beneficial users are temperature, type and timing of sediment input and biological contaminants. About 1 mile downstream from the analysis area the Middle Santiam River is listed under the 303(d) classification with the State of Oregon, from river mile 5.3 (Green Peter Reservoir) to 37.1 (headwaters), because it exceeds the temperature criterion of 180 C (64.4 0F) for salmonid migration and rearing during a portion of the summer (December 2003 Temperature criteria adopted by the Environmental Quality Commission and approved by US EPA in March 2004). The Middle Santiam River is listed in the draft 2004 listing for summer temperature, but not in the 1998 list when this project was first proposed.

Water flowing out of the South Pyramid planning area is typical of west-slope Cascade streams. Well-forested riparian areas and incised channels create high water quality conditions for downstream beneficial users. Stream temperatures fall within State standards most of the year. Water chemistry meets the needs of aquatic dependent species found in these stream systems, and there are no sources of pollutants endemic to the planning area. Natural sources of sediment along stream channels contribute short-term increases in turbidity during storm or runoff events.

South Pyramid Creek flows over and through glacially derived soils. These soils typically contain lower clay content than non-glacial soils and erode to produce short-term turbidity. Suspended particles larger than clay settle out quickly when stream flow energies drop.

Sediment entering the system is either deposited on the streambed (bedload) or suspended in the water column (suspended load). Generally suspended loads in flowing water consist of particles less than 0.5 mm in diameter (Dunne et al., 1978). Bedload is made of larger particles that move downstream by bouncing along the bottom. Suspended load is a main component of a stream's total turbidity.

Embeddedness of the stream bottom (substrate) determines the degree that fine sediments (sand, silt and clay) fill the small spaces between substrate rocks. It can be a measure of the amount of fine materials being transported through the system. Embeddedness is used to assess the condition of the substrate habitat for supporting aquatic species. Studies have shown that most fish fry would leave an area or die when embeddedness reaches 50-60 percent (Harvey, 1989). Level II stream surveys in South Pyramid Creek detected current embeddedness levels of 10-20 percent.

Environmental Consequences – Water Quality

Direct and Indirect Effects - Water Quality

Alternative 1 – Without a sale in the area adequate road maintenance funding would not be available to maintain road systems. When ditches fill there would be potential for increased sediment from road surfaces being washed into stream channels.

All Action Alternatives

All alternatives have some potential to introduce contaminants like petroleum products and/or introduce sediment into stream channels through (a) ground-based yarding (Alt. 2 = 6a acres, Alt. 3 = 59 acres and Alt. 4 = 34 acres) where compaction and potential rerouting of water from skidding could extend the drainage network, (b) clearing vegetation and other road maintenance on 27 miles of haul routes, (c) reopening 800 feet of temporary logger's spur road, and (d) fine sediment generated from haul along 27 miles of road.

Mitigation measures outlined in Table 16, implementation of Best Management Practices, subsoiling compacted areas, and full-leave, no-harvest Riparian Reserves would minimize these impacts. Anticipated effects are expected to be minor and within the range of those evaluated in the Willamette Forest Plan.

There is also a minor risk of increasing solar radiation to stream channels and thus increasing stream temperatures. This could happen if Riparian Reserve vegetation blew down following harvest activities and exposed streams to increased sunlight. Full-leave, no harvest Riparian Reserves are left on all streams. The likelihood of this is very low.

Cumulative Effects – Water Quality

Area

The area considered for water quality cumulative effects is the Pyramid planning subdrainage.

Actions Contributing to Cumulative Effects

Past, present and reasonably foreseeable management actions on public and private lands that were considered in the evaluation of water quality cumulative effects in this area include all ground-disturbing activities, activities with potential for spills of such things as petroleum products, activities that remove shade from stream channels, etc (see Appendix K for more cumulative effects information).

Conclusions and Rationale for those Conclusions – Water Quality

Water quality cumulative affects are similar to the hydrology and the stream channel cumulative effects as all three are intertwined. The hydrology and stream channel conditions are within the range of natural variability and the same can be concluded for water quality. Provided prescribed Best Management Practices are met, it is not anticipated that adverse cumulative effects to water quality would occur as a result of this project.

The effects of proposed activities are tempered by the timing of the action in relation to the recovery of other managed stands in the area and required stream buffers. ARP values exceed mid-point values assigned to this area in the Willamette Forest Plan. That, combined with full-leave, no-harvest Riparian Reserves, would result in minimal water quality impacts from this project, especially given the spatial nature of disturbances relative to streams.

The likelihood is low for this project to create water turbidity outside of the natural high flow/high turbidity range of variation, and thereby affect the drinking water supply of downstream communities. (For further information refer to Hydrology Report in Appendix H and cumulative effects in Appendix K)

Riparian Reserves

Existing Conditions – Riparian Reserves

Riparian Reserves for this planning area are based on the interim widths established in the NW Forest Plan. Widths vary depending upon the height of the potential site tree. In the Pacific silver fir plant association one potential site tree is 150 feet tall. All units, except Unit 24, fall in this plant association. So Riparian Reserves widths are 150 feet slope distance, either side of class III and IV streams and 300 feet slope distance, either side of fish-bearing streams. South Pyramid Creek, below the project area is the only known fish-bearing stream associated with this project.

Unit 24 falls in the western hemlock plant association where one potential site tree is 172 feet tall. So Riparian Reserve widths are 172 foot slope distance, either side of class III and IV streams and 344 feet slope distance, either side of fish-bearing streams.

Direct, Indirect and Cumulative Effects – Riparian Reserves

All Alternatives

Riparian conditions are maintained through the utilization of full-leave, no harvest Riparian Reserves. Through time these reserves would develop desired stand characteristics, structure, openings, down wood naturally. Direct and indirect effects to the Riparian Reserves are a compilation of the hydrology, stream channel, water quality and terrestrial wildlife components and would not be restated here.

It is anticipated that management of the Riparian Reserves in this manner would protect and enhance the aquatic and wildlife dependent species present, and meet the Aquatic Conservation Strategy objectives.

Conclusions – Hydrology, Stream Channels, Water Quality and Riparian Reserves.

In looking at the direct and indirect effect for hydrology, stream channels, water quality and Riparian Reserves, it is not anticipated that any of the effects would be detrimental or create noteworthy downstream effects. The highest risk associated with Alternative 1 would only occur, if and when, a fire burns in the area. Due to fire management protocols, fire starts within this area would be actively pursued and controlled as soon as possible. This reduces the risk associated with Alternative 1 to being very low.

The greatest risk associated with Alternative 2 is 61 acres of ground-based logging. This risk is minimal due to full-leave, no-harvest Riparian Reserves. This risk is also reduced with prescribed Best management practices. The action falls well within the Forest Plan standards and guidelines. If all BMP's and standards and guidelines are met it has been shown through past actions that detrimental impacts to beneficial users would not occur.

Alternative 3 treats the 111 acres with various prescriptions. The main difference between this alternative and Alternative 2 is regeneration of 43 acres. The difference in effect is a longer recovery time on the 43 acres of regeneration cutting.

The main difference between Alternative 4 and Alternative 2 is regeneration of 75 acres. The difference in effect is a longer recovery time on the 75 acres of regeneration cutting.

The critical elements in the maintenance of hydrology, stream channels, water quality and Riparian Reserves in the planning area are the existing riparian areas. Provided these riparian areas are maintained in a healthy state the stream systems are expected to obtain their desired future condition. Future management activities are considered in the long-term objectives for riparian areas of perennial and intermittent streams. Long-term riparian objectives are considered along with other resource goals and objectives agreed to by the interdisciplinary team. Stream-side management prescriptions are designed to maintain Aquatic Conservation Strategy Objectives (ACSO), as defined in Willamette's LRMP to meet these long term objectives. Under all action alternatives full-leave, no-harvest Riparian Reserves are maintained.

Floodplains occur in the planning area. No activities would occur within flood plains due to the maintenance of full-leave, no-harvest Riparian Reserves. Wet areas would be dealt with on an individual basis under the stand specific recommendations and wetland areas less than 1/4 acre would be treated as special habitat areas (FW-211).

The action alternatives proposed in the South Pyramid Thin project meet Federal and State water quality objectives. These objectives are met through the implementation of BMP's. Riparian Reserves have been established 150 to 172 feet on either side of the intermittent and perennial non-fish-bearing streams, and 300-344 feet on either side of the fish-bearing or domestic water supply streams. These reserves are adequate to maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems and meet the ACS Objectives

Monitoring - Hydrology, Stream Channels, Water Quality and Riparian

Stand response to treatment would be evaluated in 3 years to insure success of planted trees. At 10-15 years a stocking check would be made to look at the stand conditions. Riparian conditions would also be monitored as to their response to treatment and species composition. This would part of the Best Management practices monitoring.

Consistency with Direction and Regulations - Hydrology, Stream Channels, Water Quality and Riparian

The following list shows the various directions and regulations that were utilized in the development of the prescriptions for this proposal. In all action alternatives unit layout and design considered and applied the intent of the direction and regulation. All of the units were reviewed on the ground and recommendations and effects considered. All actions within the alternatives are anticipated to be consistent with this direction with regard to water quality, hydrology, stream channels and riparian protection.

Table 27: Consistency with Direction and Regulations for Hydrology, Stream Channels and Water Quality

Direction and Regulations	Alternative 2	Alternative 3	Alternative 4
Willamette Forest Plan Watershed requirements.	yes	yes	yes
ACSO	yes	yes	yes
NW FOREST PLAN	yes	yes	yes
Clean Water Act	yes	yes	yes
DEQ Sufficiency Analysis for Stream Temperature 303d listing Water Quality Management Plan.	yes	yes	yes
Best Management Practices	yes	yes	yes

(For further information refer to Hydrology Report in Appendix H and cumulative effects in Appendix K)

Biological Resources

Fisheries

Introduction – Fisheries

The South Pyramid project area is located in the Headwaters of the Middle Santiam sixth-field subwatershed where there are a number of smaller streams that support a population of resident cutthroat trout. Brook trout have been observed in a nearby tributary to the Middle Santiam River called Holman Creek. Historically there were Upper Willamette River Steelhead (UWS) and Upper Willamette River spring Chinook salmon (UWC) in the Middle Santiam River below the confluence of Bachelor Creek and the Middle Santiam approximately 2 miles downstream, from the lowest unit.

The nearest anadromous fish that are listed under the Endangered Species Act (ESA) are 26 miles downstream. They are hatchery-raised juvenile spring Chinook salmon that were released by Oregon Department of Fish and Wildlife (ODFW) in Quartzville Creek in 2004 and 2005. Some of these fish have moved downstream to Green Peter Reservoir and have shown up in the sport fishery. Whether these fish have made it through the reservoir and passed the dam successfully is not known at this time. (Refer to Fisheries Biological Evaluation and Fish Effects Table in Appendix E for further information).

Analysis Methods - Fisheries

Primary Information sources used to describe the existing condition of the South Pyramid Sale area include the following information sources:

- Willamette National Forest Geographic Information System (GIS) Database.
- Aerial photos.
- Field reviews of the project area.
- Information from other resource personnel, including the hydrologist, wildlife biologists, silviculturist, fuels, logging systems and engineering (roads).
- Region 6 Protocol Stream Surveys (1990's).
- Middle Santiam Watershed Analysis (1996)
- Other resource specialist reports prepared for this project

Desired Future Condition - Fisheries

This area would provide habitat capable of supporting self-sustaining populations of resident fish species and there would be abundant habitat for all fish life stages. Fluctuations in habitat availability would fall within the natural range of variability. There would be a decrease in invasive species such as Brook Trout (*Salvelinus fontinalis*) and increases in native species. The habitat complexity in the watershed would have sufficient large woody material in the rivers and tributaries. Water temperatures would satisfy state requirements and thermal barriers are not present to make available quality habitat inaccessible to fish. The number and quality of pools available would be increased to a satisfactory level. Hydrologic function allows for natural sediment transport and bedload movement preventing high levels of substrate embeddedness

causing poor spawning conditions and decreased hyporheic function. Hyporheic processes would be unencumbered allowing for functional nutrient cycling that promote healthy populations of aquatic invertebrates providing nutrition for fish. Riparian zones would promote late-successional characteristics allowing for future recruitable large woody material, enhanced primary shade zones and complex bank habitat.

Existing Condition – Fisheries

Habitat for fish in this watershed is in fair to good condition. Past management activities and flood flows have resulted in increases to stream width and decreases in stream depth. The result of this is potentially increased stream temperatures. Additionally, the events of the past may have also reduced channel complexity which results in the diagnosis of a fair to good condition rather than a diagnosis of excellent condition. The quality of fish habitat is dependent on the quality of the stream channel and surrounding riparian area. Prior to the 1996 flood event there was more large wood in the stream channels which created more complex habitat and better conditions for fish.

A stream survey of South Pyramid Creek, done by Ecosystems Northwest in 1996, looked at approximately three miles of the stream. The report characterized South Pyramid Creek as a moderate to high gradient stream with a moderate amount of pool habitat. The number of pools per mile decreases with increasing stream gradient. Stream channel bank instability is low in lower stream reaches and increases in the upper reaches probably associated with the local geology. The survey revealed that channel bank instability was caused by an event in the past and not an ongoing disturbance, as there are signs of recovering vegetation. Woody debris in this system is generally abundant but of small size. Large-sized woody debris is preferable to small pieces. These large pieces have the ability to become key elements in future log jams and they create better pools and complex habitat.

The survey identified that the dominant substrate is cobble in the lower reaches and boulders and bedrock in the upper reaches. Cobble provides good spawning habitat, and in this area the better spawning sites are in the lower reaches. The survey also identified eleven falls, chutes or dams that could be upstream fish-passage barriers (vertical drops over 2'). Seven falls are present and they vary in height from 10 to 30 feet and one chute is 40 feet high.

The water temperature noted by the survey crew in late summer and autumn of 1995 was 44-47OF. On October 16, 1995 stream temperatures ranged from 45-64OF. Stream temperature data taken between August 16 and Oct 15, 1995 show fluctuations between 44OF and 63OF with the highest temperatures in August and September. Temperatures dropped quickly in October. Although different salmonid species have the same basic habitat requirements, differences in temperature adaptations exist. Generally, salmonids require a water temperature of 65O F or lower to thrive. Most species can survive temperature as high as 70 O F for short periods of time. However, such temperatures decrease growth rates, spawning, migration, and stamina.

The nearest potential Endangered Species Act (ESA) - listed fish habitat (LFH) is below a barrier falls that is approximately 2 miles downstream from the project area. The habitat that is available just below the falls is not currently utilized by any ESA-listed species. The nearest observed ESA-listed species is hatchery-reared Upper Willamette River Chinook salmon. In the spring of 2004 and 2005 they were released by ODFW in Quartzville Creek and observed downstream in the Whitcom Creek inlet of Green Peter Reservoir.

They are well outside (~ 26 miles) of the project area and its effects. Typical juvenile Chinook behavior in this watershed is to out-migrate approximately 1 year from emergence. If these planted juveniles have similar behavior they should not attempt to migrate upstream towards the project area from the body of Green Peter Reservoir. They should head out of the reservoir into the S. Santiam River and on to the Willamette River. Currently there are no ESA-listed adult Chinook passed above Green Peter dam. There is current discussion about the potential for passing adult Chinook above Green Peter dam. The outcome of this discussion is unknown at the time of this writing. In the event that adults are passed above the dam it could be assumed that there is the potential for those fish to utilize the habitat up to a barrier falls, within two miles of the project area that would stop their migration. The Middle Fork of the Santiam River historically was the most productive spawning grounds for this system.

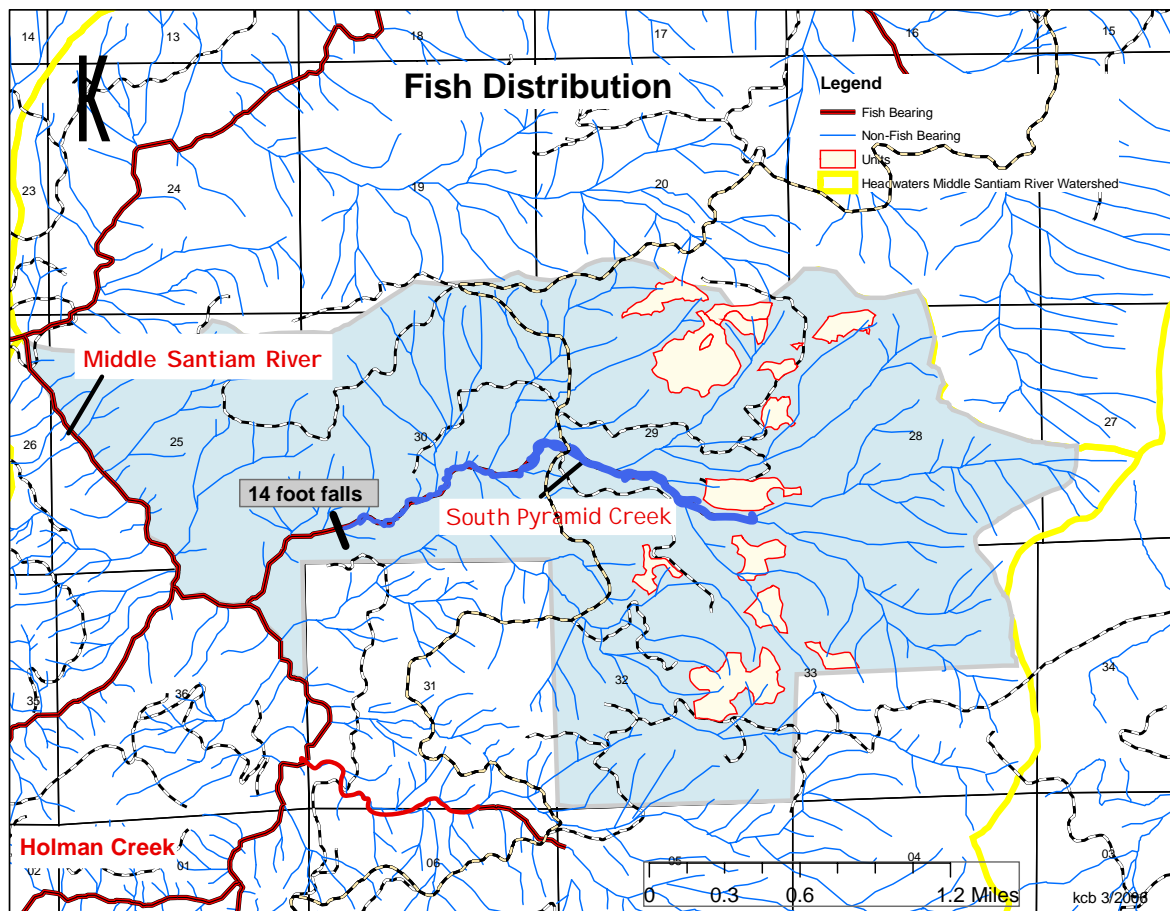


Figure 12: Fish Distribution Map

Environmental Consequences – Fisheries

All Alternatives - Management Indicator Species (MIS) – Fisheries:

1) **Management Indicator Species (MIS) - Anadromous Fish** combined with ESA-listed Chinook salmon and steelhead.

Anadromous spring Chinook salmon and winter steelhead, both listed as threatened species under the Endangered Species Act (ESA), are currently utilizing habitat 26 and 34 miles, respectively, downstream from the project area. Their historic distribution stops approximately two miles downstream from the project area at a natural barrier falls (figure 12). Effects to stream water quality were predicted to be minor, and the probability that these minor effects would be carried downstream to historic or currently occupied habitat is zero. Therefore, all alternatives would have no effect on ESA-listed or MIS-anadromous fish.

2) **Management Indicator Species – Resident Fish**

The only resident fish observed has been cutthroat trout, and this was documented in the survey conducted by Ecosystems Northwest in March 1996. (Ecosystems Northwest, 1996). Cutthroat Trout were observed at the confluence of South Pyramid Creek and the Middle Santiam River up to a point where there is a 14-foot channel spanning falls approximately 0.5 miles upstream from the confluence. With full leave, no-harvest Riparian Reserves, required mitigation measures and the implementation of Best Management Practices in road work, there is a very low probability that approx. 0.5 miles of South Pyramid would be negatively affected, and that the magnitude of negative effect would be very low.

Direct and Indirect Effects- Fisheries

Alternative 1 - No Action

Implementation of Alternative 1 would maintain the stream channels, riparian areas, and fish habitat in their current conditions. The direct effects to these areas would be from natural events. There would be physical and biological changes in the riparian areas, stream complexity, and habitat diversity from natural disturbance.

Indirect effects of this alternative include fluctuations in resident fish population size and structure in response to increases or decreases in stream habitat quality as a result of more woody material being introduced from the riparian timber stands if they decline.

Alternative 2

Implementation of Alternative 2 would maintain the stream channels, riparian areas, and fish habitat in their current conditions. No direct effects are anticipated from implementation of this alternative but there may be some short term (5-10 years) indirect effects from ground disturbance during harvest activities (61 acres of ground-based yarding systems). Unit prescriptions and mitigation measures would be implemented to minimize ground disturbance that produces sediment and turbidity in streams. All streams have full-leave, no harvest buffers which should also minimize the chance of sediment reaching streams.

Road re-opening and maintenance activities could potentially produce sediments to streams but with the implementation of Best Management Practices, mitigation measures and full-leave, no-harvest Riparian Reserves there would be a low risk of impacts to streams and no risk to fish habitat through the implementation of this alternative.

Alternative 3

Implementation of Alternative 3 would maintain the stream channels, riparian areas, and fish habitat in their current conditions. No direct effects are anticipated from implementation of this alternative but there may be short term (5-10 years) indirect effects from ground disturbance during harvest activities (59 acres of ground-based yarding systems). Unit prescriptions and mitigation measures would be implemented to minimize ground disturbance that could lead to sedimentation effects that would extend to the stream channel network. All streams have full-leave, no harvest buffers which should also minimize the chance of any sediment reaching streams.

Regeneration harvest, road re-opening and road maintenance activities could potentially produce sediments to streams. Through implementation of Best Management Practices, mitigation measures and full-leave, no-harvest Riparian Reserves the impact and duration of sedimentation would result in no risk to fish habitat.

Alternative 4

Same as Alternative 3, except on 34 acres of ground-based systems where there may be short term (5-10 years) indirect effects from ground disturbance during harvest activities.

Cumulative Effects - Fisheries

Area

The area of consideration for cumulative effects was the South Pyramid analysis area which lies within the boundaries of the Middle Santiam Watershed (5th field HUC 1709000601). Project elements are within the boundaries of the smaller Headwaters Middle Santiam River subwatershed (6th field HUC 170900060102).

Actions Contributing to Cumulative Effects

Actions that contribute to cumulative effects on the fisheries resource in this area include: timber harvest activities, road building and maintenance and road failures (See Appendix K for more cumulative effects information).

Methodology

Sediment, turbidity and temperature are the main things that effect aquatic habitat and water quality for fish. Using information in the GIS database as well as hydrology, stream channel and water quality reports, combined with experience and professional judgment, an assessment was made as to which past, current and future actions were still contributing to sediment, turbidity and temperatures and thus cumulative effects on the fisheries resource.

Conclusions - Fisheries

Past management activities, which occurred here between 13 and 45 years ago, resulted in removal of trees adjacent to stream channels in the analysis area. In these areas there is a cumulative loss of large wood recruitment potential for fish and aquatic habitat until these regenerated stands reach sufficient size and stand development to provide this resource (about 100 years from initial harvest).

No other cumulative effects due to past, present or reasonable foreseeable federal or non-federal projects, where effects overlap in both time and space, are expected for fish and aquatic resources as a result of the South Pyramid Timber Sale.

This determination was made given the following considerations:

- Best Management Practices, Forest Plan Standards and Guidelines, In-Water Work Guidelines, NW Forest Plan Standards and Guidelines, and other mitigation measures would be followed minimizing potential effects on fisheries and aquatic resources from project activities.
- Full-leave, no-harvest Riparian Reserves would be left on all stream channels to help isolate fisheries and aquatic resources from project activities.
- The analysis area is currently above midpoint hydrologic recovery percentage and is not showing any hydrologic cumulative effects beyond those analyzed in the Willamette Forest Plan.
- Stream channels are currently stable and water quality is high. Neither is showing adverse cumulative effects.
- No harvest has occurred in this area since 1993 and 13 years worth of recovery and growth has happened on managed stands in the area.
- No foreseeable future projects are planned in the project area.
- There are no streams upstream of the analysis area that flow into South Pyramid Creek that could be contributing additional effects here.

Consistency with Direction and Regulations - Fisheries

Willamette Forest Plan: The alternatives are consistent with Forest Plan direction. None of the potential combined effects are expected to further reduce aquatic habitat elements below Willamette Forest Plan standards and guidelines or adversely affect the viability of aquatic TES species. Potential effects are not expected to increase watershed effects outside the range of natural conditions.

NW Forest Plan: The application of the NW Forest Plan direction is expected to maintain or improve fish habitat conditions in the project area.

Endangered Species Act: All alternatives are consistent with Endangered Species Act direction. ESA consultation is not required for this project, as the implementation would have no effect on any ESA-listed fish species.

Magnuson-Stevens Fishery Conservation and Management Act, 1976 (MSA): MSA consultation is not required for this project, as the implementation would have no effect on any MSA-listed fish species.

Clean Water Act Section 303(d): The Middle Santiam River, which is located downstream of the analysis area, is currently on the 303(d) list for water temperature concerns for summer rearing of salmonids.

For all of the alternatives, no additional disturbance to the remaining shading vegetation in any riparian area would occur on perennial or fish-bearing streams. No measurable change in water temperature is predicted in any perennial stream as a result of any proposed action. 303(d) listed streams would not be at risk from any increased temperature from project activities (refer to Sufficiency Analysis on file and available for public review at Detroit Ranger District).

Executive Order 12962, Recreational Fisheries: All alternatives include aquatic conservation actions that would improve the quantity, function, sustainable productivity, and distribution of recreational fisheries as directed under Executive Order 12962, Recreational Fisheries

Executive Orders 11988 and 11990: The proposed alternatives would have no impact on floodplains or wetlands as described

Terrestrial Wildlife

A. Threatened and Endangered Species

1. Northern Spotted Owls

Introduction – Northern Spotted Owls

The northern spotted owl is listed as a threatened species and is also a management indicator species (MIS). There are three known owl sites that are within the influence of the proposed action.

Suitable habitat for the northern spotted owls (*Strix occidentalis*) has three main components: nesting, roosting, and foraging (NRF) habitat. Generally suitable habitat is 80 years of age or older, multi-storied with canopy closures exceeding 60 percent, and with sufficient large snags and down wood to provide opportunities for nesting, roosting, and foraging. Late-seral forest is superior habitat and preferred by spotted owls over other habitat conditions (Thomas et al. 1990).

Dispersal habitat allows spotted owls to move between stands of suitable habitat and for juveniles to disperse from natal territories. This habitat does not have a multi-storied canopy, large trees or large snags and down wood. Dispersal habitat generally consists of mid-seral stands between 40 and 80 years of age with canopy closures of 40% or greater and trees with a mean diameter of 11 inches or more (USDI, 2005). Most managed or natural forest stands 35-40 years old begin to develop dispersal habitat conditions.

Significant issues relating to terrestrial wildlife for this project include habitat effects on the northern spotted owl and the potential impacts of harvest operations to goshawks.

Analysis Methods – Northern Spotted Owls

The analysis area was surveyed for northern spotted owls using Region-6 protocol with a total of 12 visits in four years. Nest sites found in the area have been mapped. Using the GIS VEGIS database, verified by aerial photography and field visits, suitable spotted owl habitat was determined within the analysis area. Proposed harvest units were reviewed on-the-ground to verify tree size, canopy closure, and existing snags and down wood. Based on proximity to known nest sites, habitat impacts to northern spotted owls were analyzed.

Desired Future Conditions – Northern Spotted Owls

Achievement of habitat and population objectives of the NW Forest Plan (1994).

Existing Condition – Northern Spotted Owl

The proposed units consist of mid-seral stage, dense conifer stands containing trees of various heights and diameter classes. Canopy closure within the units is moderate to high (>60%) with moderate levels of snags and down wood. Old growth trees, large snags and large down wood, remnants from the previous stand, are sparsely distributed throughout the area and within the proposed units. Most units do not possess multiple canopy layers or have only a few acres with multiple canopy levels. All the units, except for unit 2b, contain sufficient structure to provide suitable, if marginal, spotted owl habitat. Unit 2b (49 acres) is dispersal habitat only, even though a portion of the unit does contain some large trees, snags, and down wood.

The proposed units are within the home range (1.2 miles) of three known owl sites (owl pair number 0670, 4462 and 4520). One of these owl sites is in the Quartzville Late-Successional Reserve (LSR). A second site is managed as a 100-acre LSR that includes the best habitat around the owl activity center. It is located near the Middle Santiam River and meets the requirements for owl activity centers known as a January 1, 1994 (USDA and USDI. 1994, p. 10). A third site, on Matrix lands, is protected with a 330-foot radius, no-harvest buffer as required by Willamette Forest Plan Standard and Guideline FW-171 which meets requirements for owl activity centers known before January 1, 1994.

The District has consulted with the U.S. Fish and Wildlife Service on this project. The Biological Opinion (USDI 1998, USDI 2005) allows timber harvest activities to within 1/4-mile of owl centers and in unsurveyed habitat after June 30 (or later if deemed necessary by an agency wildlife biologist).

One Critical Habitat Unit (CHU OR-15) overlaps a portion of the planning area and includes (wholly or partially) several proposed harvest units (see figure 5).

The Santiam Area of Concern (AOC) overlaps a small portion of the southwestern part of the analysis area (see figure 6). It borders the analysis area along the southern boundary. There are no proposed activities in the AOC.

Table 28: Owl Habitat within Proposed Harvest Units

Unit	Unit Size in Acres	Acres of Suitable Owl Habitat in Units	Acres of Dispersal Habitat in Units
1a	13	13	0
1b	3	3	0
2a	8	8	0
2b	49	0	49
4a	4	4	0
4b	8	8	0
4c	11	11	0
6a	21	21	0
8a	13	13	0
8b	6	6	0
9	38	38	0
24	7	7	0
27	11	11	0

Environmental Consequences – Northern Spotted Owls

Introduction: Spotted owls may be affected if habitat is modified within their median home range (1.2 mile radius around the nest tree) or activity center. Habitat modification may occur in three different ways: (1) habitat degradation which affects the quality of suitable or dispersal habitat without altering the functionality of such habitat, (2) habitat downgrading which alters the functionality of suitable habitat so that it no longer

supports nesting, roosting, and foraging, and (3) habitat removal which alters suitable or dispersal habitat to such an extent that the habitat no longer supports nesting, roosting, foraging, or dispersal.

To minimize disturbance to nesting spotted owls from harvest activities within a 1/4-mile radius of any known spotted owl activity center, a seasonal restriction on harvest and associated activities as outlined in Table 16 would be implemented.

Spotted owls may also be affected by noise disturbance above ambient levels during the nesting season (March 1 – September 30). Disturbance can occur from any activity producing above-ambient noise within 1/4 mile (1/2 miles for aircraft and 1 mile for blasting) of owls during the nesting season. Disturbance has a greater impact during the critical nesting period (3/1 - 7/15) than during the remainder of the nesting season (July 15 to September 30) (see seasonal restrictions Table 16)

Direct and Indirect Effects – Northern Spotted Owls

Alternative 1 – No Action

There would be no direct, indirect, or cumulative effects to spotted owls, spotted owl habitat, or spotted owl critical habitat. Habitat within the proposed units would continue to function as dispersal and/or suitable habitat. Mid-seral habitat within the units would continue to increase in quality through natural processes and eventually become owl habitat.

Snags and down wood would increase as competition-induced mortality increases over time. There would be some increased risk of habitat losses to fire proportional to this mortality, but this risk would be mitigated by fire suppression activities.

All Action Alternatives

This project is consistent with current standards established for projects that would specifically affect the northern spotted owl and its habitat. These standards were established for the Willamette Province by the Level 1 Consultation Team and are listed in the Batched Biological Assessment (BA) (USDA et al. 1998). The project is also consistent with Terms and Conditions in the Biological Opinions for this project (USDI Fish and Wildlife Service 1998) This project also considers new information from the 5-year species status review and other recent documents (USDI 2004a, Anthony et al. 2004, Courtney et al. 2004). No harvest would occur in the Area of Concern (AOC) in any action alternatives so habitat, especially dispersal habitat here would not be impacted.

Full-leave, no-harvest Riparian Reserves would be maintained in all harvest units. These reserves would maintain dispersal habitat for owls and other terrestrial species through these Matrix lands.

All harvest units in the Critical Habitat Unit (CHU) would retain dispersal habitat characteristics, at a minimum. Stand treatments would degrade or downgrade existing habitat in the short-term (10+ years), but improve it after trees respond to the thinning by increasing diameter and height growth and increasing crown size. Once the canopy closes again, improved suitable habitat would return to these stands and susceptibility to fires, insects and diseases would decrease. Thinning would also introduce diversity into the relatively large block of fire-regenerated second growth with the amount of diversity varying by alternative.

The U.S. Fish and Wildlife Service has suggested that the reduction of suitable spotted owl habitat to less than 40% (1182 acres) of the median home range (within 1.2 miles of owl activity center) has a notably higher likelihood of leading to disruption of essential breeding, feeding, and sheltering behaviors (USDI 1990). Table 28 describes the impacts of the various alternatives on the home range of the three owl pairs in the analysis area.

The remaining suitable habitat within home ranges of all three owl pairs in the project area would exceed 40% or 1182 acres under all action alternatives. Alternative 2 would affect the most acres, downgrading or degrading 314 acres of suitable habitat. Alternatives 3 and 4 would affect fewer acres of suitable habitat, 180 and 47 acres respectively, but would remove 61 and 24 acres respectively through regeneration harvests. Acres downgraded or degraded by thinning would recover to suitable dispersal habitat over 10 to 20 years while acres removed by regeneration harvests would require several decades (40 to 50 years) to provide suitable dispersal habitat.

By maintaining 40% or more of habitat within the home ranges as suitable habitat, all of the action alternatives would have minimal impacts or disruption of the essential breeding, feeding, and sheltering behavior of the owl pairs in the project area.

Table 29: Suitable Owl Habitat for Owl Pairs Affected by Alternatives

Owl Pair #	Acres of Suitable Habitat Within 1.2 Miles	Affected Acres of Suitable Habitat Within 1.2 Miles (Acreages reflect overlaps in home ranges and therefore exceed total harvest acres described by alternative in the narrative. Some units are only partially within home ranges.)											
		Alternative One			Alternative Two			Alternative Three			Alternative Four		
		Acres Removed (percent of suitable habitat within 1.2 mi.)	Acres Downgraded (percent of suitable habitat within 1.2 mi.)	Acres Degraded (percent of suitable habitat within 1.2 mi.)	Acres Removed (Percent of suitable habitat within 1.2 mi.)	Acres Downgraded (percent of suitable habitat within 1.2 mi.)	Acres Degraded (percent of suitable habitat within 1.2 mi.)	Acres Removed (percent of suitable habitat within 1.2 mi.)	Acres Downgraded (percent of suitable habitat within 1.2 mi.)	Acres Degraded (percent of suitable habitat within 1.2 mi.)	Acres Removed (percent of suitable habitat within 1.2 mi.)	Acres Downgraded (percent of suitable habitat within 1.2 mi.)	Acres Degraded (percent of suitable habitat within 1.2 mi.)
0670	1,256	0 (0%)	0 (0%)	0 (0%)	0 (0%)	44 ac. (3.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
4462	1,829	0 (0%)	0 (0%)	0 (0%)	0 (0%)	106 ac. (5.8%)	83 ac. (4.5%)	43 ac. (2%)	68 (4%)	0 (0%)	17 (1%)	15 (0.8%)	0 (0%)
4520	2,239	0 (0%)	0 (0%)	0 (0%)	0 (0%)	67 ac. (3%)	14 ac. (<1%)	18 ac. (<1%)	51 (2%)	0 (0%)	7 (0.3%)	8 (0.4%)	0 (0%)
Totals		0 (0%)	0 (0%)	0 (0%)	0 (0%)	266 ac. (4%)*	48 ac. (2%)	61 ac. (1%)	119 Ac. (2%)	0 (0%)	24 (0.5%)	23 (0.4%)	0 (0%)

* Percent of the total acres affected compared to the total suitable and available habitat within 1.2 miles of all three owl sites combined.

NOTE: Numbers reflect some overlap in home ranges and therefore exceed total harvest acres described by alternative in the narrative. Some units are only partially within home ranges.

Alternative 2

This alternative proposes to commercially thin 140 acres of suitable owl habitat and 49 acres of dispersal habitat. Suitable habitat in units 6a and 8a (34 acres) would be degraded but would still function as suitable habitat since a minimum 60% canopy closure would remain. Dispersal habitat in unit 2b (49 acres) would also be degraded but would still function as dispersal habitat since a minimum 40% canopy closure would be retained. Habitat in all other treated units would be temporarily downgraded from suitable habitat to dispersal habitat since the canopy closures would be reduced to 40-50%. In about 10 years the tree canopies in these units would close again and suitable habitat quality would return. Habitat quality would be improved over current conditions through increased diameter, height and crown growth.

A portion, or all, of units 4a-c, 6a, 8a-b, 9, and 27 are located within CHU OR-15. A total of 30.9 acres of critical habitat would be affected by thinning. Remnant old-growth trees, snags, down wood, and trees exceeding 30 inches DBH would be retained with additional down wood and snags created where needed to meet Forest Plan direction. Improving diversity and increasing vertical and horizontal stand structure would contribute to improving the quality of owl habitat here in the next 10 to 20 years.

Temporarily downgrading habitat adjacent to the Area of Concern (AOC) (for about 10 years) though timber harvest would potentially expand the width of area lacking dispersal habitat thus limiting northern spotted owl dispersal through the AOC. As canopies begin to close again dispersal habitat would return and habitat quality would be improved through increased tree size and tree canopy growth.

Within the home ranges of the three owl pairs in the analysis area the greatest impact of this alternative would be to the home range of owl pair 4462. In this owl's home range 106 acres of habitat would be temporarily downgraded from suitable to dispersal habitat for about 10 years until the canopies close again. An additional 83 acres would be degraded, which means the quality of the habitat would be affected but its functionality would not be altered. There would still be 1,829 acres of suitable habitat in the home range of owl pair 4462 (see table 29).

Owl pair 4520 would be impacted by temporarily downgrading 67 acres of habitat and degrading 14 acres of habitat. This leaves 2,239 acres of suitable habitat within the 1.2 mile radius home range.

Owl pair 0670 would be impacted by temporarily downgrading 44 acres of habitat leaving 1,256 acres of suitable habitat in its home range.

For all three owl pairs the remaining suitable habitat in their home ranges exceed the minimum 40% (1182 acres) suggested by the US Fish and Wildlife Service. It is therefore expected that disruption of essential breeding, feeding and sheltering behaviors would be minimal for these owls.

Recent Biological Opinions received from the U. S. Fish and Wildlife Service recommend that timber harvest be deferred within 0.7 miles of an active spotted owl nest between March 1 and September 30 to allow adult owls and their young to successfully utilize the core area for breeding, feeding, and sheltering prior to juvenile dispersal. Nine harvest units occur within 0.7 miles of the nest core for owl pair 4462. One unit lies within 0.7 mile owl pair 4520 (see table 30). The March 1 – Sept. 30 restriction would be applied on these units in order to minimize potential effects on the owls in close proximity to these units. Owl pair 4462 has the greatest potential for impacts because of the number of units in close proximity. It is likely that any potential impacts would be minimal due to the seasonal restriction and likely short term (probably two logging seasons) duration of timber harvest here. Units treated within this core area would remain at least dispersal habitat, so spotted owls would continue to use this habitat following timber harvest.

Table 30: Proximity of Proposed Harvest Units to Owl Pairs and Acres of Unit in CHU

Unit Number	Owl Pair Number						Within Critical Habitat Unit
	0670		4462		4520		
	Proposed Units Within 1.2 Miles	Proposed Units Within 0.7 Miles	Proposed Units Within 1.2 Miles	Proposed Units Within 0.7 Miles	Proposed Units Within 1.2 Miles	Proposed Units Within 0.7 Miles	
1a			X		X		
2a			X		X		
2b dispersal- only habitat			X	X	X		
4a			X	X	X		3.7 acres
4b			X	X	X		4.8 acres
4c			X		X	X	11 acres
6a			X	X	X		1.8 acres
8a			X	X	X		1.2 acres
8b	X		X	X			6 acres
9	X		X	X			0.4 acres
24			X	X			
27	X		X	X			2.0 acres

A “may affect, and is likely to adversely affect” determination was made for this alternative due to downgrading suitable habitat to dispersal habitat; however, it should be noted that this project would not jeopardize the species nor adversely modify critical habitat (USDI 1998).

Alternative 3

This alternative proposes to do regeneration harvest on 43 acres of suitable owl habitat in units 1a, 1b, and 6a and thin 19 acres of suitable habitat in units 2a, 4a, and 24, and thin 49 acres of dispersal habitat in unit 2b. Regeneration harvest in suitable habitat would remove 43 acres of that habitat. Thinning in 19 acres of suitable habitat and 49 acres of dispersal habitat would temporarily downgrade these habitats for about 10 years until tree canopies gradually grow together again. Thinning here would improve suitable habitat through increased diameter, height and crown growth in the next

decade. Thinned dispersal habitat in unit 2b (49 acres) would remain dispersal habitat following treatment but it would be more open than it is currently for about a decade.

Within the CHU, 3.7 acres of suitable habitat in unit 4a would be temporarily downgraded to dispersal habitat for about 10 years and 1.8 acres in 6a would be removed.

The greatest impact of this alternative would be to the home range of owl pair 4462 with 43 acres of habitat being removed and 68 acres being temporarily downgraded (19 suitable habitat and 49 dispersal habitat). There would still be 1,829 acres of suitable habitat in the home range of owl pair 4462.

Owl pair 4520 would be impacted by removal of 18 acres of habitat and downgrading of 51 acres of habitat for about 10 years in their home range. This leaves 2,239 acres of suitable habitat within the 1.2 mile radius.

There would be no effects on the home range of owl pair 0670 retaining all 1,256 acres of suitable habitat in its home range.

For all three pairs the remaining suitable habitat exceeds 40% (1182 acres) suggested by the US Fish and Wildlife Service.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to the removal and downgrading of suitable spotted owl habitat; however, this project would not jeopardize the species nor adversely modify critical habitat (USDI 1998).

Alternative 4

This alternative proposes to do regeneration harvest on 26 acres of suitable owl habitat in units 1a, 1b, and 4a and thin 49 acres of dispersal habitat in unit 2b. It would also thin 15 acres of suitable habitat in units 2a and 24 temporary downgrading this habitat. In about 10 years the canopies on the thinned units would close again and suitable habitat quality would improve through increased diameter, height and crown growth.

Within the CHU, 3.8 acres of suitable habitat in units 2a and 4a would be downgraded to dispersal habitat for the next decade following treatment.

The U.S. Fish and Wildlife Service has suggested that the reduction of suitable spotted owl habitat to less than 40% (1182 acres) of the median home range (within 1.2 miles of owl activity center) has a notably higher likelihood of leading to disruption of essential breeding, feeding, and sheltering behaviors (USDI 1990). Table 28 describes the impacts of this alternative on the home range of three owl pairs in the analysis area. The greatest impact of this alternative would be to the home range of owl pair 4462 with 17 acres of habitat being removed and 15 acres being temporarily downgraded. There would still be 1,829 acres of suitable habitat in the home range of owl pair 4462.

Owl pair 4520 would be impacted by removal of 7 acres of habitat and downgrading of 8 acres of habitat for about 10 years in their home range. This leaves 2,239 acres of suitable habitat within the 1.2 mile radius.

There would be no effects on the home range of owl pair 0670 retaining all 1,256 acres of suitable habitat in its home range.

For all three pairs the remaining suitable habitat exceeds 40% (1182 acres) suggested by the US Fish and Wildlife Service.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to the removal and downgrading of suitable spotted owl habitat; however, it should be noted that this project would not jeopardize the species nor adversely modify critical habitat (USDI 1998).

All Action Alternatives

AOC – No harvest activities occur in the Santiam Area of Concern so there would be no impacts to spotted owl dispersal in this area. In addition, full leave, no-harvest, Riparian Reserves serve to “improve travel and dispersal corridors for many terrestrial animals and plants, provide for greater connectivity within the watershed,” and serve as connectivity corridors among Late-Successional Reserves (USDA and USDI, 1994, A-5 and B-13). Figure 4 shows the Riparian Reserve network within the analysis area.

Snags and live defective trees that pose a safety threat to woods-operation personnel would need to be felled within the stands, adjacent to work areas, and along haul routes in all action alternatives. All hazard trees would be retained as down wood. Additional down wood and snags would be created as needed to meet Forest Plan direction. Habitat conditions for spotted owl prey species would be improved by the increased levels of snags and down wood.

Timber harvest activities under these 3 action alternatives are expected to create disturbance to the three owl sites. All harvest activities, including log haul, would be scheduled outside the critical nesting season (March 1 – July 15) and, whenever possible, outside the 0.7 mile core areas July 15 – September 30. Timber harvest would likely occur over a two-year period due to snow conditions and the mandatory owl restriction period. Reproductive status of owl pairs 4462 and 4520 would be monitored during the years of harvest in order to minimize this disturbance during the latter part of the nesting season.

Cumulative Effects- Northern spotted owls

Analysis Area:

Middle Santiam River 5th field watershed (66,750 acres).

Actions Contributing to Cumulative Effects

Timber harvest, especially regeneration harvest, road construction and fire suppression activities on both public and private lands have contributed to cumulative effects (see Appendix K for more cumulative effects information).

Methodology

Using the GIS database a 1.2 mile circle was analyzed around all known spotted owl activity centers in the Middle Santiam River 5th field watershed. For each circle, the amount of suitable owl habitat was determined to see if these activities centers meet the criteria of 40% (1182 acres) of the area in suitable habitat.

Cumulative Effects and Conclusions: - Northern spotted owls

There are 20 known northern spotted owl activity centers in the Middle Santiam 5th field watershed, including the three in the South Pyramid analysis area. An activity center is an “area of concentrated activity of either a pair of spotted owls or a territorial single owl” (USDA and USDI, 1994, page C-10). In an analysis of the suitable spotted owl habitat within a 1.2 mile radius of the known activity centers, 19 exceed the 40% minimum acreage (1182 acres) of suitable habitat (see Table 30 below –the highlighted pairs are located within the South Pyramid analysis area). The average number of acres of suitable habitat is 1840 or 64%. One pair has only 32% in suitable habitat with only 915 acres.

Past timber harvest activities and road building have removed suitable spotted owl habitat and reduced interior forest habitat, due to edge effect of the created openings. It has changed stand structure and seral stage distribution, decreased patch size of late-successional habitat and removed snags. It appears however, that 19 of the 20 known activity centers in the 5th field watershed still retain the minimum, or more, suitable habitat within their median home ranges including the three activity centers in the analysis area.

Critical Habitat Unit (CHU OR-15) currently has 42,919 acres of which 45% (19,126 acres) is suitable spotted owl habitat (nesting, roosting or foraging) habitat and 13% (5,540 acres) is dispersal habitat.

Alternative 2 thins 31.8 acres in the CHU, Alternative 3 thins 3.7 acres and Alternative 4 does not treat any acres in the CHU. Thinning these stands while also retaining remnant old-growth trees (if present), trees over 30 inches DBH (if present), snags, and down wood, the quality of this habitat would improve as the thinned stands increase in diameter and height and canopies increases over the next decade. There are no additional habitat altering projects in suitable or dispersal spotted owl habitat currently being planned in the vicinity of this project at this time.

The 5-year species status review has provided new information about potential threats to the northern spotted owl from climate change on regional vegetation patterns, sudden oak death syndrome, West Nile virus, barred owls and range wide population decline. (USDI 2004a, Anthony et al. 2004, Courtney et al. 2004).

Continued habitat loss due to timber harvest, especially on Federal lands, has declined relative to expectations in 1990 (Courtney et al. 2004). Nonetheless, past habitat loss is a current threat when compiled with current management activities. Fragmentation of old-growth and mature habitat has contributed to poor demographic performance in certain parts of this species range. This fragmentation has also allowed edge effects to become more prevalent, and as a result, predation by great horned owls has increased. Barred owls have also benefited from fragmentation and there is raised concern about

potential hybridization between barred owls and northern spotted owls. Hybridization levels may increase if northern spotted owl population levels decrease significantly (Courtney et al. 2004).

Connected issues such as climate change on regional vegetation patterns, sudden oak death syndrome, West Nile virus may have also added to the range wide population decline and cumulative threats to the species (Courtney et al. 2004). With the onset of global warming, new problems arise with the potential effects to vegetation patterns. In addition, sudden oak death presents a possible future threat to northern spotted owl habitat because of its potential impact on forest tree dynamics and alteration of key habitat components, most specifically in the southern most portion of its range (Courtney et al. 2004). West Nile virus has also become an issue of concern as it has spread quite rapidly though the United States in recent years. The virus is now within the range of the northern spotted owl, although no known cases of infection are known at this time (Courtney et al. 2004).

Other factors such as fire, wind and volcanic activity have also been issues of concern and serve as potential sources of habitat loss. With the buildup of fuels in some areas of the Cascades, there is a potential for catastrophic fire events. Recent fire events such as the 2003 Biscuit Fire in southwest Oregon produced a 2.3 percent of northern spotted owl habitat loss (SEI 2004). Windthrow and volcanic activity were considered issues by the 5-year review species status review; however, such issues were insignificant in comparison to threats of wildland fires (Courtney 2004).

Although new literature updates our knowledge on the new threats listed above, the impacts of these new issues have been rated by the US Fish and Wildlife Service as Low, Moderate and Severe threats (USDI 2005). Vulnerability to natural disturbances was rated as a low threat. West Nile and sudden oak death syndrome were rated as potential threats with substantial uncertainty about their effects when compiled with management activities (USDI 2005). Effects caused by the action alternatives in this project appear to have the greatest potential to impact local owls as a result of habitat modifications. Effects caused by the action alternatives could also increase the threat of great horned owl predation on spotted owls and hybridization between barred and spotted owls. As a result, potential impacts on the species from a range-wide perspective are those directly associated with the action alternatives and potential to modify habitat.

Table 31: Suitable Habitat within Home Range of Owl Pairs in the Middle Santiam River Watershed

Owl Pair Number	Total Acres within 1.2 mile radius of activity center	Required Minimum Acres of Suitable Habitat Needed within 1.2 mile radius of activity center	Actual Acres of Suitable Habitat Within 1.2 Mile radius of activity center	Percent of area in Suitable Habitat in activity center
16	2895.3	1182	1274	44
645	2895.3	1182	2057	71
647	2895.3	1182	2603	89
653	2895.3	1182	1775	61
656	2895.3	1182	1812	63
658	2895.3	1182	1637	57
670	2895.3	1182	1256	43
693	2895.3	1182	1652	57
696	2895.3	1182	2344	81
2957	2895.3	1182	915	32
2975	2895.3	1182	2023	70
2977	2895.3	1182	2327	80
2979	2895.3	1182	1580	55
2981	2895.3	1182	2345	81
4092	2895.3	1182	1252	43
4097	2895.3	1182	2000	69
4401	2895.3	1182	2347	81
4462	2895.3	1182	1829	63
4520	2895.3	1182	2239	76
6076	2895.3	1182	1732	60
20 act. centers			Ave = 1850	Ave = 64%

Consistency with Direction and Regulations – Northern Spotted Owl

Treatment of Northern spotted owls is consistent with direction and regulations outlined in the Regulatory Framework, Management Direction, and Guidance section outlined in Appendix L.

2. Bald Eagles

Bald eagles listed as a threatened species and they are also management indicator species (MIS). Bald eagles do not occur in the analysis area and would not be impacted by proposed project activities.

B. Sensitive Wildlife Species**Introduction – Sensitive Wildlife Species**

Eighteen Region-6 sensitive wildlife species were evaluated to determine if they or their habitat would be impacted by this project (Table 32). Habitat for 8 species (Baird's shrew, Pacific shrew, Pacific fisher, Pacific fringe-tailed bat, Oregon slender salamander, Cascade torrent salamander, Crater Lake Tightcoil, and peregrine falcon) was found in the planning area. Habitat does not exist for 10 of the 18 species (least bittern, bufflehead, harlequin duck, yellow rail, black swift, California wolverine, foothill yellow-legged frog, Oregon spotted frog, Northwestern pond turtle, and Mardon skipper). Surveys have been completed previously for the presence of peregrine falcon but none were detected. The eight species with habitat in the project area are addressed further in the Biological Evaluation (Appendix E and F).

Table 31: Sensitive Wildlife Species on the Willamette National Forest

Species	Habitat Present in South Pyramid Planning Area?	Species Documented or Suspected in South Pyramid Planning Area?
Amphibians		
Oregon Slender Salamander	Yes	Documented
Cascade Torrent Salamander	Yes	Suspected
Foothill Yellow-legged Frog	No	
Oregon Spotted Frog	No	
Birds		
Least Bittern	No	
Bufflehead	No	
Harlequin Duck	No	
Yellow Rail	No	
Black Swift	No	
Peregrine Falcon	Yes	Suspected
Invertebrates		
Mardon Skipper	No	
Mammals		
Baird's Shrew	Yes	Suspected
Pacific Shrew	Yes	Suspected
California Wolverine	No	
Pacific Fisher	Yes	Suspected
Pacific Fringe-tailed Bat	Yes	Suspected
Mollusks		
Crater Lake Tightcoil, also a survey and manage species	Yes	Suspected
Reptiles		
Northwestern Pond Turtle	No	

Environmental Consequences – Sensitive Wildlife Species*Direct and Indirect Effects – Sensitive Wildlife Species***Alternative 1 – No Action**

There would be no impacts to sensitive wildlife species under this alternative. Existing habitat would develop slowly toward late-successional conditions, barring natural disturbance events (e.g. fire, windstorms).

Alternatives 2-4

Of the sensitive species listed in the table above, only the Oregon slender salamander, Baird's shrew, Pacific shrew, Pacific fisher, and Pacific fringe-tailed bat may be impacted by the action alternatives, either through site disturbance or habitat modification. Proposed treatments may impact individuals or habitat for these species, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

No-harvest buffers identified for perennial streams would eliminate effects to Cascade Torrent Salamander and Crater Lake Tightcoil, a small mollusk species. There should be no impacts to these species. The remaining sensitive species do not occur within the planning area or would not be affected by harvest activities (See Appendix E and F: Wildlife Biological Evaluation).

Cliffs suitable for peregrine falcon nesting and within 3 miles of proposed units have no known occupancy. No impacts to this species are expected by proposed harvest. Additional peregrine falcon surveys would be done prior to timber harvest. See Biological Evaluation (Appendix E and F) for details on all affected sensitive species.

Cumulative Effects – Sensitive Wildlife Species

The amount of habitat being affected by this project is a small percentage of the existing sensitive species habitat currently available in the South Pyramid Planning Areas. The retention of existing down wood and the creation of snags and additional down wood after harvest is complete, would help mitigate for any loss of habitat. There are no additional habitat altering projects at this time within the South Pyramid Planning Area.

Consistency with Direction and Regulations – Sensitive Wildlife Species

Treatment of "other wildlife species" is consistent with direction and regulations outlined in the Regulatory Framework, Management Direction, and Guidance section outlined in Appendix L.

C. Course Woody Debris and Snags

Introduction and Analysis Methods – Coarse Woody Debris and Snags

Course woody debris and snag retention play a significant role in influencing ecosystem functionality and productivity. This significance is addressed in the Forest Plan and elsewhere (Brown et al. 2003). Management Standards and Guidelines in the Northwest Forest Plan further emphasize the significance of this relationship. American marten, fisher and two species of salamander rely on course woody debris, specifically. Cavity-nesting birds and bats rely on snags for roost and nesting sites.

For the Willamette National Forest, the Forest Plan requires that 240 linear feet per acre be retained in a harvest area. Logs must be 20” or larger in DBH (diameter at breast height) and at least 20 feet in length. Decay class 1 and 2 logs may be counted in these totals. Snag habitat, under the Forest Plan, shall be retained within a harvest unit at levels sufficient to support species of cavity-nesting birds at 40% of the potential population (2.1 snags per acre in decay classes 1, 2 & 3 greater than 20 feet tall with a DBH of 18” or greater).

Current science suggests that other approaches should be considered when identifying appropriate levels of down wood and snag abundance in addition to the potential population approach as directed by the Forest Plan. One recommended approach is to use DecAID, a program devoted to identifying appropriate levels of down wood and snags in selected habitat types. DecAID is “the decayed wood advisor for managing snags, partially dead trees and down wood for biodiversity in forests of Washington and Oregon” (Mellen et al. 2006). DecAID is based on a synthesis and integration of published scientific literature, research data, wildlife databases, forest inventory databases and expert judgment (Mellen et al. 2006). Although DecAID is known as the best available science, it also has limitations. It should be noted that DecAID is a tool that can help managers evaluate the effects of forest conditions. It is intended to evaluate across a landscape scale, not to evaluate site specific areas. DecAID also highly recommends that an analysis area should be at least 20 square miles or roughly 12, 800 acres in size. The South Pyramid analysis area is a little over 3,200 acres, ¼ of the minimum size suggested by DecAID. As a result, the 6th field subwatershed was considered with respect to the project area. The South Pyramid project area lies within boundary of the Headwaters Middle Santiam River subwatershed. This subwatershed is approximately 20, 800 acres and meets the criteria when using DecAID to evaluate snag and down wood levels. The most acres proposed for treatment in the action alternatives are approximately 190 acres, which comprises about 1% of this 6th field subwatershed. The Westside Lowland Conifer-Hardwood Forest Habitat Type was chosen, with a Small/Medium Tree Vegetation Condition in the DecAID Repository and all proposed treatment units within the South Pyramid Planning area fall into this habitat type and size class.

DecAID provides information on snag and down wood in three species tolerance levels, 30%, 50% and 80%. The 50% tolerance level is typically considered when evaluating activities in matrix allocations and 80% is typically considered in late-successional reserves. These considerations are general guidelines and it is the responsibility of the biologist to interpret and use information from DecAID to evaluate the needs of the area being examined. DecAID can provide information that

can supplement current Forest Plan Standards and Guidelines. At the 50% tolerance level, DecAID indicates a snag density range of 10-18 snags per acre $\geq 10''$ DBH and 1-8 snags per acre $\geq 20''$ DBH. Although data was not gathered for snags between 10 and 20 inches, based on the snags 20 inches or larger, the South Pyramid planning area is within the range of snag densities at the 50% tolerance level for this habitat type. Data from DecAID shows that down wood cover used by wildlife at the 50% tolerance level ranges from 3-10% cover. There are no exact conversions of linear feet of down wood to percent down wood cover and down wood data gathered for South Pyramid analysis only included pieces that met Forest Plan standards (>20 inches, longer than 20 feet and decay classes I and II). DecAID down wood data includes smaller down wood diameters and piece sizes than the Forest Plan and includes all decay classes. Using log size to percent cover conversion ratios developed for the Mid Willamette LSR Assessment, the current down wood cover percentage using only wood that meets Forest Plan standards would be about 2-3% coverage or at the lower end of range for the 50% tolerance level of down wood. Inclusion of all size classes and decay classes of current down wood would be expected to increase the cover percentage by 1-2% which would increase the current percent coverage closer to the mid range of the DecAID 50% tolerance level. DecAID also showed that at or above the 50% tolerance level, a vast majority of wildlife species were associated with percent cover (Mellen et al 2003).

Pre-field exams were conducted in the project area to assess habitat potential. Pre-field exams involved a walk-thru and information was documented on down wood, snag abundance and habitat requirements of wildlife species. A Biological Evaluation (BE) was completed for this project consistent with the direction in Forest Service Policy FSM 2672.4-7. (Please see Appendix F: Wildlife Biological Evaluation). In addition, stand exam information was used to determine current down wood and snag levels.

Current Conditions – Coarse Woody Debris and Snags

Approximately half of the units within the project area have snag levels that meet or exceed Forest Plan Standards and Guidelines while the rest of the units do not currently meet the standards (Table 33). Current snag density across the entire planning area is calculated to average 48% (or 2.4 snags/acre) of potential population level. All proposed harvest units except unit 6a meet or exceed Forest Plan Standards and Guidelines for down wood. The proposed harvest units occur in mid-seral stands with an average age of 111 years (Table 1). Relative Density Index of 0.6 or greater indicate an overstocked stand and a lower average DBH (diameter at breast height) as shown on page 9 of the EA. Average diameters of the proposed harvest units were 14 inches DBH (pg 9, EA). Greater competition occurs for resources when a maximum density is reached. Higher densities can limit forest vigor and health and as a result, some units have up to 30% in dead trees. In addition, habitat diversity is reduced in higher density stands due to the prolonged time it takes to achieve large diameter trees and multi-story stand composition (Oliver 1990). Greater diversity in habitat conditions can benefit many forest species, including salamanders, bats and the Pacific Fisher.

Table 32 Current snag levels (.18" and >20')

Unit	Stand Number (Area Number)	Snags per Acre	Meets Forest Plan Standards and Guidelines?
1a	1	1	No
1b	1	1	No
2a	2	3	Yes
2b	2	3	Yes
4a	4	18	Yes
4b	4	18	Yes
4c	4	18	Yes
6a	6	11	Yes
8a	8	0	No
8b	8	0	No
9	8	0	No
24	Not available	Not available	Not available
27	8	0	No

Table 33 Current down wood levels (>20", >20', Class I & II

Unit	Stand Number (Area Number)	Linear ft. per Acre	Meets Forest Plan Standards and Guidelines?
1a	1	322	Yes
1b	1	322	Yes
2a	2	254	Yes
2b	2	254	Yes
4a	4	338	Yes
4b	4	338	Yes
4c	4	338	Yes
6a	6	173	No
8a	8	610	Yes
8b	8	610	Yes
9	8	610	Yes
24	Not available	Not available	Not available
27	8	610	Yes

Direct and Indirect Effects – Coarse Woody Debris

Alternative 1

Alternative 1 proposes no immediate changes to snag density or down wood within the proposed units. Current snag density within the planning area would remain at 48% (or 2.4 snags/acre) of potential population level across the entire planning area. Most snags are located in intact mature and late-successional habitats (seral types 3 and 4). Down wood in decay classes 1 and 2 is limited within all proposed harvest units. Natural processes over time would increase both snag and down wood densities.

Alternative 2, Proposed Action

Alternative 2 proposes light to moderate thinning on 189 acres of seral stage III habitat. This habitat would remain seral stage III habitat after harvest. Most existing large snags would be retained except where they pose a safety concern to workers and can not be avoided. Snags felled for worker safety would be left on site as down wood. Additional snags would be created after harvest to maintain the minimum 40% potential population level within the thinning units. This alternative does not create additional early seral habitat or change the overall snag density currently within the planning area. Future snag recruitment typically created by natural thinning processes over the next 40 years would be reduced by reducing stocking levels with commercial thinning. Additional down wood would also be created in thinning units after harvest by felling green trees in order to meet Forest Plan standards for partial harvest areas. Average snag densities across the entire planning area would remain approximately the same at about 2.4 snags/acre due to any changes per acre being relatively small and limited to about 1% of the total planning area.

Alternative 3

Alternative 3 proposes the same light to moderate thinning as Alternative 2 on 68 acres. These thinning acres would be treated the same as described above under Alternative 2, with similar habitat results. Alternative 3 also creates 43 acres of early seral habitat (seral type 1) with a 40% snag population level after harvest (2.1 snags per acre in decay classes 1, 2, or 3 and greater than 20 feet tall, greater than 18"DBH). This snag habitat would benefit early seral, cavity dependent species, like western bluebirds. . Average snag densities across the entire planning area would remain approximately the same at about 2.4 snags/acre due to any changes per acre being relatively small and limited to about 1% of the total planning area.

Alternative 4

Alternative 4 proposes the same light to moderate thinning as Alternative 2 on 15 acres. These thinning acres would be treated the same as described above under Alternative 2, with similar habitat results. Alternative 4 also creates 75 acres of early seral habitat with a 40% snag population level after harvest (2.1 snags per acre in decay classes 1, 2, or 3 and greater than 20 feet tall).

Additional green replacement trees would be retained in regeneration units to replace existing snags in the future as they decay and fall down. Dead, defective and live green trees retained for snag habitat would be greater than 18" diameter (if available) or the largest trees available within the stand being treated. Units identified for regeneration harvest have numerous large legacy trees that would be used to provide snags and green replacement trees. By following Forest Plan standards, Alternatives 3 and 4 would have minimal effect on the snag density currently within the planning area. However, harvest operations are likely to reduce future recruitment of snags within harvest units typically created by natural thinning processes over the next 40 years. Average snag densities across the entire planning area would remain approximately the same at about 2.4 snags/acre due to any changes per acre being relatively small and limited to about 1% of the total planning area.

Forest Plan standards require 240 linear feet of downed logs greater than or equal to 20 inches diameter and greater than 20 feet long be retained in all regeneration harvest units. Decay classes 1 and 2 can be counted towards this total. All existing down wood within the units would be retained. Additional down wood would be created from standing trees after timber harvest is complete.

Forest Plan standards also require 15% of regeneration harvest acres (per unit) retained over multiple rotations as Green Tree Retention (GTR) Areas. Placement of GTRs would include concentrations of existing snags or down wood wherever possible. These areas act as refugia for species that require very old forests.

Cumulative Effects- Coarse Woody Debris and Snags

Area

The area analyzed for cumulative effects was the planning area and individual harvest units.

Actions contributing to Cumulative Effects

Past timber harvest, road construction, fire suppression and road maintenance activities all contribute to cumulative effects on coarse woody debris and snags. (see Appendix K for more cumulative effects information).

Conclusions – Coarse Woody Debris and Snags

Timber harvest, road building and natural disturbances have all impacted the amount of snags and down wood habitat within the South Pyramid Planning Area (Appendix K). Timber harvest and road building activities have reduced snag and down wood habitat while natural disturbances such as insects, disease, windthrow and suppression mortality have added to snag and down wood levels. While additions to snags as a result of suppression mortality in the small tree sizes would be reduced in stands proposed for thinning, it and the other natural mortality factors would continue to maintain or increase snags and down wood across the planning area. Current harvest prescriptions designed for these alternatives may reduce the number of snags within the units but increase the amount of down wood. To mitigate this, additional snags and down wood would be created following timber harvest to meet Forest Plan Standards and Guidelines. Depending on the current snag densities in proposed treatment units, snag densities at the harvest unit level may be lower, higher or about the same post-treatment.

However, the treatment units represent about 1% of the entire planning area of about 3,200 acres so at that scale, existing snag densities would not measurably change and would remain at approximately 2.4 large snags per acre across the planning area. Based on the DecAID inventory data from unharvested areas in stands similar to the proposed harvest units (WLCH_OCA_S.inv-15) this post treatment snag densities is approximately at the 50th percentile level for this habitat type and seral condition. Down wood levels would either be maintained or increased in all treatment units and would also remain within the range for 50th percentile of down wood coverage. In the reasonable foreseeable future, there are no additional habitat altering projects identified at this time within the South Pyramid Planning Area.

Consistency with Direction and Regulations – Coarse Woody Debris and Snags

Treatment of snag and down wood habitat is consistent with direction and regulations outlined in the Regulatory Framework, Management Direction and Guidance section outlined in Appendix L.

D. Management Indicator Species

Introduction – Management Indicator Species (MIS)

Management Indicator Species (MIS) selected in the Willamette Forest Plan to facilitate management of all species are summarized in that document on page III-69. They include northern spotted owl, bald eagle, big game, cavity excavators, pine marten, pileated woodpecker, and peregrine falcon. All the terrestrial management indicator species, except bald eagle may occur within the South Pyramid Planning Area.

1. Primary Cavity Excavators

Introduction – Primary Cavity Excavators

The significance of snags and down wood providing habitat for cavity dependent species has become an increasingly important issue as new information becomes available. Wildlife trees provide habitat for cavity dependent species (woodpeckers and other birds), spotted owl nesting, and spotted owl prey such as flying squirrels. DecAID shows that as down wood percent cover increases throughout a habitat type (Westside Lowland Conifer-Hardwood Forest Western Cascades, Small/Medium Tree condition was used for analysis purposes) there is a general increase in cumulative wildlife species composition. Northern flying squirrels, Townsend's chipmunk and Western red-backed salamanders were several species that showed a notable increase in cumulative species composition, indicating that down wood percent cover can be an integral part of maintaining species viability (Mellen et al. 2006). DecAID also shows that cumulative species composition did not significantly change as down wood composition increased in tolerance levels for certain species. Pacific shrew, Trowbridge's shrew, and Townsend's vole showed a relatively stable cumulative species composition as tolerance levels increased. Data from DecAID shows

similar results with snag density levels. Brown creepers and bushy-tailed woodrats maintained stable cumulative species composition as snag density (snags ≥ 10 " DBH) increased (Mellen et al. 2006).

Analysis Methods – Primary Cavity Excavators

A wildlife biologist conducted a pre-field and field review along with use of current stand exam information to analyze current conditions. The Decayed Wood Advisor (DecAID) was also used to provide recommendations for appropriate on levels of snags and down wood in the South Pyramid Planning Area. DecAID (Mellen et al. 2003) summarizes information on primarily cavity excavators as well as a broad range of other organisms that use snags and down wood. This tool also helps managers evaluate the effects of forest conditions and existing or proposed management activities on organisms that use snags and down wood. Recommendations from the use of DecAID are not intended to be used as a prescription for the level of snags and down wood for every acre but are recommendations for a range of conditions to be met across the landscape at the appropriate scale. In addition, DecAID recommends that an analysis area should be a minimum of 12, 800 acres in size for reliable results. Since the project area of South Pyramid is only a little over 3,200 acres in size, the use of DecAID would be imprudent and inappropriate. As a result, the 6th field subwatershed was considered with respect to the project area. The South Pyramid project area lies within boundary of the Headwaters Middle Santiam River subwatershed. This subwatershed is approximately 20, 800 acres and meets the criteria when using DecAID to evaluate snag and down wood levels. The most acres proposed for treatment in the action alternatives are approximately 190 acres, which comprises about 1% of this 6th field subwatershed. The Westside Lowland Conifer-Hardwood Forest Habitat Type was chosen as the appropriate habitat type and Small/Medium Tree Vegetation Condition as the appropriate tree size in the DecAID model. All stands within the South Pyramid Planning area fall into this habitat type and stand condition class.

Desired Future Conditions – Primary Cavity Excavators

The Willamette Forest Plan requires snags be retained in harvest units and throughout the drainage at a minimum 40% of the potential population of primary cavity excavators, and the full 100% population potential for two identified species (black-backed woodpeckers and flammulated owls). Retention of snag habitat for black-backed woodpeckers and other primary cavity excavators provides required suitable habitat for flammulated owls.

The 40% level in the Pacific silver fir or true fir series requires an average of 2.1 snags per acre (including 100% snags for black-backed woodpeckers and flammulated owls) in decay classes I, II, or III and greater than 20 feet tall. Green replacement trees also need to be retained to replace the current snag population as it decays and falls down. A minimum of 4.5 snags and green trees per acre (TPA) is required to provide for wildlife tree habitat within high elevation regeneration units.

For green-tree and snag retention patches on Matrix lands, the Forest Plan requires a minimum 15% of regeneration harvest unit acres be retained over multiple rotations for species that require very old forests. This standard does not apply to commercial thinning units. The Forest Plan also

requires 240 linear feet of downed logs per acre, at least 20 inches in diameter and greater than 20 feet long, be retained in harvest units on Matrix lands. Desired future conditions for this project area would be to maintain at least Forest Plan Standards and Guidelines with consideration of DecAID information to evaluate wildlife impacts and potential range of snag and down wood habitats.

Existing Conditions – Primary Cavity Excavators

Snags (dead and dying trees) and down wood are important structural components of forest communities and are used by wildlife species in a variety of ways. In forests of western Oregon, snags are used by nearly 100 species of wildlife, of which 53 species (39 birds and 14 mammals) are cavity dependent (Brown 1985). Snag height, diameter, decay stage, and species of snags provide a range of habitat features for a variety of wildlife species. Hollow trees and snags are uncommon but are especially valuable habitat for some wildlife. Defective trees with deformities such as snow breaks, dead or broken tops, heartrot, and mistletoe brooms also provide valuable habitat for wildlife species.

Down wood (stumps, root wads, limbs, bark, and logs) is also an important component of forest communities. In addition to cycling minerals and nutrients within the forest ecosystem, it creates structure and diversity of habitats for a variety of terrestrial and aquatic wildlife. Logs in various stages of decay are used by wildlife species. Larger diameter logs provide habitat for a greater range of wildlife species and persist over a longer period of time than smaller material. Hollow logs, like hollow trees and snags, are extremely valuable to wildlife and should be retained wherever they occur.

The Forest Plan requires snags be retained in harvest units and throughout the drainage at a minimum 40% of the potential population of primary cavity excavators, and the full 100% population potential for two identified species (black-backed woodpeckers and flammulated owls). Retention of snag habitat for black-backed woodpeckers and other primary cavity excavators provides required suitable habitat for flammulated owls.

The 40% level in the Pacific silver fir or true fir series requires an average of 2.1 snags per acre (including 100% snags for black-backed woodpeckers and flammulated owls) in decay classes I, II, or III and greater than 20 feet tall. Green replacement trees also need to be retained to replace the current snag population as it decays and falls down. A minimum of 4.5 snags and green trees per acre (TPA) is required to provide for wildlife tree habitat within high elevation regeneration units.

For green-tree and snag retention patches on Matrix lands, the Forest Plan requires a minimum 15% of regeneration harvest unit acres be retained over multiple rotations for species that require very old forests. This standard does not apply to commercial thinning units. The Forest Plan also requires 240 linear feet of downed logs per acre, at least 20 inches in diameter and greater than 20 feet long, be retained in harvest units on Matrix lands.

DecAID provides information on snag and down wood in three tolerance levels, 30%, 50% and 80%. The 50% tolerance level is typically used when considering matrix allocations and 80% is typically used when considering late-successional reserves. These considerations are general

guidelines and it is the responsibility of the biologist to interpret and use information from DecAID to best fit the needs of the area being examined. DecAID can provide information that can supplement current Forest Plan Standards and Guidelines. At the 50% tolerance level, DecAID recommends retaining a snag density range of 10-18 snags per acre $\geq 10''$ DBH and 1-8 snags per acre $\geq 20''$ DBH. Data from DecAID shows that down wood cover used by wildlife at the 50% tolerance level ranges from 3-10% cover. DecAID also showed that at or above the 50% tolerance level, a vast majority of wildlife species were associated with percent cover (Mellen et al 2003).

The western portion of the South Pyramid planning area is primarily late-successional habitat (seral type 4) and the eastern portion is mid-seral (seral type 3) habitat. Special habitats, containing few snags or down wood, are scattered throughout, but primarily are found in the eastern portion. A total of 3749 acres of forest habitats (seral types 1- 4) in the planning area was used to calculate snag density.

Timber harvest has occurred extensively along the southern boundary and to a lesser extent in middle portion of the planning area. Harvest in the past 20-30 years has created 1255 acres (33% of total forest habitat) of early seral habitat (seral types 1 & 2). Few snags or down wood were retained in these past harvest units. Broadcast slash burning in these units often destroyed any habitat structure that was left. To maintain populations of snag-dependent wildlife, snags need to be provided in each successional stage of a plant community (Brown 1985).

Environmental Consequences – Primary Cavity Excavators

Direct and Indirect Effects-Primary Cavity Nesters

Alternative 1

Alternative 1 proposes no immediate changes to snag density or down wood within the proposed units. Current snag density within the planning area would remain at 48% (or 2.4 snags/acre) of potential population level across the entire planning area. Most snags are located in intact mature and late-successional habitats (seral types 3 and 4). Down wood in decay classes 1 and 2 is limited within all proposed harvest units. Natural processes over time would increase both snag and down wood densities.

Alternative 2

Alternative 2 proposes light to moderate thinning on approximately 190 acres of seral stage III habitat. This habitat would remain seral stage III habitat after harvest. Most existing large snags would be retained except where they pose a safety concern to workers and can not be avoided. Snags felled for worker safety would be left on site as down wood. Additional snags would be created after harvest to maintain the minimum 40% potential population level within the thinning units. This alternative does not create additional early seral habitat or change the overall snag density currently within the planning area. Future snag recruitment typically created by natural thinning processes over the next 40 years would be reduced by reducing stocking levels with

commercial thinning. Additional down wood would also be created in thinning units after harvest by felling green trees in order to meet Forest Plan standards for partial harvest areas.

Alternative 3

Alternative 3 proposes the same light to moderate thinning as Alternative 2 on 68 acres. These thinning acres would be treated the same as described above under Alternative 2, with similar habitat results. Alternative 3 also creates 43 acres of early seral habitat (seral type 1) with a 40% snag population level after harvest (2.1 snags per acre in decay classes 1, 2, or 3 and greater than 20 feet tall). This snag habitat would benefit early seral, cavity dependent species, like western bluebirds.

Alternative 4

Alternative 4 proposes the same light to moderate thinning as Alternative 2 on 15 acres. These thinning acres would be treated the same as described above under Alternative 2, with similar habitat results. Alternative 4 also creates 75 acres of early seral habitat with a 40% snag population level after harvest (2.1 snags per acre in decay classes 1, 2, or 3 and greater than 20 feet tall).

Additional green replacement trees would be retained in regeneration units to replace existing snags in the future as they decay and fall down. Dead, defective and live green trees retained for snag habitat would be greater than 18" diameter (if available) or the largest trees available within the stand being treated. Units identified for regeneration harvest have numerous large legacy trees that would be used to provide snags and green replacement trees. By following Forest Plan standards, Alternatives 3 and 4 would have minimal effect on the snag density currently within the planning area. However, harvest operations are likely to reduce future recruitment of snags within harvest units typically created by natural thinning processes over the next 40 years.

Forest Plan standards require 240 linear feet of downed logs greater than or equal to 20 inches diameter and greater than 20 feet long be retained in all regeneration harvest units. Decay classes 1 and 2 can be counted towards this total. All existing down wood within the units would be retained. Additional down wood would be created from standing trees after timber harvest is complete.

Forest Plan standards also require 15% of regeneration harvest acres (per unit) retained over multiple rotations as Green Tree Retention Areas. These areas act as refugia for species that require very old forests.

Cumulative Effects – Primary Cavity Excavators

Area

The area analyzed for cumulative effects was the planning area and individual harvest units.

Actions Contributing to Cumulative Effects

Past timber harvest, road construction, fire suppression and road maintenance activities (see Appendix K for more cumulative effects information).

Conclusions – Primary Cavity Excavators

Timber harvest, road building and natural disturbances have all impacted the amount of snags and down wood habitat within the South Pyramid Planning Area . Past timber harvest and road building have reduced snag and down wood habitat while natural disturbances typically have increased snag and down wood levels. Refer to previous conclusions about cumulative impacts on snag habitat on page 127. Cumulative impacts to primary cavity excavators would be minimal since less than 1% of the analysis area/habitat would be impacted by proposed activities and on stand that would be harvested, mitigations would maintain snag levels at the 40% population potential prescribed by the Forest Plan. Snag densities across the entire planning area would remain at or near the 50% tolerance levels described in DecAID for these species.

Consistency with Direction and Regulations – Primary Cavity Excavators

Treatment of snag and down wood habitat is consistent with direction and regulations outlined in the Regulatory Framework, Management Direction, and Guidance section outlined in Appendix L.

2. Pileated Woodpecker and Pine Marten

Introduction – Pileated Woodpecker and Pine Marten

Mature and old-growth forests provide feeding, resting, and breeding areas for pileated woodpeckers and pine marten. Both species may also use younger or more open stands provided forest structure (snags and down wood) is available (Csuti et al 1997).

Direct and Indirect Effects-Pileated Woodpecker and Pine Marten

Action Alternatives

Light to moderate thinning planned in Alternatives 2-4 would degrade habitat for these two species in the short term (about 10 years) by reducing the canopy closure in treated areas to 40-60%. Retaining remnant old-growth trees, trees over 30 inches DBH, snags, and down wood, and creating additional snags and down wood where needed, would improve habitat for pileated woodpecker and marten as the canopy increases. In about 10 years the tree growth as a result of

thinning would increase tree diameter, height and canopy closure. This would result in improved habitat over current conditions.

Regeneration harvest planned in Alternatives 3 and 4 would remove habitat for these two species. Retaining remnant old-growth trees and providing sufficient amounts of snag and down wood habitat within regeneration harvest units would provide valuable forest structure for both species as the next stand develops.

Table 34 Pileated Woodpecker and Pine Marten Habitat

Consequence	Habitat Acres			
	Alt 1	Alt 2	Alt 3	Alt 4
Habitat degraded	0	189	68	15
Habitat removed	0	0	43	75

The amount of pileated woodpecker and pine marten habitat affected is displayed in Table 34. Alternative 4 would have the greatest impact to pileated woodpeckers and pine marten based on acres of regeneration harvest planned because it removes habitat.

Cumulative Effects-Pileated Woodpecker and Pine Marten

Area

The area analyzed for cumulative effects was the planning area and individual harvest units.

Actions contributing to Cumulative Effects

Past timber harvest, road construction, fire suppression and road maintenance activities (see Appendix K for more cumulative effects information).

Conclusions – Pileated Woodpecker and Pine Marten

Timber harvest, road building and natural disturbances have all impacted the amount of snags and down wood habitat within the South Pyramid Planning Area. Past timber harvest and road building have reduced snag and down wood habitat while natural disturbances typically have increased snag and down wood levels. Current harvest prescriptions designed for these alternatives may reduce the number of snags within the units but increase the amount of down wood. Refer to previous cumulative effects conclusions about down wood and snags on pages XXX. In the reasonable foreseeable future, there are no additional habitat altering projects identified at this time within the South Pyramid Planning Area. Cumulative impacts to pileated woodpecker and pine marten would be minimal since less than 1% of the analysis area/habitat would be impacted by proposed activities and on stand that would be harvested, mitigations would maintain snag levels at the 40% population potential prescribed by the Forest Plan

Consistency with Direction and Regulations – Pileated Woodpecker and Pine Marten

Treatment of snag and down wood habitat is consistent with direction and regulations outlined in Regulatory Framework, Management Direction and Guidance section in Appendix L.

3. Northern Spotted Owl

The assessment of the effects of the proposed project on the northern spotted owl and its habitat are addressed in the section on threatened and endangered species beginning on page 108.

4. Bald Eagle

There is no habitat for the bald eagle in analysis/project area and the activities proposed with this project would have no impact on the bald eagle or its habitat.

5. Big Game

Introduction - Big Game

Big game species within the planning area include Roosevelt elk, black-tailed deer, mule deer, cougar, and black bear. Roosevelt elk and black-tailed deer use the area from spring through early winter, or until the snow depth drives them out. Mule deer migrate from the east side of the Cascades during the early summer and return in late fall. Cougars prey on both deer and elk and move in and out of the planning area depending on the food supply. Black bears are omnivorous and prefer forests with dense understory for food and cover, but often forage in clearcuts and natural openings. They reside year round in the planning area, over-wintering in caves or tree cavities.

Roosevelt elk, blacktailed deer and mule deer utilize similar habitats on the forest. All three species migrate using summer and winter ranges. Elk appear to be more sensitive to the effects of forest management and are used to represent the habitat requirements of all three species (USDA, 1990, p. III-76)

Analysis Methods – Big Game

A Model to Evaluate Elk Habitat in Western Oregon (Wisdom, et al. 1986) is used to evaluate elk habitat quality and project effects on this quality. Habitat values considered in the model are forage quality, cover quality, open road density, and the spacing of forage and cover areas. A mathematical equation is then used to integrate the four habitat variables to obtain an overall value of habitat effectiveness (HEI).

Desired Future Condition – Big Game

Habitat would be managed to maintain viable populations. Distribution of habitat would provide for species viability and maintenance of populations throughout their historic range on the Forest.

Existing Condition – Big Game

The South Pyramid drainage provides high quality elk habitat due to gentle topography, numerous wetlands providing calving and breeding areas, and scattered forage areas within a landscape of dense cover. Most of this drainage is classified as summer range, though some winter range is located in the western portion. Winter range is generally defined as habitat below 2400 feet elevation on the north and east aspects, and below 3200 feet elevation on the south and west aspects.

Deer and elk use natural openings (such as wet meadows) extensively for foraging, breeding, and calving. To function as prime habitat, these openings must be surrounded by sufficient cover to offer security from predation, inclement weather and human disturbance. Most big game use of openings occurs within 300 feet of hiding cover and most big game use of hiding cover occurs within 900 feet of forage areas (Wisdom, et al. 1986). As such, small openings scattered across a forested landscape create the most secure habitat for big game.

Current deer and elk use within the planning area is concentrated in forage openings, adjacent cover areas, wetlands, and connective travel corridors. Portions of the area with dense overstory cover and few natural or man-made openings have little use except for travel corridors and cover when elk are intensely hunted. Forage sites within the planning area are typically young plantations with open road access.

Biologists have long understood that open roads impact deer and elk populations. Not only would new road construction reduce forage and cover habitat, but road traffic reduces habitat use next to open roads. Road traffic can also stress individual animals through fear, causing an increase in metabolic rates and the use of energy reserves. Such stress can be particularly critical during winter and spring seasons when their body condition is poor and forage quality is low. Finally, open roads improve opportunities for poaching of big game herds. The heaviest vehicular traffic in this planning area occurs during the fall big game hunting seasons (late August through early November).

The Forest and the Oregon Department of Fish and Wildlife have defined the South Pyramid drainage as a “moderate emphasis” elk management area. Habitat conditions shall provide good quality cover and forage distributed within the area emphasis boundaries (FW-150, USDA 1990). A Model to Evaluate Elk Habitat in Western Oregon (Wisdom, et al. 1986) is used to evaluate elk habitat quality and project effects on this quality. Habitat values considered in the model are forage quality, cover quality, open road density, and the spacing of forage and cover areas. A mathematical equation is then used to integrate the four habitat variables to obtain an overall value of habitat effectiveness (HEI).

A “moderate emphasis” area should possess an HEI between 0.4 and 1.0 for each habitat value with 1.0 being optimum and less than 0.4 being marginal. The overall HEI for a “moderate emphasis” area should be greater than 0.5. Table 35 describes the current index values for the South Pyramid drainage.

Table 35 Current Elk Habitat Effectiveness Values

Habitat Effectiveness Indices (HEI)					Open Road Density
Overall	Forage	Cover	Roads	Size & Spacing	Miles/ Sq. Mile
0.47	0.28	0.49	0.40	0.89	2.86

All proposed harvest units currently provide thermal and hiding cover for deer and elk. This project has the potential to modify big game habitat effectiveness through the placement of harvest units, prescriptions, and management of new or existing roads. These HEI indices would be used as criteria to compare alternative effects on big game habitat effectiveness.

Current HE value for forage quality is below Forest Plan objectives and subsequently drives the HE composite value down below 0.5. Most available forage within the management area occurs in managed stands less than 20 years old. Forage quantity would decline as these stands grow into hiding cover. Open road density within this management area is currently 2.86 miles of open road per square mile. Most forage areas within the management area have open road access.

Environmental Consequences – Big Game

Direct and Indirect Effects – Big Game

Alternative 1 – No Action

The quality of thermal cover in proposed units would eventually increase under Alternative 1 as natural mortality thins the dense stocking levels, releases some dominant trees, and allows a shrub and herbaceous layer to develop in small openings. Thermal cover is most valuable to big game when stand canopies are dense enough to intercept and hold a substantial amount of snow, yet have small, dispersed openings for secluded foraging.

Road densities would remain the same as they are currently, but some local roads may close over time through vegetative growth and lack of maintenance.

This alternative would also result in less forage than the action alternatives because the dense canopy closure does not allow light to the forest floor to produce abundant forage.

Alternatives 2, 3 and 4

Alternatives 2-4 provide an opportunity to improve big game thermal cover by reducing tree density and allowing more structural diversity to develop sooner than could be expected in alternative 1. Reducing the canopy cover allows more sunlight to reach the forest floor to promote shrub and herbaceous vegetation growth. The development rate of complexity is greater in action alternatives than would occur naturally under Alternative 1 barring any major natural disturbance.

By proposing 43 acres of regeneration harvest (units 1a, 1b, 6a) in Alternative 3 and 75 acres (units 1a, 1b, 2b, 4a) in Alternative 4, acres of early seral habitat providing forage would increase by 2% and 3% respectively. The quality of big game forage in clear cut harvest units is proportionately dependent on when the harvest unit was broadcast burned, seeded and fertilized. A harvest unit that has all 3 treatments post harvest has a much higher quality value than if it was clear cut harvest only. It is unlikely that, even if the units proposed for regeneration harvest in Alternative 3 and 4 are successfully slash burned, the fire intensity would be high enough to set back plant succession and expose sufficient mineral soil to successfully seed and fertilize the units. Due to these variables, forage quality within the regeneration harvest units is expected to be low to moderate. Therefore, there would be no measurable change in either the forage or overall values shown in Table 35. Even though the forage quality would not be improved as much as it could be under intense management, this value would still be higher from regeneration harvest than if would be from commercially thinning.

Big game use of units 1a and 1b would increase after harvest due to the southern aspect, gentle slope, and proximity of cover. Likewise, big game use in units 2b and 6a should as well given closure of road 2047 860 which also closes road 2047 864. Closing these roads would allow big game to more fully utilize forage in these units. Approximately 1 mile of road 2047-860 and ½ mile of road 2047-864 would be closed with a berm. Both units are adjacent to two existing regeneration harvest units so the combined openings would be fairly large. Open road density within the emphasis area remains at 2.86 miles of open road per square mile of habitat in Alternative 2 and decreases to approximately 2.83 miles of open road per square mile in Alternative 3 and 2.80 of open road per square mile in Alternative 4. The HE value for roads shows a slight increase for Alternatives 3 and 4.

Cumulative Effects – Big Game

Analysis Area: The analysis area for cumulative effects is the planning subwatershed which included the analysis area plus a portion of two sections of private land south of the analysis area.

Actions Contributing to Cumulative Effects

Projected harvest operations over the next 10 years would likely create only localized effects on big game habitat, but create little change to HEI values over the subwatershed. These would be the same effects described under the proposed action. Any regeneration harvest that occurs would remove thermal cover habitat while increasing forage habitat. Thinning operations would create short-term reductions in cover quality while encouraging greater habitat diversity in the understories of treated stands. Cumulative changes to habitat values from the next 10 years of public and private management in this subwatershed are likely to be insignificant. Road and trail maintenance activities over the next 10 years would also have no significant effects on big game habitat in this subwatershed. Public thinning projects would likely close more spur roads (<3

miles) and slightly improve the roads HEI (see Appendix K for more information on cumulative effects).

Consistency with Direction and Regulations – Big Game

Treatment of big game is consistent with direction and regulations outlined in the Regulatory Framework, Management Direction, and Guidance section outlined in Appendix L.

E. Survey & Manage Species

1. Red Tree Voles

Surveys were completed during the summer of 2002 using Regional Survey Protocol for the Red Tree Vole (version 2.0). No red tree vole nests were located. Members of the public completed additional and unsolicited surveys during the fall of 2002 and submitted nest material from two potential red tree vole nests reportedly collected in units 6 and 8a. The two submitted samples were validated as inactive red tree vole nests. Additional agency surveys were completed near these two potential sites, but no active nests were located. Further sampling conducted through tree climbing in the spring of 2003 also did not locate any active nests.

2. Bats

Sites commonly used by bats for roost sites and hibernacula include caves, mines, snags and decadent trees, wooden bridges and old buildings. Provisions for retention of large snags and decadent trees are included in the standard and guideline for green tree patches in the Matrix. Caves and abandoned mines, wooden bridges and buildings require additional protection measures to ensure their habitat value is maintained. No caves, abandoned mines, wooden bridges or buildings were found in the project area. This issue would not be analyzed further.

3. Great Gray Owl

Within the range of the northern spotted owl, the great gray owl is most common in coniferous forests adjacent to meadows. Surveys to determine occupancy are required in habitat that is above 3000 feet in elevation, within mature stands with greater than 60% canopy cover, and within 1000 feet of meadows larger than 10 acres. Known nest sites require a 1320 foot protection buffer and natural meadows require a 300 foot no-harvest buffer. The planning area does not possess meadows greater than 10 acres.

The small natural meadows near units 4c and 8a are protected as special habitat areas with 300 foot no-harvest buffers. No impacts to great gray owls are anticipated.

F. Migratory Birds

1. Neotropical Migratory Birds

On January 10, 2001 an executive order was signed to protect migratory landbirds. One purpose of the order is to ensure that environmental analyses evaluate the effects of actions on migratory birds. Habitats vary broadly for this group of species. There are 85 bird species recognized as neotropical migrants on the Forest. Thirty-five of these species are identified as “species of concern” in “Neotropical Migrants on National Forests in the Pacific Northwest” by Brian Sharp (1992). These species are associated primarily with old growth, riparian, rocky cliffs, or grass habitats.

Alternative 1 – No Action

There would be no disturbance or impacts to migratory landbirds. Any large scale changes in species diversity or numbers would be dependent on natural and human-caused disturbances, primarily wild fire. More subtle changes would occur through time as tree density is reduced through natural thinning where snags and down wood are created through suppression of the overstory and the understory develops from increased sunlight to the forest floor.

Alternatives 2 – 4

The light to moderate thinning planned for each alternative would reduce the forest canopy closure to 40 – 60% while retaining remnant old-growth trees, trees over 30 inches DBH, and existing snags (to the extent possible) and down wood. Thinning would increase structural diversity within the stands by reducing competition of the overstory trees and accelerating understory development from increased sunlight to the forest floor. This would create a more open forest community than what currently exists, benefiting some bird species but having a negative impact on others. Snags are fairly numerous in the stands proposed for treatment, but are not uniformly distributed. It is anticipated that many of these snags would be lost in both thinning and regeneration harvest units, affecting cavity dependent migratory landbirds. Snag creation within the units after logging is complete would help mitigate for this loss.

This project would influence the abundance of migratory bird species in each stand. For those species that are negatively impacted, there are areas of no-harvest (primarily riparian habitat) in both the thinning and regeneration harvest units where the canopy closure would remain close to 100% and all snags would remain. For species like western blue bird, tree swallow, and red-tailed hawk, creation of early seral habitat by regeneration harvest plus retention or creation of snags, would be beneficial.

Timber harvest activities during the spring and summer may also impact migratory birds through disturbance during the nesting season. Seasonal operating restrictions planned for spotted owls (see Mitigation Measures Common to Action Alternatives) would eliminate disturbance in some stands for most of the migratory bird breeding season.

Cumulative Effects-Neotropical Migratory Species

Past timber management within the South Pyramid Planning Area has resulted in a variety of habitats across the landscape. This variety of habitats is beneficial in providing for a range of migratory bird species. Different bird species occupy different habitats so changing one habitat to another through habitat manipulation can have an impact on migratory landbirds, either positive or negative. This project would create a more open forest canopy and encourage shrub and understory vegetation development within the stands, benefiting those bird species that utilize this type of habitat. There are no additional habitat altering projects at this time within the South Pyramid Planning Area.

Consistency with Direction and Regulations – Management Indicator Species

Treatment of Management Indicator Species is consistent with direction and regulations outlined in the Regulatory Framework, Management Direction, and Guidance section outlined in Appendix L.

G. Forest Raptors

1. Northern Goshawk

There is a goshawk nest located in the eastern third of the analysis area. This nest was active in 1998. Using June 1996, Region 6 protocol additional surveys were done in 2003 and 2004 to relocate the nest and verify use. In 2003 surveys, no birds were found. In 2004 a single adult was located during two successive surveys of this area.

To the east of the nest site there is a little more than 1,000 acres of unroaded and unharvested land in the analysis area and an additional 3,300 acres in the adjacent area outside of the analysis area. This area could provide post-fledging habitat, alternate nest sites, as well as other habitat needs. To the west of the nest site considerable harvest and roading have occurred within the analysis area (refer to figures 7, 8 and 9 to see nest site locations in relation to proposed and past harvest units).

Northern goshawk (*Accipiter gentilis*) is an Oregon Department of Fish and Wildlife sensitive species that is rare in the Willamette National Forest. Goshawks are large forest hawks that prefer large patches of late seral forests with large trees and dense canopy closure (*Csuti, Blair et al. 1997*).

“Relatively few studies have addressed the amount or patch size that the hawks may be selecting and whether this habitat represents selection of a buffer of “nest site habitat” larger than what is actually used at the nest, or simply the forested area that happens to surround the nest site. Base on observations of feathers, whitewash, and prey remains, Reynolds (1988) defined an area (approximately 30 acres) of intensified use surrounding the nest as the “nest area.” (Northern Goshawk Status Review 1998, Appendix A page 7). This research and recommendations to protect goshawk nest sites in Matrix and Adaptive Management areas on the Willamette National Forest

using the eastside screen direction, led to the selection of a 650 foot (30 acre) no-harvest buffer around the nest site (USDA. 1994a, p. 9-17). In addition a ¼ mile logging restriction zone would be implemented to avoid disturbance during nesting season (April 1 – July 31).

There have not been many research studies of goshawks in similar habitat in western Oregon but a review of over 180 documents of information on how goshawks used habitat in both breeding season and in winter by Reynolds R. T., 9 January 2004, the following information appears to be relevant to this planning area:

- “Despite the wide diversity of habitats occupied by goshawks, the reports reviewed showed that mature and older forests (including, but not limited to, old growth) consistently comprised the habitat in goshawk nest areas (typically 30-acre areas immediately surrounding the nest) in both North America and Europe.” *This is consistent with the habitat in the nest buffer around the goshawk nest in South Pyramid. It appears the 30-acre size of the nest buffer is also consistent with that found in the research.*
- “The diversity of vegetation type within the home ranges of goshawks increased with increasing distance from goshawk nests. The diversity of vegetation often included multiple forest age classes, edges and openings.” *This is consistent with the habitat around the nest area in South Pyramid. The area varies from a patchwork of various ages of managed stands on both public and private land to relatively contiguous area (1000+ acres) of seral stage 3 (understory reinitiation) stands.*
- “Many nests were active every other year, which indicated that many pairs of goshawks usually alternated between two nests. Some pairs maintained four nests within their territories. Most alternate nests were located within two stands or occasionally three stands with 1 km of each other. (Coleman Crocker-Bedford, D. and Barbara Chaney, Characteristics of Goshawk Nesting Stands USDA Forest Service, North Kaibab Ranger District, Kaibab NF, Fedonia, AZ).”
- “Territorial goshawks, while they are highly faithful to their territories over years, do not breed every year. Non-breeding goshawks do not respond to some commonly –used survey techniques (broadcasting). Consequently, non-breeding, territorial goshawks are difficult to detect and unless surveys are conducted over several years (sufficient to include a breeding year) in an area, that area can be misclassified as “available but not used.” *The above two bullets suggest that goshawk nesting is not consistent from year to year and that survey techniques might miss non-breeding goshawks so conclusions about presence or absence of birds may be somewhat difficult to ascertain over a short period of time. The following was found in South Pyramid: An active nest was located in 1998. Additional surveys were done in 2003 and 2004 to relocate the nest and verify use. In 2003 surveys, no birds were found. In 2004 a single adult was located during two successive surveys of this area.*

- “The North Kaibab Ranger District in northern Arizona is an example of goshawks occupying and breeding in managed forests. Virtually no part of the North Kaibab RD contains forests in which some trees were not harvested (Burnett 1991, Kaibab National Forest 1993) and Reich et al (2004) studied breeding goshawks on over 100 territories that produced over 600 young between 1991 and 2003.” *It appears that, at least in Arizona, goshawks occupy and breed in managed forests. Both private and public lands have been harvested in the vicinity of the goshawk nest in South Pyramid prior to the discovery of the nest in 1998.*
- “A number of authors (Reynolds et al. 1992, Hargis et al. 1994) suggest that timber harvests could be compatible with goshawk conservation if stands of mature and older trees and forest edge are provided.” *Both mature stands and forest edge are present in the South Pyramid planning area suggesting that timber harvest could be compatible with goshawk conservation here.*
- “Clearly goshawks are opportunistic; they use a wide variety of habitats and take whatever prey presents itself provided they can see and pursue it. In tall forest habitats, goshawks typically hunt from tree perches and fly relatively short distances from perch to perch (Widen 1984).”
- “Bosakowski et al (1999) suggested that goshawks may be breeding more commonly on private industrial forests than previously predicted. Nesting stands in their study were at or younger than the usual harvest age (45-60 s) for industrial forestlands in western Washington.”
- “Penteriani and Faivre (2001) evaluated the effects of timber harvests in goshawk nesting stands on their nesting in Italy and France. They found no difference in nestling production in logged versus unlogged stands. They concluded that goshawks can tolerate some level of timber harvests within the nest stand as long as the cover reduction does not exceed 30%.” *It appears that at least some researchers believe that goshawks live and breed in managed forests where logging occurs.*

No harvest units are proposed within the nest buffer around the goshawk nest site. The 30-acre buffer is consistent with the above research and with management direction. In addition, Alternative 2 has three units that are partially or wholly within the ¼-mile logging restriction zone around the goshawk nest. These units would be thinned and yarded with helicopters. Harvest activities would not occur during the nesting season for these birds, avoiding harassment during this critical time. Given the buffer around the nest area and the logging restriction during nesting season, along with research that indicates goshawks thrive in a variety of habitats across their range

including managed stands where logging occurs, it is not anticipated that the proposed action would have detrimental effects on goshawks.

Neither Alternative 3 nor 4 have any proposed harvest units in close proximity to the goshawk nest area. It is therefore anticipated that neither of these alternatives would have detrimental effects on goshawks in the area.

Vegetation

Introduction – Vegetation – General

The **purpose** of this project is as it relates to vegetation is to: (a) contribute approximately 8,000 to 9,000 CCF (hundred cubic feet) of wood fiber toward the District's timber target for fiscal year 2006, (b) enhance growth and vigor of the stand and/or to reduce future losses from fire, insects and diseases, and (c) capture competition-induced mortality for use as commercial wood products and to reduce long term fuel buildup.

The action is **needed** to meet district timber targets assigned through the Forest budgeting process and to improve stand growth and/or wood fiber quality on densely stocked, naturally-regenerated stands in General Forest – Matrix management allocations.

A significant issue with respect to vegetation is the harvest of natural stands on public lands.

Analysis Methods – Vegetation – General

Existing stand conditions were determined from stand exam information. Stands were reviewed in the field and prescriptions written for their treatment.

Desired Future Condition – Vegetation – General

The Willamette Forest Plan describes the desired future condition in the General Forest management allocation as follows: “The landscape would be a patchwork of age classes and species of trees. On lands suitable for timber production, timber would be available for sale on a non-declining even-flow basis. There would be an orderly transition from the naturally occurring mature forest to a regulated forest with a balance of ages in each age group up to approximately 80 years old. This transition would take place over several decades as plantations progress through the various ages with new plantations created through the orderly harvesting of a portion of the mature stands in each decade. Most of the existing plantations are 1-30 years old; the progression to a regulated forest would proceed over the next 50-60 years, or longer.

Young stands would be managed to maintain vigor and growth using stand treatments such as reforestation with genetically selected stock, fertilization, precommercial and commercial thinning, and protection from insects, disease and damage. Stands of various conifer species would predominate depending on growing sites; although the natural variety of hardwoods, shrubs and forbs would continue to be components of the ecosystem with fluctuations occurring as stands progress through the seral stages. Managed stands would generally consist of a well-stocked understory with a scattered mix of large snags and green replacement trees. Large woody debris would be left on the ground to provide habitat and maintain long-term soil productivity. After about 60 years these large trees would be gone and replacement snags would come from within the stands. The overall appearance would become more uniform towards the end of the rotation.

The developed road system would provide the access necessary to harvest timber, transport the logs, and tend stands of growing trees. New construction and reconstruction would be planned at the

lowest practicable mileage and standard required to provide for efficient transportation of goods, safety of users, and the least effect on resource values. Maintenance of these roads would be based on these same considerations. Some of this road system would be in a low-maintenance state with no vehicle traffic planned to protect watershed conditions, provide for wildlife needs, and control costs” (USDA, 1990, p. IV-227)

Existing Condition – Vegetation – General

The table on the next page outlines the existing condition of the stands being considered for treatment with this project. The average stand is 111 years old, 14 inches in diameter and 84 feet tall. These fire-regenerated natural stands are classified in the stem-exclusion seral stage (see Figure 13 for map of distribution of seral stages in the analysis area). Stands in this seral stage have dense crowns which block out light to the forest floor, and limit additional tree regeneration in the understory. Typically, shade-tolerant understory trees that are present persist but grow very slowly. Intermediate or suppressed trees that do not tolerate shade well suffer from competition and have a high mortality rate. Shade-intolerant shrubs and forbs frequently disappear at this stage.

Stand vigor and growth is declining in these stands. Some trees have begun to die due to overcrowding and competition between trees for nutrients and light as evidenced by competition-induced mortality up to 30% in some units.

These 75-150 year-old natural stands have stand densities ranging from 280 to 430 trees per acre.

Their Relative Density (RD) ranges from .69 to .96 with an average of .85. Relative Density is a percentage of the maximum possible density for a particular species and is expressed as proportion of the maximum density of 1.0. For Douglas-fir a

relative density of .55 and above has been determined to be the point where imminent competition mortality is likely to occur. Recommended optimum density for managing Douglas-fir to maximize gross production is within the range of .4 to .55 relative density. All stands exceed this density.



The stands being considered for treatment occur between 3,400' and 4,000' elevation on slopes that range from 14% to 45%. Most are on southeast to southwest aspects and the remainder are on northeast to northwest aspects. Stand composition is about 60% Douglas-fir, 25% western hemlock and 15% true fir and other species. As elevation increases more true fir is present in stands. The lower elevations of the analysis area lies within the western hemlock plant association while the upper elevations are Pacific silver fir plant associations.

The following table describes the existing condition of each of the stands proposed for treatment in the alternatives for South Pyramid Timber Sale.

Table 36: Basic Stand Information for the Proposed Harvest Units

Unit #	Age	Average Diameter (DBH) in inches	Average Height in feet	Trees Per Acre	Species Composition (for trees greater than 7 inches in diameter)			Canopy Ratio (%)	Relative Density	% Dead Trees
					% Douglas-fir	% western hemlock	% true fir / cedar			
1a	85	13	67	300	53	26	21	25-35	.67	27
1b	85	13	67	300	53	26	21	25-35	.67	27
2a	83	12	80	430	55	26	18	35-45	.91	1
2b	83	12	80	430	55	26	18	35-45	.91	1
4a	117	13	76	390	58	35	8	35-45	.85	14
4b	117	13	76	390	58	35	8	35-45	.85	14
4c	93	13	70	410	80	8	11	45-55	.90	15
6a	121	16	105	300	52	27	21	35-45	.95	30
8a	146	15	80	320	64	25	11	25-35	.96	0
8b	146	15	104	320	54	24	22	45-55	.96	25
9a	148	14	110	280	66	25	9	25-35	.76	0
24	75	13	65	430	64	26	9	No Info.	.85	No Info.
27	148	14	110	280	65	27	7	No Info.	.76	No Info.
Averages	111	14	84	342	61	25	13	35-45	.85	14

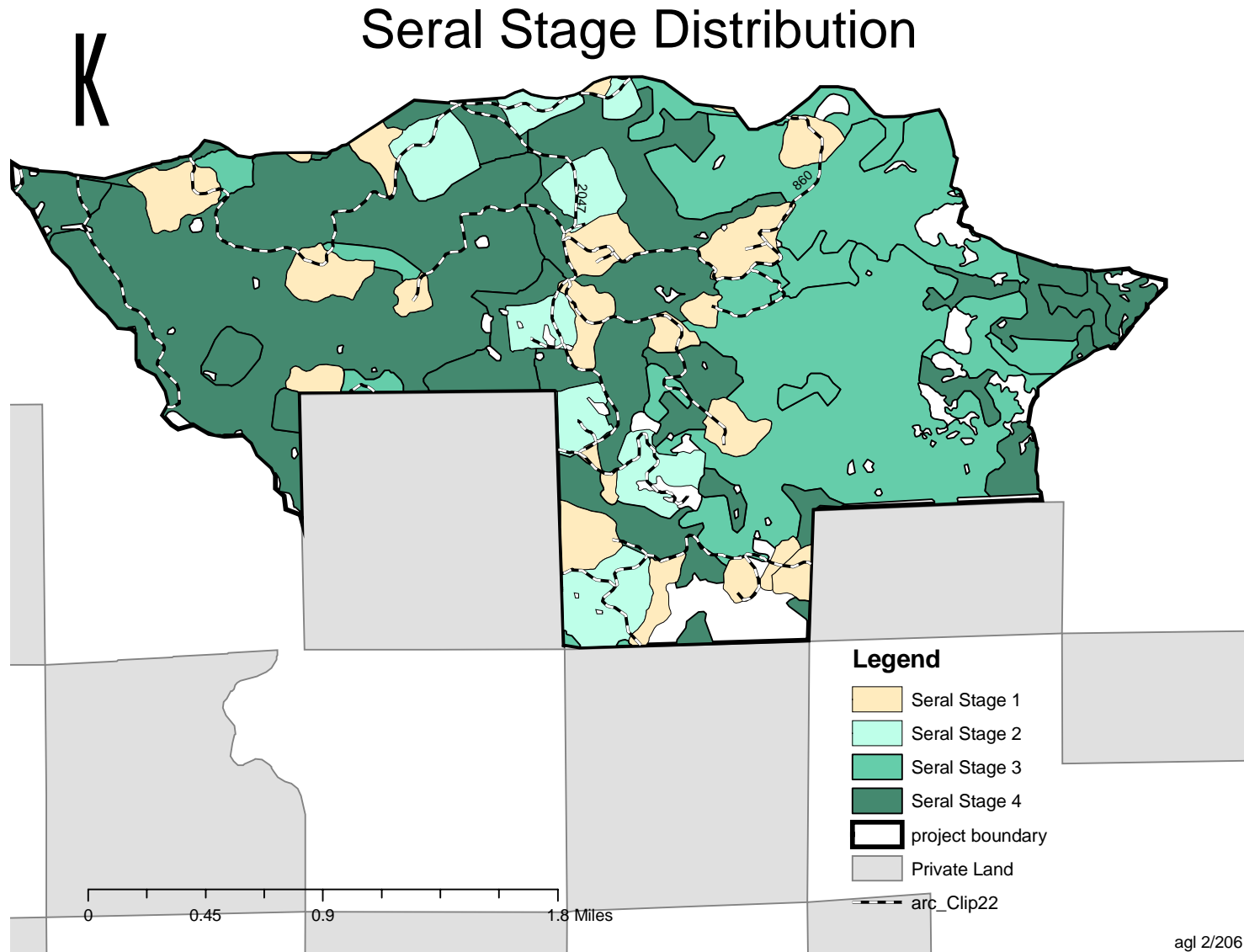


Figure 13: Seral Stage Distribution Map

Environmental Consequences – Vegetation – General

Direct and Indirect Effects – Vegetation – General

Alternative 1 – No Action

These heavily stocked stands would continue to stagnate as trees compete with each other for growing space. Diameter growth would be low or would decline and live crown ratios would get smaller. These trees would become less vigorous and more susceptible to insects and diseases. Competition-induced mortality would increase thus increasing both snag and down wood levels. The down material would increase fuel loadings making the stands more vulnerable to wildfire and insect infestations. This capture competition-induced mortality would not be available for commercial wood products.

Low light levels in unthinned stands would suppress development of shade-tolerant trees and limit understory vegetation. The diameter and product value of trees harvested in the future would be reduced without treatment.

No harvest would occur in natural stands under this alternative.

Alternatives 2, 3 and 4

The proposed stand treatments (see Integrated Prescriptions and Silvicultural prescriptions in Appendices A and M, respectively) have been designed to meet the purpose and need of meeting district harvest targets, enhancing stand growth and vigor and/or reducing losses from fire, insects and diseases, and capturing competition-induced mortality for use as commercial wood products and to reduce long-term fuel buildup in General Forest-Matrix allocations. Alternative 2 thins 189 acres, Alternative 3 thins 68 acres and regenerates 43 acres, and Alternative 4 thins 15 acres and regenerates 75 acres. No treatments occur in Riparian Reserves in any of these alternatives.

For some of the younger, less dense stands, thinning would increase growing space and trees would respond to varying degrees with increased diameter growth and live crown ratios depending on stand age and degree of suppression. This response would likely be less than if the stands had not been allowed to reach such high relative densities for such long periods of time.

For the older, more-dense stands, studies have shown that thinning would decrease suppression-related mortality by 3 to 5 times over unthinned, natural stands (USDA, 1982). Some of these older thinning stands would improve growth and vigor especially in heavier-thinned units. Others in lighter thins may not improve their growth as much, but mortality in these stands would decrease (USDA, 1982).

Development of a second canopy layer would be accelerated following thinning and understory vegetation should increase due to more sunlight reaching the forest floor. A small percentage of trees may be damaged during logging. Following thinning, some trees may blow down as a result of increased exposure to wind.

Regeneration harvests are planned in Alternative 3 (1a, 1b, and 6a) and Alternative 4 (1a, 1b, 2b, and 4a). Regeneration of these stands would allow existing fuels to be effectively reduced and remove potential

mortality that is expected to occur. Green tree retention areas and individual trees to be left would include the largest diameter trees available on these sites.

Stands that are regenerated in Alternative 3 and 4 would be replanted with a mixture of native species and would begin development through the various seral stages over time. Other early seral vegetation species would be allowed to develop that do not thrive under either closed canopy or partially-shaded conditions.

Regeneration units may create edge effects on adjacent old-growth habitat through harvest of units 1a and 1b. Edge effects are manifested primarily in edaphic changes (air temperature, relative humidity, solar penetration) that influence habitat quality of adjacent old-growth, but can also show up as increased windthrow along the exposed stand edges. By regenerating unit 6a, Alternative 3 may also compromise the habitat function of residual old growth trees scattered in or next to the unit. Alternatives 2 and 4 have less risk of edge effect to old-growth habitat than Alternative 3, though the risk from all three alternatives is low.

Connectivity to the Parks Creek subwatershed is not compromised by any action alternative considered in this project. No harvest units are placed in the low elevation saddle that lies between Three Pyramids and Crescent Mountain and connects these two subwatersheds. Thinning units are located west of this saddle in Alternative 2; however retaining 50 to 60 percent canopy closure maintains habitat connectivity for dispersal of late-successional forest species. Furthermore, thinning would not occur in Riparian Reserves, which serve as important travel corridors for many species.

Alternatives 2, 3 and 4 all harvest 189, 111 and 86 acres of natural stands. Elsewhere in this chapter are discussions about how this harvest would impact habitat function and various ecosystem functions valued in these areas.

Table 37 below compares stand conditions for pre and post treatments in thinned units for the proposed action. Units 2a, 2b, 4a and 24 are also thinned in Alternative 3 and Units 2a and 24 are thinned in Alternative 4.

Table 37: Pre and Post Stand Treatments for the Proposed Action Alternatives

Unit	Acres	Silvicultural Prescription	Canopy Closure		Trees Per Acre		Relative Density		Basal Area	
			Pre	Post	Pre	Post	Pre	Post	Pre	Post
1a	13	Thin	95%	40%	300	75	.67	.31	265	130
2a	8	Thin	95%	40%	430	75	.91	.27	330	110
2b	49	Thin	95%	40%	430	75	.91	.29	270	120
4a	4	Thin	95%	50%	390	100	.85	.35	365	140
4b	8	Thin	95%	50%	390	75	.85	.29	365	120
4c	11	Thin	95%	50%	410	75	.90	.29	360	120
6a	21	Thin	95%	60%	300	100	.95	.41	400	175
8a	13	Thin	95%	60%	320	75	.96	.29	390	120
8b	6	Thin	95%	50%	320	100	.96	.39	390	160
9a	38	Thin	95%	50%	280	75	.76	.29	320	120
24	7	Thin	95%	50%	430	100	.85	.35	330	140
27	11	Thin	95%	50%	280	75	.76	.29	320	120

Cumulative Effects – Vegetation – General

Area

The area analyzed for cumulative effects was the analysis area.

Actions Contributing to Cumulative Effects

Past timber harvest, road construction, trail construction, and other ground-disturbing activities contribute to cumulative effects on vegetation (see Appendix K for more cumulative effects information).

Cumulative Effects – Vegetation - General

As a result of *past* management actions the current seral stage distribution in the planning area is 369 acres of stand initiation, 279 acres of stem exclusion, 1,002 acres of understory reinitiation, 1,485 acres of late-successional and 157 acres of non-forest. There are no *present* actions that would affect the seral stage distribution in the analysis area. The only *reasonably foreseeable future action* affecting vegetation is non-commercial thinning on 264 acres. This young stand thinning would not change the seral class condition in these stands.

The cumulative effects on seral stage distribution in the analysis area that would be caused by the alternatives being considered are displayed in the table below.

Table 38: Seral Stages by Alternative

Seral Stage	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Stand Initiation	369	369	412	440
Stem exclusion	279	279	279	279
Understory Reinitiation	1,002	1,002	959	931
Late successional	1,485	1,485	1485	1,485
Non-forest	157	157	157	157

Alternatives 1 and 2 would have no cumulative effects on seral stages. Proposed thinning with the alternative would not alter seral stages but it change the number of trees per acre and the canopy density, in treated stands. Alternatives 3 and 4 would increase stand initiation from 11.2% of the planning area to 12.5% and 13.3%, respectively. Alternatives 3 and 4 would decrease understory reinitiation from 30.4% of the analysis area to 29.1% and 28.3%, respectively.

These effects would be the same as described for the direct and indirect effects. Cumulative effects to growth rates would be the same as described in direct effects except for the contribution of accelerated growth from the 189 acres of young stand thinning. This cumulative effect would be the same for thinning in all action alternatives.

There is no private or other ownership land in the analysis area.

Conclusions and Rationale for those Conclusions – Vegetation - General

The Middle Santiam watershed has been significantly altered by past harvest practices. The portions that are nearest to natural conditions are generally located on protected areas on federal lands such as wilderness areas. A patchwork of small openings, scattered about the federal ownership in the South Pyramid analysis area would likely continue on General Forest –Matrix lands. Some of the areas would grow into seral stages represented on adjacent lands, while more openings are created with new harvests here.

Stands treated with this proposal would generally respond to thinning by increasing growth and crown ratios and all thinned stands would reduce competition-induced mortality until the trees grow and begin to crowd each other again. Timber would be contributed to the district’s harvest targets and competition-induced mortality would be captured for sale as wood products. There would be less fuel build up in stands as tree mortality is reduced.

Monitoring – Vegetation – General

Planting success would be monitored on regenerated units.

Consistency with Direction and Regulations – Vegetation - General

Alternatives are consistent with direction and regulations outlined in the Regulatory Framework, Management Direction, and Guidance section outlined in Appendix L.

Sensitive Plants and Survey and Manage Species

Introduction – Vegetation - Sensitive Plants and Survey and Manage Species

Survey and manage and sensitive botanical species, including vascular plants, lichens, fungi and bryophytes contribute to the overall diversity of the District. These species are surveyed for and protected if found from timber sale activity (see Botany Report in Appendix D).

Analysis Methods – Vegetation - - Sensitive Plants and Survey and Manage Species

There are three steps in a plant biological evaluation which fulfill the requirements dictated by the USFS Manual (2672.4):

Step 1. Pre-field Review: Each area to be affected by management actions is investigated for sensitive plant habitat in the pre-field review. The following sources are consulted to determine whether potential habitat exists: R-6 Regional Forester's and Willamette NF *Potential Endangered, Threatened and Sensitive Plant Lists*, Willamette NF *Sensitive Plant Handbook*, *Oregon Natural Heritage Data Base* and Willamette NF Data Base records, previous botanical surveys, aerial photos and USGS topographical maps, and knowledge provided by individuals familiar with the area. Each plant on the Willamette NF Sensitive Plant List is considered. Effects of actions on sensitive plant populations are analyzed and Conservation Strategies and the Willamette Forest Plan are consulted to determine whether actions are consistent with direction.

Step 2. Field Reconnaissance: Units which have been identified as having high probability habitats in or surrounding the unit during the pre-field review are surveyed. Surveys include an intense search of all high probability habitat during the season when identification is possible. If a sensitive species is found, R-6 sighting forms are filled out and sent to the Willamette NF Supervisor's Office and the Oregon Natural Heritage Data Base and the effects on the plant population analyzed.

Step 3. Risk Assessment: If a sensitive species is found on or adjoining a site where an action is proposed, a risk assessment (an analysis of the effects of a proposed action on species and their habitats) is then performed. A risk assessment considers (a) the likelihood of beneficial/adverse effects and (b) the consequences of these effects on sensitive species populations to determine cumulative effects on the overall population. Management recommendations are then made to mitigate adverse effects.

Desired Future Condition – Vegetation - - Sensitive Plants and Survey and Manage Species

The desired condition for the South Pyramid sub-watershed with respect to survey and manage and sensitive botanical species includes retention of existing occurrences and promotion of stand structure diversity and complexity. This increase in stand structure development would provide for more suitable potential habitat for many of these species in the future.

Existing Condition– Vegetation - - Sensitive Plants and Survey and Manage Species

Prior to the survey and manage and sensitive species surveys associated with South Pyramid Timber Sale, two Region 6 sensitive plant species had been documented in the South Pyramid sub-watershed.

Thompson's mistmaiden (*Romanzoffia thompsonii*) occurs approximately ¼ mile northeast of Unit 8A, along a tributary to South Pyramid Creek. Habitat for this species is limited to seepy meadow slopes at low to mid elevations with south aspects. Also, a sensitive plant population of mountain moonwort (*Botrychium montanum*) had been documented approximately ½ mile north of Unit 2A. It prefers sites dominated by western red-cedar or incense cedar. Additionally, two survey and manage lichens had been documented approximately ½ mile west of Unit 1A. These are *Dendriscoaulon intricatum* and *Nephroma occultum*. *Dendriscoaulon intricatum* is a tiny lichen found on bark and twigs in areas having a high proportion of cyanolichens. *Nephroma occultum* is a sensitive and survey and manage species and is found in similar habitat. These populations appear to be stable, and would not be affected by activities within the South Pyramid project area.

Environmental Consequences – Vegetation - - Sensitive Plants and Survey and Manage Species

Introduction: There are 71 species on the Regional Forester's Sensitive Plant List. Many of these are also considered survey and manage species. Habitat exists for 40 of the 71 species. Of the 40 species, 16 are fungi for which only limited surveys were conducted. Fungi are listed in Survey and Manage Categories B and D, for which surveys are considered impractical (USDA, USDI, 2001). Complete surveys were done for the remaining 24 species. The species that were found and the number of populations located are listed in Chapter 2 under Mitigation in All Action Alternatives. Four survey and manage and sensitive lichen populations were located of the following two species: *Nephroma occultum*, (two sites) and *Pseudocyphellaria rainierensis* (two sites). Another survey and manage lichen, *Leptogium rivale*, was found in four tributaries of South Pyramid Creek. Additionally, two survey and manage fungi were located. These are *Albatrellis ellisii* (one site) and *Polyozellus multiplex* (one site). Both are found in Unit 6A. Further information about these species is found in the Biological Evaluation (*Appendix D*).

Changes in hydrology, including water temperature and sediment may affect *Leptogium rivale*, an aquatic lichen found on submerged rocks in clear, cold streams (USDA, USDI, 2003). Persistence of the other lichen species may be threatened by host tree removal, windthrow, changes in microsite conditions, changes in epiphyte ecology and competition in more open stands, and by dispersal limitations in more widely spaced stands (USDA, USDI 2003). The two fungal species are mycorrhizal and their persistence may be threatened by host tree removal, windthrow, soil disturbance, climate change, and changes in microsite conditions (Castellano and O'Dell, 1997).

Documented sites were evaluated and those deemed at risk from the proposed action would be protected under all alternatives. See Sensitive Species in Chapter 2 Mitigation Common to All Alternatives.

In addition to the sensitive and survey and manage species found, a species on the Forest Concern List was located on a south facing dry rock garden in Unit 2b. This species is the pine broomrape (*Orobancha pinorum*), a root-parasite that doesn't make chlorophyll. In the action alternatives, Unit 2b is logged with a helicopter and a 30-70 foot buffer would protect the site from disturbance.

Direct and Indirect Effects – Vegetation – - Sensitive Plants and Survey and Manage Species

Alternative 1 – No Action

Alternative 1 would provide the most benefit to sensitive fungi because most of them form mycorrhizal relationships with conifers and timber harvest, even thinning, has been shown to have negative short term (5-7 years) impacts to fungi (Pilz *et al*, 2003). There would be no direct effects to other sensitive and survey and manage species.

Under Alternative 1, No-action, no acres would be treated. The stands would slowly open up enough to provide for greater structure and diversity. Windthrow, snowdown, and insect and disease pockets would create openings. Coarse woody debris would be abundant as trees die due to overcrowding. Indirect effects to survey and manage and sensitive species would likely be minimal.

Alternative 2 and 3

There are 16 species of fungi for which surveys are incomplete. Fungi fruit inconsistently and would require multiple surveys each year for several years to determine their presence. Eleven of these fungi are mycorrhizal, four are saprophytic on duff or wood and one is a parasite on truffles.

Due to mitigation measures in the action alternatives, no direct effects to known lichen and fungal sites are anticipated. It is likely that individual sites of fungi may be negatively affected in the short term by host tree removal, physical disturbance, soil compaction, and disruption of mycelial networks if the fungi are present (Kranabetter and Wylie, 1998, Ameranthus and Perry, 1994). Reductions in the number of fruiting bodies of chanterelles, a common mycorrhizal species, were noted after initial thinning but appear to rebound after several years (Pilz *et al*, 2003). Despite harvesting more acres, Alternative 2 presents the least risk of the action alternatives to survey and manage and sensitive species by limiting harvest to thinning (see table below). Mature trees left in the thinned stands would act as mycorrhizal hosts for fungi and growing substrate for lichens. Microclimatic changes would likely occur from thinning but would disappear over time as canopies of the residual trees expand and the understory develops. Thinned stands are expected to continue supporting survey and manage and sensitive species.

Table 39: Acres Harvested by Alternative

Prescription	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Acres Regenerated	0	0	43	75
Acres Thinned	0	189	68	15
Total Acres	0	189	111	90

Alternatives 3 and 4

Alternatives 3 and 4 have direct negative affects to habitat for survey and manage and sensitive species because they include regeneration harvest of 43 acres and 75 acres, respectively. These harvest acres would no longer provide habitat for survey and manage species. Regeneration harvest of Unit 6a in Alternative 3 is

particularly notable because it has more characteristics of an older stand than other units and survey and manage fungi were located in the stand.

Two studies have shown that fungal species richness declines in forest openings (*Durall, et al, 1999, Kranabetter and Wylie, 1998*) therefore, in the short term (40 years), Alternatives 3 and 4 reduce habitat for survey and manage and sensitive mycorrhizal fungi due to regeneration harvest. Regeneration harvest units also create barriers to dispersal of survey and manage lichens, many of which are dispersal-limited (*USDA, USDI, 2000b*). However, thinning may enhance stand structure and understory development over the long term. The addition of understory trees and shrubs may benefit the sensitive mycorrhizal species. Duff retention and coarse woody debris creation would benefit the sensitive saprophytic species.

Cumulative Effects – Vegetation – - Sensitive Plants and Survey and Manage Species

Area

The area analyzed for cumulative effects was the analysis area.

Actions Contributing to Cumulative Effects

Past timber harvest, road construction, trail construction, and other ground-disturbing activities (see Appendix K for more cumulative effects information).

Cumulative Effects and Conclusions – Vegetation - Sensitive Plants and Survey and Manage Species

A total of 734 acres of was harvested in the analysis area from 1960 to 1990. Most of these stands were in seral stages III and IV. These forests certainly contained multiple populations of survey and manage and sensitive botanical species. Fungal diversity declines with clear-cutting and fire (*Byrd, et al, 2000, Bruns, et al 2002*). *Pseudocyphellaria rainierensis* and *Nephroma occultum* were most certainly in some of those old-growth stands. Numerous western redcedar stumps attest to the past presence of a greater amount of cedar that may have provided habitat for the *Botrychium* species. There has been no timber sale activity on Forest Service lands in the Upper Middle Santiam subwatershed for about 13 years. Habitat disturbing activity has been limited to recreation and road maintenance that affect small areas.

Despite the large amount of past harvest activity there are about 1,500 acres of forest greater than 150 years old remaining in the analysis area. These forests serve as refugia for many sensitive species that would be able to re-colonize the younger stands as they mature and become more complex in structure and diversity.

Harvest of forests on private land is likely to occur in the future and may impact individual species and habitat for survey and manage and sensitive species. Loss of private habitat should not contribute to a trend towards Federal listing or cause a loss of species viability in this subwatershed.

A summary of cumulative effects is contained in the Addendum to the Botanical Biological Evaluation (Appendix D).

The proposed actions may affect individuals or habitat but are not likely to contribute to a trend towards federal listing or a loss of the species viability in this subwatershed. Riparian Reserves and known site

protective buffers would help maintain suitable habitat on matrix lands over the long term. Road and trail maintenance activities over the next 10 years in this subwatershed would have no significant effects on sensitive botanical species.

Most private lands in the subwatershed have been regenerated in the past and are not likely to contain habitat for most sensitive species. Future harvest of these lands would not likely result in further loss of habitat.

Monitoring – Vegetation - Sensitive Plants and Survey and Manage Species

Monitoring would be done to ensure that sensitive plant populations are protected during project activities.

Consistency with Direction and Regulations – Vegetation - Sensitive Plants and Survey and Manage Species

Sensitive plant protection measures proposed for this project are in compliance with the direction in the documents listed in the Regulatory Framework/Management Direction and Guidance section in Appendix L.

Invasive Plants

Introduction- Vegetation - Invasive Plants

An invasive plant is defined as “a non-native plant whose introduction does or is likely to cause economic or environmental harm or harm to human health” (Executive Order 13122). An estimated 420,000 acres of Forest Service lands in Region 6 are infested with invasive plants (USDA 2004). Invasive non-native plants, including noxious weeds, are a threat to native plant communities. These species thrive in a new environment because they arrive without the complement of predators, disease, and other ecosystem components found in their native region of the world. Most of these species take advantage of disturbance gaps such as logged units, roads, rock quarries, burned areas, the areas surrounding human structures, and trails. Weed seeds and other propagules can be introduced into an area by a variety of agents, most notably wind, highway and off-road vehicles, and construction equipment. They can also disperse by way of water, animals, and humans. Once established, these populations serve as a seed source for further dispersal, generally along road and trail corridors.

Timber sale contracts are now required to include provisions to minimize the introduction and spread of invasive plants. Weed populations in the units and along transportation routes must be mapped on the sale map and equipment-cleaning areas need to be identified (see also Appendix D).

Analysis Methods – Vegetation - Invasive Plants

Surveys for invasive species, including noxious weeds, were conducted in all stands in concurrence with the sensitive species surveys. Priority treatment sites covered by the Willamette National Forest Integrated Weed Management Plan are mapped in a GIS layer and tracked in a database. These sites are managed cooperatively through a Memorandum of Understanding with the Oregon Department of Agriculture.

Desired Future Condition – Vegetation - Invasive Plants

The desired condition is prevention of new invader establishments and a cessation of established weed spread with a corresponding reduction in established weed presence. Allowing for the return of disturbed areas to a more natural condition helps retain sensitive species habitat and other special native habitats, and impedes noxious weeds from dominating these areas. This condition can be advanced through implementation of this project with good management practices, minimizing disturbance where possible, and executing mitigation measures such as invasive weed removal and native species revegetation.

Existing Condition – Vegetation - Invasive Plants

The most serious weed infestations in the South Pyramid project area are Himalayan blackberry (*Rubus discolor*), evergreen blackberry (*Rubus laciniatus*), Scotch broom (*Cytisus scoparius*), and tansy ragwort (*Scenecio jacobaea*).

The ability of blackberry species to spread beneath a forest canopy, rather than being confined to open disturbed sites, makes them a greater threat to native plant diversity than other weed species found in the

planning area. Non-native blackberries are currently established along Roads 2047 and 2049, but have not yet been detected off roadways. Blackberries spread by growing roots at the tips of their canes during the winter when soils are saturated. These species also spread by seed, most often in bird and mammal droppings. Manual removal is often not successful because even small pieces of root left in the soil are able to sprout new vegetative shoots. There are no approved biological controls available however a rust that affects these species has been detected in Oregon. It has not yet spread to the Sweet Home Ranger District. Scotch broom is an established weed that favors roadsides and early seral plantations. It is shaded out in late-successional stands. There is a large population along Rd 2047-852 and it has invaded a plantation at the end of the road. There is another population on Rd. 2047-840 and it is scattered along Rd 2047. Most of these populations have been manually removed however this treatment needs to be repeated every few years in order to keep plants from producing seed. The seeds of Scotch broom can persist in the soil for decades and germinate if the soil is disturbed.

The population of tansy ragwort is exploding in this drainage and elsewhere at higher elevations on the District. It is an early seral species that is shaded out beneath a forest canopy. Tansy ragwort has historically been found scattered along roadsides at lower elevations, however, it has recently spread into young plantations at higher elevations. Biological control agents for tansy ragwort are cinnibar moths and flea beetles. Cinnibar moths have not migrated up in elevation at the same rate as tansy and efforts to establish flea beetle colonies at higher elevations have not been successful.

Timber harvest, including thinning, may enhance habitat for all of these weed species by opening up the canopy and creating seed germination sites by disturbing the soil. In addition, new weed species may be introduced on logging and slash treatment equipment. Additional roads and landings become semi-permanent openings, favored habitat for most weed species.

Environmental Consequences – Vegetation - Invasive Plants

Direct and Indirect Effects – Vegetation – Invasive Plants

Alternative 1 – No Action

The No Action Alternative has the least risk of spreading weeds. There would be no ground disturbance, therefore few opportunities for weed seed to become established. Few weed species can survive the dark conditions of interior forest. Although opportunities for post-sale activity funds would not be generated, there is less risk that weeds would spread into the closed canopy stands, not only due to light limitations but also because there would be no equipment in the stands that could potentially spread weed seeds. There is still some risk of weed spread through the use and maintenance of an open road system. Use includes administrative and public vehicle traffic during three seasons of the year. Vehicles can transport weed seed. Road maintenance improves weed seed establishment by creating more soil disturbance along roadways. Maintenance can also transport seed and vegetative stock within gravel shipments from infested rock pits.

Alternatives 2, 3, and 4

It is a combination of soil disturbance and transport of seed that constitutes the direct effects of timber harvest on weed introduction and persistence. The action alternatives increase the risk of invasive weed spread in the planning area above Alternative 1 (No Action). Increased risk varies by alternative. Ground disturbance from creating landings, harvesting trees, using ground-based harvest equipment, and treating post harvest fuels increases the risk of weed establishment. In the proposed action alternatives, the areas that would be semi-permanently opened up to light and disturbance would be most at risk, e.g., roads, landings and regeneration units. Risk decreases in areas where roads and landings are closed, rehabilitated, and seeded with desirable species (see *Risk Matrix* below). Risk also decreases with thinning prescriptions rather than regeneration harvest, and the use of helicopter harvest rather than ground based Mitigation measures listed in Chapter 2 would help curtail establishment and spread of weeds, however, they should not be viewed as absolute prevention. Many weed species have wind or animal dispersed seed that may escape equipment cleaning (or other mitigation measures) and find a foothold on disturbed soil in the planning area.

All of the action alternatives present about the same level of risk but for different reasons. Alternative 2 has a lower risk of weed invasion compared to Alternatives 3 and 4 if only regeneration harvest is considered. Early seral conditions resulting from regeneration harvest (0 acres in Alternative 2, 43 acres in Alternative 3 and 75 acres in Alternative 4) are preferred by most weed species. Risk of invasion is heightened further by the use of ground-based equipment, which increases soil disturbance and is an effective vector for seed spread.

The number of acres harvested by ground-based equipment in Alternative 2 is 61, Alternative 3 is 59, and Alternative 4 is 34. Although Alternative 2 harvests the most, the increased risk is not as significant as the harvest prescriptions. Six existing landings would be expanded for helicopter use in Alternative 2, while only 3 landings are expanded in Alternatives 3 and 4. The increased the risk of Alternative 2.

In the *Risk Matrix* below, Alternative 2 shows a slightly higher risk of promoting noxious weeds due to a larger level of ground disturbance and habitat modification represented by more disturbance via ground-based and skyline harvest vs. helicopter harvest. Due to the increase of acres in Alternative 2 over Alternative 3, more post-sale activity money would be available for weed surveys and control after thinning occurs.

Table 40: Risk Comparison of Invasive Weed Introduction and Establishment Potential by Alternative

Activity	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Acres treated (189 in Alt. 2, 111 in Alt. 3, and 90 in Alt. 4)	0	2	1	1
Acres regeneration harvest (0 in Alt.2, 43 in Alt. 3, and 75 in Alt. 4)	0	0	2	3
Acres treated with ground based equipment (61 in Alt.2, 59 in Alt 3, and 34 in Alt. 4)	0	3	3	2
Road maintenance (22 miles of haul routes for all action alternatives)	0	2	2	2
Subsoil skid roads (7.3 ac. in Alt. 2, 7 ac. in Alt.3 and 4.1 ac in Alt. 4)	0	2	1	1
Helicopter landings (6 in Alt. 2, 3 in Alt.3 and 2 in Alt. 4)	0	3	2	2
Sale-generated dollars collected for mitigation	2	0	0	0
Totals	2	12	11	11

Assigned risk values of 0 = no risk; 1 = small risk; 2 = moderate risk; and 3 = large risk. Derived from relative risk of invasive weed introduction and establishment by alternative based on the level of weed promoting activities within each alternative.

Cumulative Effects – Vegetation – Invasive Plants

Area

The area analyzed for cumulative effects is the analysis area and the road system accessing the analysis area (27 miles).

Actions Contributing to Cumulative Effects

Ground-disturbing activities such as ground-based yarding systems used during timber harvest, road construction and reconstruction, vehicular traffic and recreation use contribute to the incremental increase in invasive weeds (see Appendix K for more cumulative effects information).

Methodology

Analysis included reviewing all proposed harvest units in the field to determine existing weed infestations. Then the pattern of known invasive weed sites was reviewed along with the mechanisms for introduction, establishment and/or expansion of invasive weeds and comparing this with similar past, present and future foreseeable actions to determine potential impacts.

Cumulative Effects and Conclusions – Vegetation – Invasive Plants

The impact of non-native invasive weeds on native plant communities is cumulative. The more disturbance and activity any given area is subject to, the more the risk of noxious weed introduction, establishment, and/or expansion.

Past activities: Nine miles of past road construction and 734 acres of timber harvest in the analysis area plus adjacent harvest has resulted in ground disturbance that provides a seedbed for invasive plants. In addition, about 27 miles of roads accessing the area has brought administrative, commercial and public vehicular traffic to the area, some of which has carried seed into the area.

Present activities: Alternatives 2, 3 and 4 harvest 189, 111 and 86 acres, respectively. All three alternatives would reopen 800 feet of temporary logger's spur road and haul timber on about 27 miles of access roads. These activities could result in spread of invasive plants but numerous measures are being implemented to minimize the potential impacts. These include preventative measures taken prior to, during, and after thinning operations that would reduce the long-term likelihood of expanded weed populations such as logging equipment washing, post-treatment survey and control funding through post-sale activities, and pretreatment of existing weed sites. The canopy in the thinned stands is expected to close in 20 to 30 years, and this would further reduce habitat for some weed species. In addition, treatment of weed sites using funding generated by this project would also help minimize weed spread and establishment. Refer to Table 16, page 63 for a complete list of required mitigation measures.

Reasonably foreseeable activities: Road maintenance, harvest on adjacent lands, vehicular traffic, and ATV use would continue in the foreseeable future and may spread or introduce weed seed, potentially leading to new infestations. Similar mitigation measures to those listed above for present activities would minimize potential spread.

Conclusions: The past, present and reasonably foreseeable actions in this area may lead to introduction, establishment and/or expansion of invasive plant populations. Mitigation measures would help minimize these effects but some activities such as recreation traffic, etc. are not so easily mitigated.

Monitoring – Vegetation - Invasive Plants

Monitoring would be done to monitor invasive weed population spread and effectiveness of treatments.

Consistency with Direction and Regulations – Vegetation - Invasive Plants

Planned noxious weed management and control measures are in compliance with the direction in the documents listed in the Regulatory Framework/Management Direction and Guidance section in Appendix L.

Social Resources

Recreation

Introduction - Recreation

The South Pyramid analysis area is used for a variety of dispersed recreational activities including hiking, horse riding, big game hunting, dispersed camping, berry picking and mushrooming. Forest roads 2047 and 2047-840 also serve as snowmobile trails for winter visitors coming off State Highway 22. The combination of this area's proximity to the Three Pyramids and the Middle Santiam River with its network of roads and trails offers visitors an attractive forest area for dispersed recreation away from the forest highway corridors. However, its lack of developed recreation facilities or large water bodies help ensure that recreation use levels would never exceed the area's capacity to provide a Roaded Natural experience.

A significant issue with respect to recreation is harvest within an unroaded block which is about 1,000 within the analysis area. This area is not an inventoried Roadless Area and was not recognized during the RARE process but is not roaded and connects with the Three Pyramids Special Interest Area and other unroaded blocks that total about 4,300 acres (see also post-sale activities in Appendix B).

Analysis Area

The area analyzed includes proposed harvest units, dispersed recreation use areas in the vicinity of harvest units, transportation routes accessing the area, the South Pyramid Creek trail corridor, and the large unroaded landscape blocks near proposed harvest units.

Analysis Methods

Calculation of total acres affected by type of harvest, along with a comparison of resulting forest conditions with Forest Plan desired future conditions assigned to each management area.

Existing Condition Recreation

Dispersed Recreation Use: Most dispersed recreation use in the analysis area occurs during the summer and fall months, with minor winter recreation use occurring along roadways used as snowmobile trails. Summer and fall visitations are concentrated along road and trail corridors with visitors focused on hiking, horse riding, or hunting. The South Pyramid drainage possesses as many as two dozen sites used by visitors for dispersed camping during big game hunting seasons. Dispersed campsites are typically old harvest landings on local spurs. One trailhead at the end of forest road 2047-747 has been improved with four campsites for horse riders using the South Pyramid Creek trail. Two campsites at this trailhead have constructed corrals. The few forest visitors picking huckleberries or mushrooms in the analysis area generally do not wander far from roads or trails in their gathering pursuits.

Unroaded Blocks: There is an unroaded block in the eastern portion of the analysis area that is approximately 1,000 acres in size. This area is contiguous with another 3,300 acres of unroaded lands including the Three Pyramids Special Interest Area. Most unroaded areas on the district do not exist in

large blocks due to extensive road building over the last 50 years. Unroaded areas, such as this, are valued for a variety of resource attributes including water quality, fish and wildlife habitat, recreation values, soil protection, etc.

The nearest Inventoried Roadless Area (IRA) is the Middle Santiam to the west of the analysis area and Echo Mountain to the southeast of the Analysis Area. A portion of the Middle Santiam became wilderness in the 1984 wilderness legislation. Much of the rest was released for multiple use management and has been managed.

Proposed timber harvest is in lands allocated to General Forest-Matrix in the amended Willamette Forest Plan. All of the proposed harvest units are within 1,500 feet of existing roads and/or previously harvest stands. The table below displays harvest units by alternatives and acres within the unroaded block.

Table 41: Acres of Timber Harvest Units within the Unroaded Block by Alternative

Unit #	Alternative 1			Alternative 2			Alternative 3			Alternative 4		
	Type of Harvest	Total Unit Acres	Acres in Unroaded	Type of Harvest	Total Unit Acres	Acres in Unroaded	Type of Harvest	Total Unit Acres	Acres in Unroaded	Type of Harvest	Total Unit Acres	Acres in Unroaded
1a				Thin	13		HCR	19		HCR	19	
1b							HCR	3		HCR	3	
2a				Thin	8		Thin	8		Thin	8	
2b				Thin	49		Thin	49		HCR	49	
4a				Thin	4		Thin	4				
4b				Thin	8	8						
4c				Thin	11	11						
6a				Thin	21	18	HCR	21	18			
8a				Thin	13	13						
8b				Thin	6	6						
9				Thin	38	38						
24				Thin	7		Thin	7		Thin	7	
27				Thin	11	11						
Totals	0	0			189	105		111	18		86	0

Travel/Trails: Past harvest activities on public and private lands within the planning area have created a dense pattern of gravel roads through and around the analysis area. Most roads in the analysis area are open to motorized traffic, but receive little use annually.

In the mid 1990's, the South Pyramid Creek Trail was constructed to connect trails along the backbone of the Old Cascades Crest to trails within the Middle Santiam Wilderness. From the southern base of South Pyramid Peak, the South Pyramid Creek trail meanders west through the drainage until it connects with the

Chimney Peak trail near the Middle Santiam River. As its name suggests most of the trail closely follows South Pyramid Creek. Much of this trail's length east of forest road 2047 lies within or near Riparian Reserves.

While locating this trail route, District staff understood timber harvest activities would play a major role in shaping the visual landscape of this subwatershed. Currently trail users experience five existing harvest units within the trail's foreground view and cross over forest road 2047. Given the management emphasis for this landscape, the trail corridor can realistically be managed as a Roded Natural ROS recreation setting. A Roded Natural setting is described as a natural-appearing forest landscape where human alterations are easily noticed and visitors have a limited chance for isolation from other visitors. Current annual use levels on this trail are low (<200 people per year).

The Willamette Forest Plan provides direction to managers to maintain vegetation within trail corridors of 100 to 300 feet wide (each side) to meet recreation resource objectives (*USDA 1990, FW-045, p. IV-52*). Timber sale project teams are also directed to minimize road crossings and road related impacts on trails (*USDA. 1990, FW-049, p. IV-53*).

Scenic Resources: The analysis area contains no scenic management areas connected to scenic travel corridors as defined by the Forest Plan. However, all management areas are assigned Visual Quality Objectives (VQO's) by the Forest Plan for designing projects such as timber sales. The Forest Plan designates most of the analysis area as General Forest (MA14a) which possesses a Maximum Modification VQO, or Riparian Reserve which possesses a Partial Retention VQO. Current landscape conditions in the analysis area meet or exceed Maximum Modification VQO's (*USDA. 1974*).

Most Riparian Reserve acres within the analysis area meet or exceed Partial Retention VQO's, however, stream reaches traveling through or along previous harvest units less than 10 years old do not meet Partial Retention VQO's.

The South Pyramid Creek trail possesses a Partial Retention VQO. With the exception of a short trail section east of analysis area, vegetative conditions within this trail corridor meet or exceed Partial Retention VQO's.

Special Interest Area: The Three Pyramids SIA forms the eastern boundary of the analysis area. It was established by the Forest Plan to protect sensitive rock garden habitat and a popular recreation trail opportunity.

Wild and Scenic Rivers: The Forest Plan identified segments of the Middle Santiam River as eligible candidates for Wild and Scenic River status (*USDA 1990, pp E-61-64*). The river segment forming the western boundary of the analysis area was recommended for a Scenic river classification, with potential anadromous fish habitat and old-growth habitat as Outstandingly Remarkable Values (ORV's).

Environmental Consequences - Recreation

Direct and Indirect Effects – Recreation

All Alternatives

None of the alternatives propose harvesting or roading in the Three Pyramids Special Interest Area or the Middle Santiam Wild and Scenic River corridor therefore there would be no impacts to these areas from any of the alternatives.

Large Unroaded Landscape Blocks: Unroaded areas are valued for a variety of resource attributes including water quality, fish and wildlife habitat, recreation values, soil protection, etc. The effects of the action alternatives on these attributes, except recreation, are discussed elsewhere in this chapter. Stands treatments within the unroaded area would not adversely affect unroaded characteristics derived from the resources listed above.

There are several opportunities for recreation activities that depend on remoteness and wilderness-like experiences in the vicinity of this project area including the Middle Santiam Wilderness Area, the Echo Mountain Inventoried Roadless Area and the Three Pyramids Special Interest Area.

The proposed harvest units within the unroaded block in all action alternatives are all within 1,500 feet of road 2047, which forms the western boundary of the area. Because of the existing roaded condition of the project area in and around the proposed harvest units, the areas proposed for harvest are not considered interior habitat. These units are also not expected to create edge effects that compromise interior habitat conditions.

None of the alternatives would harvest in late-successional habitat and is not expected to affect areas that would function as biological strongholds or refuges for species that depend on large undisturbed areas, such as the threatened northern spotted owl.

Roads are either visible or vehicles can be heard on roads from any of the proposed harvest units in the project area. Except for short term noise and traffic occurring during project implementation, the proposed action and other action alternatives would have not diminish any sense of remoteness or solitude that currently exist within any unroaded areas in the project area.

Alternative 1 – No Action

Dispersed Recreation Use: There would be no change in the existing dispersed recreational use of this area under this alternative.

Large Unroaded Landscape Blocks: Alternative 1 would have no effects on unroaded characteristics in the unroaded block. No interior habitat would be lost within this block. Natural processes are the only foreseen forces creating change to habitat features in this area.

Travel/Trails: There would be no effect on travel or trails in the analysis area.

Scenic Resources: There would be no change in Visual Quality Objectives (VQO's) from existing conditions for land management areas. As young timber stands continue to grow, the visual quality objectives would improve over time in these previously harvested areas.

Alternative 2

Dispersed Recreation Use: Proposed harvest operations have the potential to interfere with recreation visitors in the analysis area if scheduled during late summer and hunting seasons. Harvest operations with helicopters can affect large areas of the analysis area either by closing roads and trail systems near harvest units or by creating substantial disturbance. About 105 acres would be logged by helicopter under this alternative.

Log haul would also create conflicts with visitors in the analysis area during the summer and autumn seasons. Harvest operations during big game hunting seasons would compete with hunters on roadways and create unwanted disturbance. This alternative relies heavily on helicopter operations making it difficult to schedule during high recreation seasons to avoid impacts to visitors. Operational restrictions would be implemented to mitigate conflicts between harvest operations and forest visitors during the peak summer and fall seasons.

The proposed action also has the ability to influence dispersed recreation through the generation of revenue. Such revenue could be applied to maintain trail and roads used to access recreation opportunities in the analysis area. This alternative generates more revenue than Alternative 4 but less than Alternative 3, but all action alternatives have the capacity to support maintenance of roads and trails for recreation visitors.

Unroaded Block: Thinning under Alternative 2 would temporarily alter the natural appearance within the unroaded block for about 10-20 years by leaving visual evidence of skid trails in 27 acres in addition to cut stumps and logging debris in 105 thinning acres. This may affect visitor experience in the area during this time. Stumps and logging debris may become most notable in unit 8a, because of the unit's proximity to the South Pyramid Creek trail. This trail runs around the north side of unit 8a, but hikers are separated from the visual evidence to thinning by a 100-foot no-harvest buffer. Over time the alterations would become less noticeable as canopies in proposed thinning units would grow closed within about 10 years, and the growth of understory vegetation should obscure most stumps and skid trails in 20 years. Thinning of 105 acres within the 4,300-acre unroaded landscape block (which extends outside the analysis area) should not compromise future management options for this unroaded block during the next forest planning process.

Travel/Trails: This alternative would create road traffic that directly competes with forest visitors during the summer and autumn seasons. The amount of traffic would be similar for all action alternatives since similar volumes are harvested and hauled with each alternative, but the duration of impact would be longest (maybe 40% longer) with Alternative 2 than the other action alternatives because of the amount of thinning in this alternative versus regeneration harvest in the other alternatives. The main access road through the analysis area, forest road 2047, has the highest potential to experience road use conflicts because of its windy and narrow character in places. Implementing operational restrictions to avoid logging or hauling operations during weekends from July 4th through Labor Day weekend in all action alternatives would not eliminate these effects but it would help to minimize user conflicts and safety concerns on the Forest road network.

Much of the South Pyramid Creek trail falls within Riparian Reserve management areas. This project does not propose harvest activities within Riparian Reserves, therefore, proposed timber harvest would not affect trail segments within Riparian Reserves. This alternative harvests near trail segments outside of Riparian Reserves (units 6a and 8a), a 100-foot (horizontal) no-harvest buffer would be maintained on each side of the trail to meet Roaded Natural recreation objectives and Partial Retention visual quality objectives.

Scenic Resources: This alternative meets VQO's for land management areas within the analysis area. Riparian Reserve buffers effectively protect scenic resources adjacent to stream channels in the analysis area. Likewise, the 100 foot protection buffer (both sides) for the South Pyramid Creek trail would mitigate visual impacts to foreground views of trail users typically created by harvest operations. Proposed thinning of unit 8a would largely go unnoticed through the 100-foot buffer by trail travelers.

Alternative 3

Dispersed Recreation Use: Dispersed recreation use effects are similar to Alternative 2 except this alternative harvests only 52 acres with helicopters compared to 105 in Alternative 2.

Log haul conflicts are similar but since this alternative has about equal amounts of helicopter and ground-based yarding it would be less difficult to schedule during high recreation seasons to avoid impacts to visitors than Alternative 2 or 4.

Finally, this alternative generates the most revenue so has a slightly higher capacity to support maintenance of roads and trails for recreation visitors than the other action alternatives.

Large Unroaded Landscape Blocks: Alternative 3 would regenerate 18 acres in the unroaded landscape block using ground-based systems. This alternative does not propose any new road construction or the harvest of late-successional habitat. Regenerating 18 acres may create some edge effects to the outer edges of the adjacent unroaded block but would not affect interior habitat there. This unit is located on an existing road and is adjacent to previously harvested units.

Travel/Trails: This alternative would create road traffic that directly competes with forest visitors during the summer and autumn seasons. The amount of traffic would be similar for all action alternatives since similar volumes are harvested and hauled with each alternative, but the duration of impact would be shorter than with Alternative 2 because there is regeneration harvest in this alternative. The main access road through the analysis area, forest road 2047, has the highest potential to experience road use conflicts because of its windy and narrow character in places. Implementing operational restrictions to avoid logging or hauling operations during weekends from July 4th through Labor Day weekend in all action alternatives would not eliminate these effects but it would help to minimize user conflicts and safety concerns on the Forest road network.

Much of the South Pyramid Creek trail falls within Riparian Reserve management areas. This project does not propose harvest activities within Riparian Reserves, therefore, proposed timber harvest would not affect trail segments within Riparian Reserves. Unit 6 harvests in the vicinity of the South Pyramid Trail but is separated from the trail by about 300 feet of Riparian Reserves (150 feet each side of the stream). In this alternative, this unit would be regenerated and may be visible from some places along the trail.

Scenic Resources: All alternatives meet VQO's for land management areas within the analysis area. Riparian Reserve buffers effectively protect scenic resources adjacent to stream channels in the analysis area. Likewise, the 100 foot protection buffer (both sides) for the South Pyramid Creek trail would mitigate visual impacts to foreground views of trail users typically created by harvest operations.

Alternative 4

Dispersed Recreation Use: This alternative has similar effects to Alternatives 3.

Large Unroaded Landscape Blocks: Alternative 4 proposes no harvest within the Pyramids landscape block and therefore would not affect unroaded landscape values.

Travel/Trails: This would create road traffic that directly competes with forest visitors during the summer and autumn seasons. The amount of traffic would be similar for all action alternatives since similar volumes are harvested and hauled with each alternative, but the duration of impact would be least with this alternative because it is mostly regeneration harvest with very little thinning. The main access road through the analysis area, forest road 2047, has the highest potential to experience road use conflicts because of its windy and narrow character in places. Implementing operational restrictions to avoid logging or hauling operations during weekends from July 4th through Labor Day weekend in all action alternatives would not eliminate these effects but it would help to minimize user conflicts and safety concerns on the Forest road network.

This alternative would not have any impact on the South Pyramid trail. No harvest units are located in close proximity to the trail.

Scenic Resources: All alternatives meet VQO's for land management areas within the analysis area. Riparian Reserve buffers effectively protect scenic resources adjacent to stream channels in the analysis area. No units are proposed near the South Pyramid Creek trail.

Cumulative Effects - Recreation

Area

The area of potential effects to recreation was assessed within the analysis area.

Actions Contributing to Cumulative Effects

Past timber sale activities and road access have influenced recreational cumulative effects here (see Appendix K for more cumulative effects information).

Effects and Conclusions - Recreation

Timber harvesting, road construction and other management activities over the past 40 years have resulted in the South Pyramid analysis area having fewer acres of unroaded or unmanaged forest. Currently approximately 2,300 acres in the analysis can be categorized as roaded and approximately 1,000 acres are unroaded. There are no present or reasonably foreseeable actions that would impact the development or roaded/unroaded characteristics in the South Pyramid analysis area so the only cumulative effect is the result of the past activities and the proposed alternatives.

Alternative 1 would have no cumulative effect since no action would be taken that results in harvesting or roading.

Alternative 2 would cumulatively result in about 895 acres of unroaded area, or a 10.5% decrease in area, within the analysis area in the short-term (or about 1-10 years) when the visual effects of thinning would still be fresh. In about 20 years, many of the visual impacts and obvious signs of management would not be readily noticeable and the cumulative effects of Alternative 2 would revert to something close to the current estimate of 1,000 acres of unroaded/unmanaged appearing landscape. The immediate impacts to the unroaded area as described above would probably still be visible during the next forest plan revision, but would not preclude future management options from being considered during forest plan revision.

Alternative 3 would cumulatively result in about 982 acres of unroaded/unmanaged forests in the South Pyramid analysis area or about a 1.8% decrease. The cumulative effects of this reduction on recreation opportunities or future management options in forest plan revision would be minimal because of the small amount of acres impacted.

Alternative 4 has no direct impact on unroaded acres in the South Pyramid analysis area and would not have any cumulative effect on unroaded/unmanaged area recreation opportunities or future management options in forest plan revision.

Economics

Introduction – Economics

The viability of a timber sale proposal is predicated on having an economically efficient proposal that contractors would want to purchase. Sale design and thinning prescription implementation requirements all must be taken into consideration in determining the economic viability of a project. A below cost (deficit) sale or a package which generates no bidder interest is not desirable because it does not accomplish the desired silvicultural treatments to achieve wildlife habitat objectives. It provides no wood or work for the community (see Appendices B and C).

A significant issue with respect to economics is operating costs per ccf harvested and disturbance effects of the various logging systems.

Existing Condition and Environmental Consequences – Economics

All proposed action alternatives for the South Pyramid Timber Sale EA show a positive return to the treasury. Short-term dollar costs and incomes have been used to provide relative economic values associated with each alternative. Values are not meant to be comprehensive because of the difficulty of assigning values to resource benefits. Timber values from a recent commercial thinning timber sale of comparable timber were used for this comparison. All acreage and costs used are estimates.

Table 42: Economic Analysis Summary

Item	Alternative 2	Alternative 3	Alternative 4
Gross Value (\$250/CCF)	8882 ccf x \$250/ccf= \$2,220,500	8034 ccf x \$250/ccf= \$2,008,500	7588 ccf x \$250/ccf= \$1,897,000
Associated Costs	\$1,130,974	\$909,031	\$1,039,663
Cost/Benefit Ratio	1.96	2.2	1.82
Present Value	\$1,089,526	\$1,099,469	\$1,757,337
Acres of Harvest by Helicopter	128	52	52
Acres of Harvest using Ground-based Yarding	61	59	34

Alternative 1 - No Action

Alternative 1 does not harvest units so does not incur any logging, road, fuel treatment or post-sale activity costs. It also does not bring in any income because no timber is sold.

Alternatives 2, 3 and 4

Alternative 2 proposes to thin 12 units (189 acres) with a mix of ground-based (61 acres) and helicopter (128 acres) logging systems, to control operating costs and avoid road construction, respectively. Resource effects of this alternative are discussed elsewhere in this chapter. By contrast, Alternatives 3 and 4 propose to regenerate and thin 7 units (111 acres) and 5 units (86 acres), respectively, with a mix of ground-based (59 and 34 acres) and helicopter (52 and 52 acres) logging systems to operate more efficiently and to limit disturbance to fewer acres.

The revenue cost ratio for Alternative 2 is 1.96, Alternative 3 is 2.2 and Alternative 4 is 1.82.

Conclusions and Rationale for Conclusions – Economics

Average logging costs per volume harvested (CCF-hundred cubic feet) is notably higher for Alternatives 2 and 4 due to the heavy reliance on helicopter logging systems.

Alternative 3 is more cost effective in meeting the project objective #1 - contributing to the District's harvest target than the other two action alternatives.

Infrastructure (Roads)

Introduction - Infrastructure (Roads)

Road development in this subwatershed is less extensive than adjacent areas, and large blocks of unroaded forest still remain near the project area. The roads that have been constructed are generally located on stable benches, flats or ridges. Few if any sidecast roads exist, and most road cuts and fills are heavily vegetated.

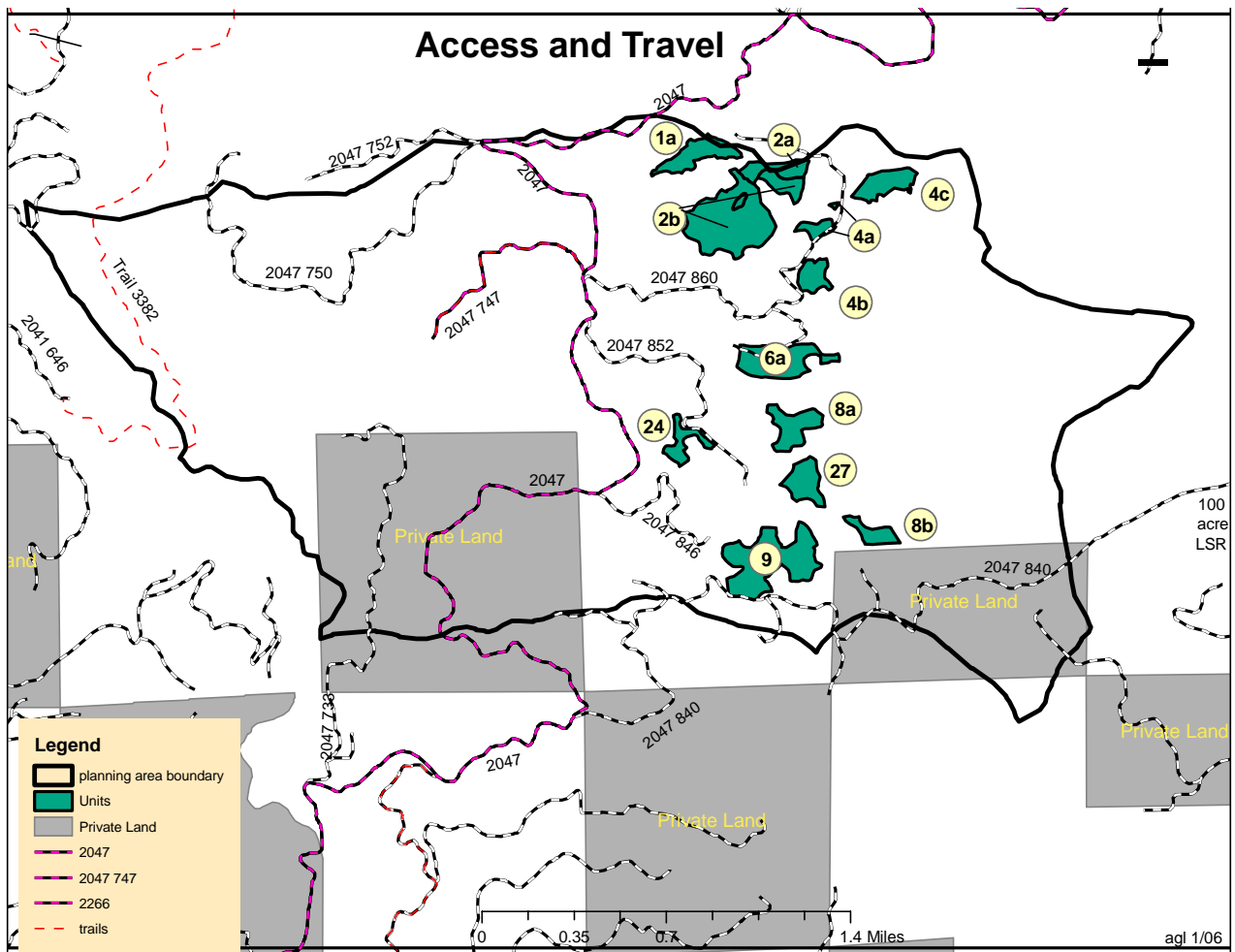


Figure 14: Access and Travel Routes

Analysis Methods - Infrastructure (Roads)

Analysis Area: haul route and existing and proposed roads that access harvest units for this project.

Analysis Methods: Using the 2003 Willamette National Forest Roads Analysis Update and Willamette Forest Plan guidance, roads were analyzed to achieve the goal of “a network of Key Roads to provide sustainable access to National Forest System lands for administration, protection and utilization in a manner consistent with Forest Plan guidance and within the limits of current and likely funding levels.

Desired Future Conditions – Infrastructure (Roads)

The desired future condition for roads is to have “a network of Key Roads to provide sustainable access to National Forest System lands for administration, protection and utilization in a manner consistent with Forest Plan guidance and within the limits of current and likely funding levels” (USDA, 2003).

Existing Condition - Infrastructure (Roads)

Sheep Creek Road #2047 (see figure 14) is a major collector that dissects the planning area, and connects US Highway 20 with State Highway 22. This route is not considered a significant recreation travel route through the District. Most of the public use on this road occurs during fall hunting seasons. One trailhead at the end of local road #2047-747 receives light recreation traffic.

Because of mixed land ownership and past timber harvest, a number of short local roads were built off Road #2047. While many of these local roads are open to public use, some are closed to motor vehicles to enhance elk habitat and provide better hunting opportunities. Some local roads remain open and maintained to allow administrative access.

Budgets for maintenance and reconstruction of open roads have declined over the past decade due to a reduced timber sale program. The District’s road budget has dropped significantly since 1990 and is expected to continue declining. Projected budgets would not maintain the existing open road system to designed standards.

The Willamette National Forest Roads Analysis identified a network of key forest roads. Key forest roads are the priority roads maintained and open to vehicular travel. The following key forest roads provide access to the planning area: 2266, 2047, 2047-747 and 2047-840. All non-key roads in the planning area can be evaluated on a case-by-case basis for closure or decommissioning.

Through a cooperative and business-like partnership of landowners, the Road Cost-Share Program provides for a common road system, permanent access to a mixed ownership, and equitable sharing of associated costs. Many of the roads in the South Pyramid planning area are part of the Harter Mountain/Latiwi and Harter Mountain/Lava Lake Right-of-Way Construction and Use Agreement area. Access and travel management decisions on roads not covered by these agreements should be consistent with resource management goals in the Forest Plan and based on findings and recommendations in the Forest Roads Analysis. Those goals are to develop and operate a National Forest road system that provides safe, environmentally sound, and efficient access to most forest resources.

Environmental Consequences – Infrastructure (Roads)*Direct and Indirect Effects – Infrastructure (Roads)***Alternative 1 – No Action**

Alternative 1 proposes no road construction or reconstruction in the planning area. This alternative also does not create a funding source from timber sales to close additional local spurs in the planning area or improve the conditions of open system roads of the key forest road network. Minimum maintenance tasks supported by annual appropriations would be completed on main system roads under this alternative, though spurs within the project area would not receive maintenance.

If Alternative 1 is selected, road improvements and closures in the planning area are less likely to be completed. Only a limited amount of wildlife and other appropriated funds are available to close the highest priority roads, with other roads remaining open. Road maintenance budgets have been declining for the Forest Service over the past several years. Maintenance of system roads would likely decrease further as budgets shrink and would need to be prioritized for limited road dollars.

Alternatives 2, 3 and 4

Under Alternatives 2, 3 and 4 road maintenance work would occur on existing system roads where needed to facilitate logging operations and to maintain drainage ditches and culverts. Funding to close roads for wildlife reasons would also be available from timber sales under these alternatives. Road maintenance includes brushing existing road rights-of-ways, and cleaning out the ditches and culvert intakes. Road maintenance contributes to a safer road system that is environmentally sound and provides efficient access through the planning area.

Both action alternatives would improve road conditions on system roads and affect public access in roughly the same way. Access and travel management within the planning area is not expected to change significantly or differ by action alternatives. Timber sale funding from this project would likely be used to close short system roads in the planning area in concert with direction from the Forest Roads Analysis.

Action alternatives would reopen about 800 feet of a closed temporary operator's spur road existing for logging operations. This road would be closed after operations are complete. Alternative 2 expands the size of up to six existing landings to facilitate helicopter operations. Alternatives 3 and 4 expand the size of up to three and four landings respectively. Each helicopter landing could be up to an acre in size.

Harvest operations under both action alternatives would be prohibited two days prior to and including the Cascades elk season to avoid conflicts, with public visitors. Both action alternatives temporarily improve existing local roads to selected landing sites.

Cumulative Effects – Infrastructure (Roads)

Area

The area of potential effect to infrastructure (roads) was assessed within the analysis area.

Actions Contributing to Cumulative Effects

Past timber sale activities have incrementally added to the road system and have provided funding for maintaining the road system (see Appendix K for more cumulative effects information).

Effect and Conclusions

Past road construction in the analysis area resulted in 9 miles of roads in the analysis area. System road miles or densities would not increase as a result of this project and there are no foreseeable future projects at this time. The effects of roads accessing the analysis area are that there is more human access to this area, than prior to road construction, because vehicle access is relatively easy. This results in increased recreational use of the watershed and increased disturbance to wildlife species over an unroaded condition. Access for wildfire suppression is easier and faster so wildfires do not generally get as large as they would have without easy suppression access. Access for commodity utilization results in more products being removed from the forest than without easy access.

The road system in the planning area is currently stable with functional drainage structures. This project would provide funding for routine road maintenance activities such as brushing to improve site distance, cleaning drainage ditches etc. that are expected to improve road conditions on system roads along the haul routes. Some roads would be closed for other resource reasons. Closing these roads would help alleviate both the expense of road maintenance and the liability of keeping roads open that cannot be adequately maintained to design standards. These actions would help us move toward desired sustainable access for administration, protection and utilization in a manner consistent with Forest Plan guidance and within the limits of current and likely funding levels.

In the future there is a need for more stable funding for road maintenance work and/or road decommissioning to minimize sediment flow off roads by being able to respond to repair and maintenance needs in a timely manner. Future harvest activities are not expected to significantly increase the open road density within the subwatershed, as existing roads can provide sufficient access to most areas.

Consistency with Direction and Regulations - Infrastructure (Roads)

Temporary operator's spur road re-opening and subsequent closure following harvest activities, routine road maintenance work, use of temporary skid trails in harvest units, use of system roads for log haul and proposed road closures are consistent with current USDA Forest Service transportation system policies and direction.

Heritage Resources

Introduction – Heritage Resources

Aboriginal groups, possibly Kalapuya, Molala and others used this area mainly for seasonal hunting, fishing and gathering wild plants. The Western Cascades' Molala utilized the natural resources of the Higher Cascades during the spring and summer months and retreated to the lower river and stream valleys during the winter (Jenkins et. al. 2001). They relied on both large and small game for meat and fur. Hunting techniques employed by the Molala for large game included the use of communal game drives, pit falls and the bow and arrow. They hunted deer, elk, black bear, cougar, bobcat, beaver, river otter, muskrat, raccoon, rabbit and squirrel.

The Molala likely camped in semi-permanent sites along many of the well-established (often blazed) aboriginal trails in the Western Cascades. They traversed ridge-line routes for swift access to both abundant hunting grounds and highland fields rich in huckleberries, which they dried next to fires for later trade. Many of these aboriginal trails were also used as trade routes according to ethno-histories, telling of the Molala trading, “upland resources at Oregon Falls with the Kalapuya for camas cakes (Zenk 1976), and the Klamath for pond lily seeds and beads (Jensen 1970).” Winkler (1984) describes the importance of trade for the Molala, and how they used “an elaborate system of aboriginal trails within the Western Cascades linked to regional prehistoric travel route attests to the importance of trade networks.” Warm Springs groups are also thought to have visited the area for trade (District files).

Analysis Methods – Heritage Resources Analysis Area – Heritage Resources

The areas of potential effect to heritage resource within the undertaking which could, or were likely, to cause a discovery were analyzed. This includes roads, landings, staging areas, rock sources, harvest units, etc.

Prior to a field survey, district cultural resource files, maps and relevant literature was reviewed by the district archaeologist for recorded or potential cultural resources within or near the proposed project area.

A survey design was developed by the district Archaeologist based on information from site records, the Forest Inventory Plan (Davis 1988), pre-field research, and knowledge of the project area from past field experience.

On the basis of research, it was determined that the South Pyramid project area had a moderate to high probability for the discovery of prehistoric sites. The area is characterized by the Old Cascades primary ridge system (Three Pyramids) to the east and steep to moderate slopes descending westerly toward the Middle Santiam River. In addition, there are ecotones such as wet meadows and rocky meadows that could have served as resource procurement areas. Quality huckleberries are found in the understory. It was determined that an intensive survey of all but the steeper (>30%) slopes would likely be productive in terms of site discovery.

With regard to historic sites, the South Pyramid area has lower potential given the lack of known historic sites in the vicinity.

The field survey was designed to examine 100% of the high probability areas within the project area following the Forest Inventory Plan, employing duff clearance and mineral soil examination at regular and replicable intervals. High probability areas included all slopes 30% or less, ridgetops, meadows, rock outcrops (some on steep slopes >30%), and level streamside areas. The low probability areas were examined through at least 20% coverage with survey transects determined by expedient travel between high probability areas. Low probability areas included mainly slopes greater than 30%.

Survey strategy consisted of walking parallel transects at 20 meter intervals, following the natural contours of the land, stopping to clear duff and debris to expose one meter square of mineral soil with the help of portable entrenching tools and hand trowels. This procedure was performed at intervals of 10 to 20 meters and included examination natural or human-caused ground disturbance. The area was surveyed over a period of 11 days in August, 1998.

Desired Future Conditions – Heritage Resources

Protect and manage significant cultural and historical resources for future generations.

Existing Condition– Heritage Resources

Existing Condition: There have been 13 previous cultural resource surveys in the subdrainage which were conducted between 1979 and 1994. Those surveys documented eight sites which indicate use of ridgelines and natural openings. The sites are predominantly open lithic along probable travelways or near hunting/gathering locales. The Three Pyramids mountains are situated between the flat Parks Creek country to the east and the Middle Santiam headwaters to the west. Access through this project area to the Three Pyramids for traditional purposes (ceremonial/religious) would have been relatively easy.

One cultural site was discovered during the survey of the project area. The presence and extent of prehistoric artifacts at the site were determined through Phase One testing performed by Archaeological Services of Clark County, Vancouver, Washington (field work in October 2001 with site report in May 2002). Based on the results of the site testing, harvest unit boundary adjustments were made to avoid impacts to heritage resources.

Environmental Consequences – Heritage Resources

Direct and Indirect Effects – Heritage Resources

Alternative 1 creates no ground disturbance and, therefore would not have any effects on heritage resources.

Action Alternatives: Known heritage resource sites would be protected under all action alternatives. Heritage resources were avoided, buffered, or otherwise protected with appropriate mitigation from the disturbing effects of harvest operations. All mitigation efforts were considered in consultation with the State Historic Preservation Office (SHPO) (see Appendix I).

Cumulative Effects – Heritage Resources

Area

The areas of potential effect to heritage resources within the undertaking which could, or were likely, to cause a discovery were analyzed. This includes roads, landings, staging areas, rock sources, harvest units, and other areas potentially subject to ground disturbance as a result of this activity

Actions Contributing to Cumulative Effects

Past harvest and associated activities, road construction, trail construction and other ground-disturbing activities have resulted in disturbance of heritage resources prior to the hiring of archaeologists to ensure their protection in the 1970's (See Appendix K for more cumulative effects information).

Methodology

Analyzing the pattern of discovered sites shows use along ridges, near water, and on gentler ground. Looking at the pattern of timber harvest, road and trail construction that has occurred in the last century and comparing it with the pattern of discovered sites, one can estimate potential cumulative impacts.

Cumulative Effects and Conclusions – Heritage Resources

It is unknown how many sites have been disturbed by past activities or the extent of that disturbance. It is also unknown how much information about past societies was lost by the disturbance of these sites.

Any present and foreseeable future harvest activities on public lands in this area would use the same protective measures and SHPO consultation described above. Located sites would be protected and mitigation measures implemented in the event of a new discovery during project activities. The cumulative risk to heritage resources into the future expected to be low. Future road and trail maintenance activities would have no significant effects on heritage resources in this subwatershed.

Future harvest operations on private lands in this subwatershed have a higher likelihood of disturbing heritage resources than public lands harvest. Because these operations would occur in managed plantations, many heritage resource sites were disturbed during previous harvest operation in the last century. Without extensive field surveys of high probability sites on private lands, the extent of past resource damage is difficult to accurately assess.

Heritage resources would be protected through project design to avoid known sites. Mitigation would be implemented that would avoid disturbance to existing sites or newly discovered sites during project activities. Cumulative risk to heritage resources in the future is expected to be low.

Monitoring – Heritage Resources

A site near the proposed harvest units would be monitored by the district archaeologist during and after project operations.

Consistency with Direction and Regulations – Heritage Resources

Under the Programmatic agreement the Forest Heritage Specialist has project review authority, and certifies that the project complies with Section 106 of the National Historic Preservation Act. That certification of the project as "No Historic Properties Affected" was completed on January 26, 2004.

Environmental Justice in Minority Populations and Low Income Populations (Executive Order 12898)

Agencies are directed to address effects accruing in a disproportionate way to minority and low-income populations; the closest population or habitation to the project area is the City of Sweet Home, (population 8200) some thirty miles west of the project area. Sweet Home is within Linn County considered a non-metropolitan county located by its western boundary along Interstate 5 and ranging east along the Western Cascades. Linn County's per capita income ranked 25th out of 36 counties in the state in 1993. In 1999 percent of persons below poverty is 11.4% from the U.S. Census Bureau 1990 and 2000 data. The State of Oregon Employment Department for Sweet Home has an unemployment rate of 11.6 percent in 2002. Minority populations in Linn County are 6.8 percent which include Native Americans, Asians, African Americans, and Hispanic.

From Federal and State data this community contains low-income people and minority persons. Implementation of an alternative that provides the opportunity for employment may positively affect low-income families who are either unemployed or underemployed. No disproportionate impacts to the citizens of Sweet Home are anticipated upon the implementation of an alternative. All contracts offered by the Forest Service contain Equal Employment Opportunity requirements. Subsistence and cultural use levels are difficult to quantify and differential patterns of subsistence consumption are unknown at this time. However, the Forest provides access to firewood, Christmas trees, mushrooms and other consumables through a personal-use permit system. The proposed thinning has the potential to contribute to the supply of special forest products (SFP) available within the area, such as salal and beargrass.

Irreversible and Irretrievable Commitments of Resources

It is not anticipated that there would be any irreversible and irretrievable commitments of resources outside of the range discussed in the Willamette Forest Plan. The protection measures identified in the Forest Plan Standards and Guidelines, Mitigation and Design Measures in Chapter 2, and Best Management Practices are designed to avoid or minimize the potential for irreversible losses from the proposed management practices.

Compliance with Other Laws, Regulations, and Policies

This section describes how the action alternatives comply with applicable State and Federal laws, regulations and policies.

Federal Mine Safety and Health Act of 1977, Public Law 91-173, as amended by Public Law 95-164: Development of rock pits would conform to the requirements of the act, which sets forth mandatory safety and health standards for each surface metal or non-metal mine. The purpose for the standards is to protect life by preventing accidents and promoting health and safety.

The National Environmental Policy Act (NEPA), 1969 – NEPA establishes the format and content requirements of environmental analysis and documentation. Preparation of the South Pyramid Project EA was done in full compliance with these requirements.

The National Forest Management Act (NFMA), 1976 – All proposed harvest units are planned on suitable land, and would be capable of restocking within 5 years of harvest by either natural or artificial means. Proposed commercial thinning would increase the rate of growth of remaining trees, and would favor species or age classes most valuable to wildlife. The resultant reduced stress on residual trees would make treated stands less susceptible to pest-caused damage. Mitigation has been identified to protect site productivity, soils, and water quality.

The burning of activity fuels would reduce long-lasting hazards from wildfire over the project area as a whole, while air quality would be maintained at a level that would meet or exceed applicable Federal, State, and local standards. All proposed activities would provide sufficient habitat to maintain viable populations of fish and wildlife, and critical habitat for threatened or endangered species would be protected. Proposed activities are designed to accelerate development of forest habitats that are currently deficient within the analysis area, enhancing the diversity of plant and animal communities in the long-term. See discussions under the applicable resource sections above, for further support that proposed activities would comply with the seven requirements associated with vegetative manipulation (36 CFR 219.27(b)), riparian areas (36 CFR 219.27(e)), and soil and water (36 CFR 219.27(f)).

Energy Requirements and Conservation Potential – Some form of energy would be necessary for proposed projects requiring use of mechanized equipment: Commercial thinning would involve small machines, while projects such as road reconstruction and maintenance could require heavy machinery for a small amount of time. Both possibilities would result in minor energy requirements. Alternatives that harvest trees could create supplies of firewood as a by-product, which would contribute to the local supply of energy for home space heating.

Prime Farmland, Rangeland, and Forestland – No prime farmland, rangeland, or forestland occurs within the analysis area.

Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

Interdisciplinary Team (IDT) MEMBERS:

The following list identifies members of the IDT responsible for coordinating, conducting and contributing to the environmental analysis:

Table 43: Interdisciplinary Team Members

Members Name	Position or Field	Education
Mike Rassbach	District Ranger	B.S. Forest Management
Todd Buchholz	Fisheries Biologist	B.S. Fisheries Science
Kelly Esterbrook	Fire and Fuels Mgmt	Fire Mgt Program Grad. Wash. Institute Tech.
Tony Farque	Archaeologist	B.S. Anthropology A.A. Forestry
Marilyn Hubbard	Transportation Planner	B.S. Civil Engineering
Brian McGinley Anita Leach	Planners	B.S. and MS Forest Management BS Forest Management
Ken Loree	Forestry Technician	Logging Systems Program, OSU Forest Engineering Institute
Brian McGinley	Resource Planner	B.S. Forestry M.F. Forest Mgmt
Virgil Morris	Wildlife Biologist	B.S. Fish and Wildlife Biology
Bill Porter	Silviculturist	B.S. Forestry OSU Silviculture Institute
Doug Shank	Geologist	B.S. Geology M.S. Geology
Alice Smith	Botanist	B.S. Botany/Plant Pathology M.S. Botany/Plant Ecology
Wayne Somes	Fisheries Biologist	B.S. Fisheries

FEDERAL, STATE, AND LOCAL AGENCIES:

Consultation with NOAA Fisheries was not required because this undertaking would have no effect on anadromous fish.

Formal consultation with the U.S. Fish and Wildlife Service, on this project, was completed and a Biological Opinion received September 1998. A “may affect, and is likely to adversely affect” determination was made due to downgrading suitable habitat to dispersal habitat (USDI, 1998). In 2005 the portion of this project affecting critical owl habitat was submitted for re-consultation and Biological Opinions were received in August 2005. It was determined that the proposed action was not likely to jeopardize the continued existence of the spotted owl or adversely modify spotted owl critical habitat. The forest must submit a monitoring report after completion of the harvest activities.

Under the Programmatic Agreement among the USDA, Forest Service Pacific Northwest (Region 6), The Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service (2204) the Forest Heritage Specialist has project review authority, and certifies that the project complies with Section 106 of the National Historic Preservation Act. That certification of the project as "No Historic Properties Affected" was completed on January 26, 2004.

TRIBES:

Government-to-government consultation regarding this project was conducted with the Confederated Tribes of Grand Ronde Community on February 26, 2004 and with the Confederated Tribes of Siletz Indians on February 18, 2004. No comments were received regarding this project at either one of these meetings. In addition, during the scoping of issues and concerns, as part of the public participation process, letters were mailed to tribal governments on February 9, 2004. No issues were raised regarding the proposed project as a result of that mailing. A number of prehistoric sites were identified near the proposed units. Located sites have been protected from ground-disturbing harvest activities by removing them from harvest units or buffering them from mechanical disturbance. No impacts, as outlined in the American Indian Religious Freedom Act, are anticipated on any American Indian social, economic or subsistence rights.

OTHERS:

The Sweet Home Ranger District prepared a project initiation letter detailing the proposed actions and issues and mailed it to over 100 people, agencies and organizations who either have expressed an interest in the area or project, or who might be interested. Recipients included Confederated Tribes of Grand Ronde Community, Confederated Tribes of Siletz Indians, Santiam Wilderness Committee, Oregon Natural Resources Council, Oregon Department of Fish and Wildlife and the City Manager of Sweet Home among others.

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Sale Name : South Pyramid Unit Number: 1a

General Stand Information

Stand Number(s)			
Location	T12S, R6E, Sections 20 and 29		
Subdrainages	South Pyramid		
Management Allocations	General Forest - Matrix and Riparian Reserve		
Other Considerations			
Average Slope	15%	Elevation	3800 feet
Aspect	SW	Stand Age	106 years
Ave. Stand Height	67 feet	Ave. Stand Diameter	16"
Alternative	2	3	4
Unit Size	13	19	19
Volume (CCF)	552	1934	1934
Upland Harvest Rx	Thin to 40% canopy closure. Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar	Clearcut with Reserve Trees	Clearcut with Reserve Trees
Riparian Harvest Rx	No harvest	No harvest	No harvest
Logging Method	Ground-based	Ground-based	Ground-based

Transportation

Alternatives	2	3	4
Access Roads	2047, 2047 860		
Reopen Road	Reopen 800' of closed logger's spur	Same	Same
Closures	Rip, seed and re-close temporary operator's spur	Same	Same

Unit Layout and Marking

Alternatives	2	3	4
Layout	150' full leave Riparian Reserve in SE corner	Same	Same
	150 foot no-harvest buffer on <i>Nephroma occultum</i>	300 foot no-harvest buffer on <i>Nephroma occultum</i>	300 foot no-harvest buffer on <i>Nephroma occultum</i>
	150 foot no-harvest buffer on <i>Pseudocyphallria rainierensis</i>	300 foot no-harvest buffer on <i>Pseudocyphallria rainierensis</i>	300 foot no-harvest buffer on <i>Pseudocyphallria rainierensis</i>
Marking	D x D spacing = 16' x 16'	N/A	N/A

Sale Name : <u>South Pyramid</u> Unit Number: <u>1a</u>			
Logging Operation			
Alternatives	2	3	4
Equipment	Pressure wash all equipment prior to working in the area	Same	Same
Landings	Use old landing in plantation NE side of unit	Same	Same
Falling	Directionally fall away from Riparian Reserves.	Same	Same
	Do not cut sugar pine, western white pine or trees over 30" stump diameter.		
Suspension Requirements	Partial, some cable	Same	Same
Yarding	Ground-based	Same	Same
	Pre-designate skid roads not to exceed 15 feet in width, generally on slopes < 30%	Same	Same
Seasonal Restrictions			
Ground-based equip	Generally operate in dry season May - Oct.	Same	Same
Native-surface roads	Dry weather haul	Same	Same
Hauling	No haul on weekends - July 4 - Labor Day	Same	Same
Sap flow	April 30-June 30	Same	Same
Elk rifle season	mid-October	Same	Same
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31	Same	Same
Post Logging			
Alternatives	2	3	4
Access	Tractor skid roads (existing or created) and landings that are not part of the dedicated transportation system or established for other future use, should be adequately scarified and/or subsoiled. Prior to cultivating skid roads after harvest activities, a re-entry survey must be conducted in those areas deemed high probability for the occurrence of heritage resources	Same	Same
	Obtain gravel from weed-free sources.	Same	Same
Botany	Survey and control noxious weeds		
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)		

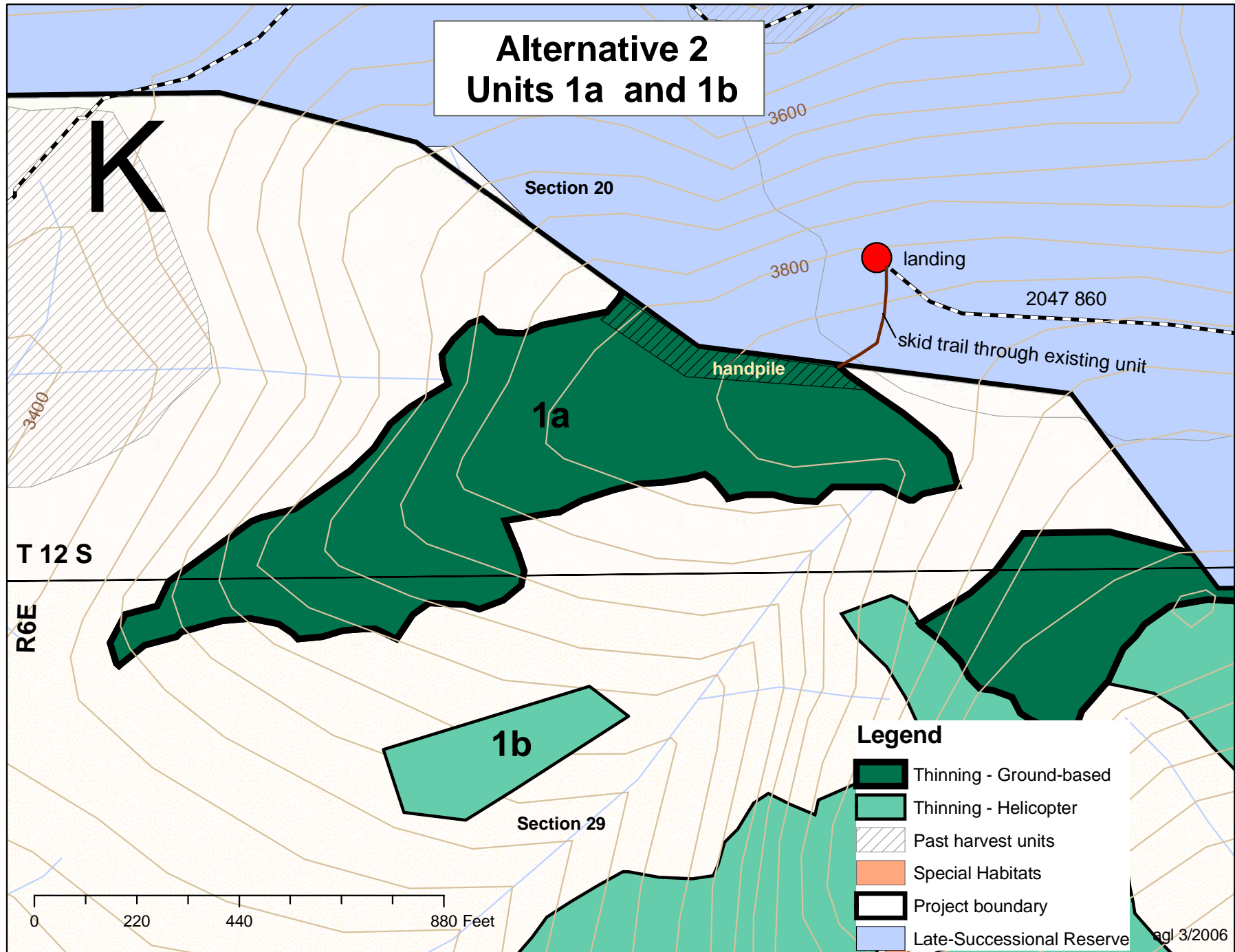
Sale Name : South Pyramid Unit Number: 1a

Alternatives	2	3	4
Fuels	Hand pile 66 feet along LSR boundary	Broadcast burn	Broadcast burn
	Post-harvest fuel survey	Same	Same
Fisheries	Water roads if become excessively dusty in summer	Same	Same
Heritage	Prior to cultivating skid roads after harvest activities, a re-entry survey must be conducted in those areas deemed high probability for the occurrence of heritage resources	Same	Same
	Any changes in unit configuration or activities outside of survey area must be coordinated with district archaeologist prior to initiation.	Same	Same
Silviculture	Precommercial thinning	Planting	Planting
	Fertilization	Animal control	Animal control
		Precommercial thinning	Precommercial thinning
		Fertilization	Fertilization
Soils	Generally top and limb trees in unit	Same	Same
	Retain 40-60% duff	Same	Same
Wildlife	Create snags and down wood	Same	Same
	Mineral blocks		

Sale Name : <u>South Pyramid</u> Unit Number: <u>1b</u>			
General Stand Information			
Stand Number(s)			
Location	T 12 S, R 6 E, Section 29		
Subdrainages	South Pyramid		
Management Allocations	General Forest - Matrix		
Other Considerations			
Average Slope		Elevation	
Aspect			
Alternative	2	3	4
Unit Size		3	3
Volume		305	305
Upland Harvest Rx		Clearcut with Reserve Trees	Same
		Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which will be kept.	Same
Riparian Harvest Rx		No-harvest	Same
Logging Method		Helicopter	Same
Transportation			
Alternatives	2	3	4
Access Roads		2047 and 2047 860	
Reopen Road			
Reconstruction			
Maintenance			
Closures			
Unit Layout and Marking			
Alternatives	2	3	4
Layout			
Marking			
Logging Operation			
Alternatives	2	3	4
Falling			
Suspension Requirements		Partial	Partial, some cable
Yarding		Helicopter	Ground-based
Hauling			
Seasonal Restrictions			
Elk rifle season		mid-October	Same
Peregrine Falcon (if discovered during sale operations)		Jan 15 - July 31	Same
Post Logging			
Alternatives	2	3	4
Botany		Survey and control noxious weeds	Survey and control noxious weeds

		Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)
Fuels		Broadcast burn	Broadcast burn
		Post-harvest fuel survey	Post-harvest fuel survey
Fisheries			
Heritage			
Hydrology			
Recreation			
Silviculture		Planting	Planting
		Animal control	Animal control
Soils			
Transportation			
Wildlife	Create snags and down wood	Same	Same
		mineral blocks	
Monitoring			

Alternative 2 Units 1a and 1b



Sale Name : South Pyramid Unit Number: 2a

General Stand Information

Stand Number(s)			
Location	T 12 S, R 6 E, Sections		
Subdrainages			
Management Allocations			
Other Considerations			
Average Slope	15%	Elevation	4,000 feet
Aspect	SE	Stand Age	74 years
Stand Diameter	12 " DBH	Stand Height	80 feet
Alternative	2	3	4
Unit Size	8 acres	8 acres	8 acres
Volume	394	394	394
Upland Harvest Rx	Thin to 40% canopy closure.	Same	Same
	Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which will be kept.	Same	Same
Riparian Harvest Rx	No-harvest	Same	Same
Logging Method	Ground-based	Same	Same

Transportation

Access Roads			
Alternatives	2	3	4
Construction			
Reconstruction			
Maintenance			
Closures			

Unit Layout and Marking

Alternatives	2	3	4
Layout	Dry rock garden with <i>Orobanche pinorum</i> . Leave 200 foot buffer (if greater than 1/2 acre). 150 foot no-harvest buffer on <i>Nephroma occultum</i> .	Same	Same
Marking			
Target Canopy Closure			

Logging Operation

Alternatives	2	3	4
Landings			
Falling			
Suspension Requirements	Partial	Same	Same
Yarding	Ground-based	Same	Same

Hauling			
Seasonal Restrictions			
Sap flow	April 30-June 30	Same	Same
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31	Same	Same
Elk rifle season	mid-October	Same	Same
Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds	Same	Same
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)	Same	Same
	Monitor sensitive species		
Fuels	Handpile along LSR boundary	Same	Same
	Post-harvest fuel survey	Same	Same
Silviculture	Precommercial thinning	Same	Same
Soils	Subsoil	Same	Same
Wildlife	Create snags and down wood	Same	Same
	mineral blocks		

Sale Name : South Pyramid Unit Number: 2b

General Stand Information

Stand Number(s)			
Location	T12S, R6E, Sections		
Subdrainages			
Management Allocations			
Other Considerations			
Average Slope	45%	Elevation	3,800 feet
Aspect	SE - W	Stand Age	74 years
Stand Diameter	13" DBH	Stand Height	80 ft. tall
Stand Health			
Alternative	2	3	4
Unit Size	49	49	49
Volume	2498	2498	4802
Upland Harvest Rx	Thin to 40% canopy closure	Same	Clearcut with reserve tree
	Leave western redcedar and incense cedar > 10 inches DBH unless competing with larger cedar which will be kept.	Same	
Riparian Harvest Rx	No harvest	Same	Same
Logging Method	Helicopter	Same	Same

Transportation

Alternatives	2	3	4
Access Roads			
Construction			
Reconstruction			
Maintenance			
Closures			

Unit Layout and Marking

Alternatives	2	3	4
Layout			
Marking			
Target Canopy Closure			

Logging Operation

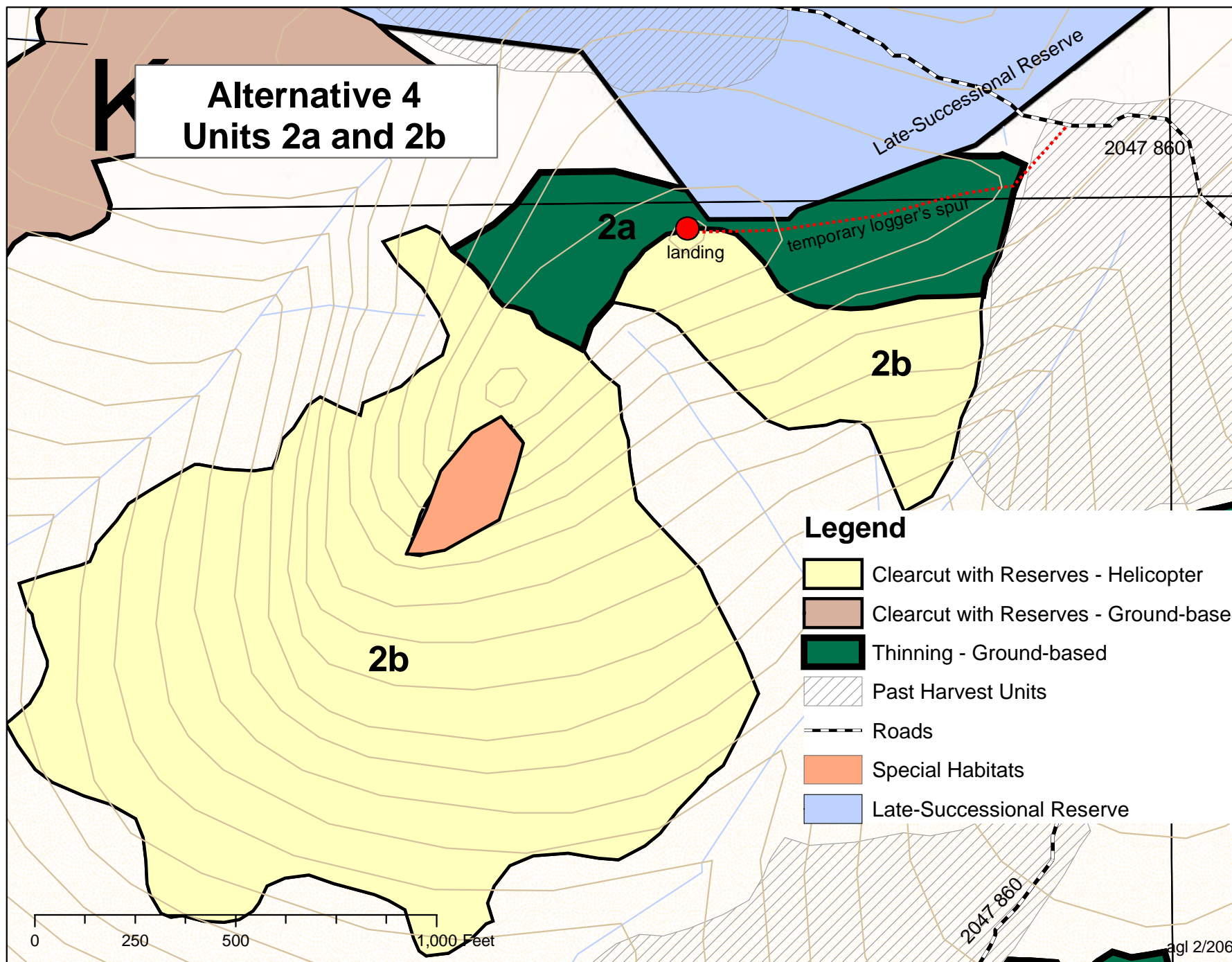
Alternatives	2	3	4
Landings			
Falling	Fall away from special habitat		
Suspension Requirements	Partial	Same	Same
Yarding	Helicopter	Same	Same
Hauling			

Seasonal Restrictions

Sap flow	April 30 - June 30	Same	Same
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31	Same	Same

Elk rifle season	mid-October	Same	Same
Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds	Same	Same
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)	Same	Same
Fuels	Yard tops - leave top attached to last log	Yard tops - leave top attached to last log	Broadcast burn
	Post-harvest fuel survey	Post-harvest fuel survey	Post-harvest fuel survey
Silviculture	Precommercial thinning	Precommercial thinning	Precommercial thinning
			Planting
			Animal damage control
Soils			
Wildlife	Create snags and down wood	Same	Same
	mineral blocks		

Alternative 4 Units 2a and 2b



Legend

- Clearcut with Reserves - Helicopter
- Clearcut with Reserves - Ground-based
- Thinning - Ground-based
- Past Harvest Units
- Roads
- Special Habitats
- Late-Successional Reserve

Sale Name : South Pyramid Unit Number: 4a

General Stand Information

Stand Number(s)			
Location	T 12S, R6E, Sections		
Subdrainages			
Management Allocations			
Other Considerations	3.7 acres in CHH for northern spotted owl		
Average Slope	25%	Elevation	3,800 feet
Aspect	SW	Stand Age	110 years
Stand Diameter	13" DBH	Stand Height	76 feet
Alternative	2	3	4
Unit Size	4 acres	4 acres	
Volume	185	185	
Upland Harvest Rx	Thin to 50% canopy closure	Same	
	Leave all cedar	Same	
Riparian Harvest Rx	No harvest	Same	
Logging Method	Ground-based	Same	

Transportation

Alternatives	2	3	4
Access Roads			
Construction			
Reconstruction			
Maintenance			
Closures			

Unit Layout and Marking

Alternatives	2	3	4
Layout			
Marking			
Target Canopy Closure			
Botany	Rock garden near top of stand. Leave 200 foot buffer.	Rock garden near top of stand. Leave 200 foot buffer.	

Logging Operation

Alternatives	2	3	4
Landings			
Falling			
Suspension Requirements	Partial, some cable	Partial, some cable	
Yarding	Ground-based	Ground-based	
Hauling			

Seasonal Restrictions

Sap flow	April 30 - June 30	April 30 - June 30	
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31	Same	
Elk rifle season	mid-October	Same	

Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds	Same	
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)	Same	
Fuels	Handpile 66 feet along 860 spur	Handpile 66 feet along 860 spur	
	Post-harvest fuel survey	Post-harvest fuel survey	
Silviculture		Planting	
		animal control	
		PCT	
Wildlife	Create snags and down wood	Same	
	mineral blocks		

Sale Name : South Pyramid Unit Number: 4b

General Stand Information

Stand Number(s)			
Location	T __ S, R __ E, Sections		
Subdrainages			
Management Allocations			
Other Considerations	8 acres in unroaded block, 4.8 acres in CHU for northern spotted owl		
Average Slope	20%	Elevation	3,600 feet
Asspect	S	Stand Age	110 years
Stand Diameter	13" DBH	Stand Height	76 feet
Alternative	2	3	4
Unit Size	8		
Volume	406		
Upland Harvest Rx	Thin to 50% canopy closure		
	Leave all cedars		
Riparian Harvest Rx	No-harvest		
Logging Method	Ground-based		

Transportation

Alternatives	2	3	4
Access Roads			
Construction			
Reconstruction			
Maintenance			
Closures			

Unit Layout and Marking

Alternatives	2	3	4
Layout			
Marking			
Target Canopy Closure			

Logging Operation

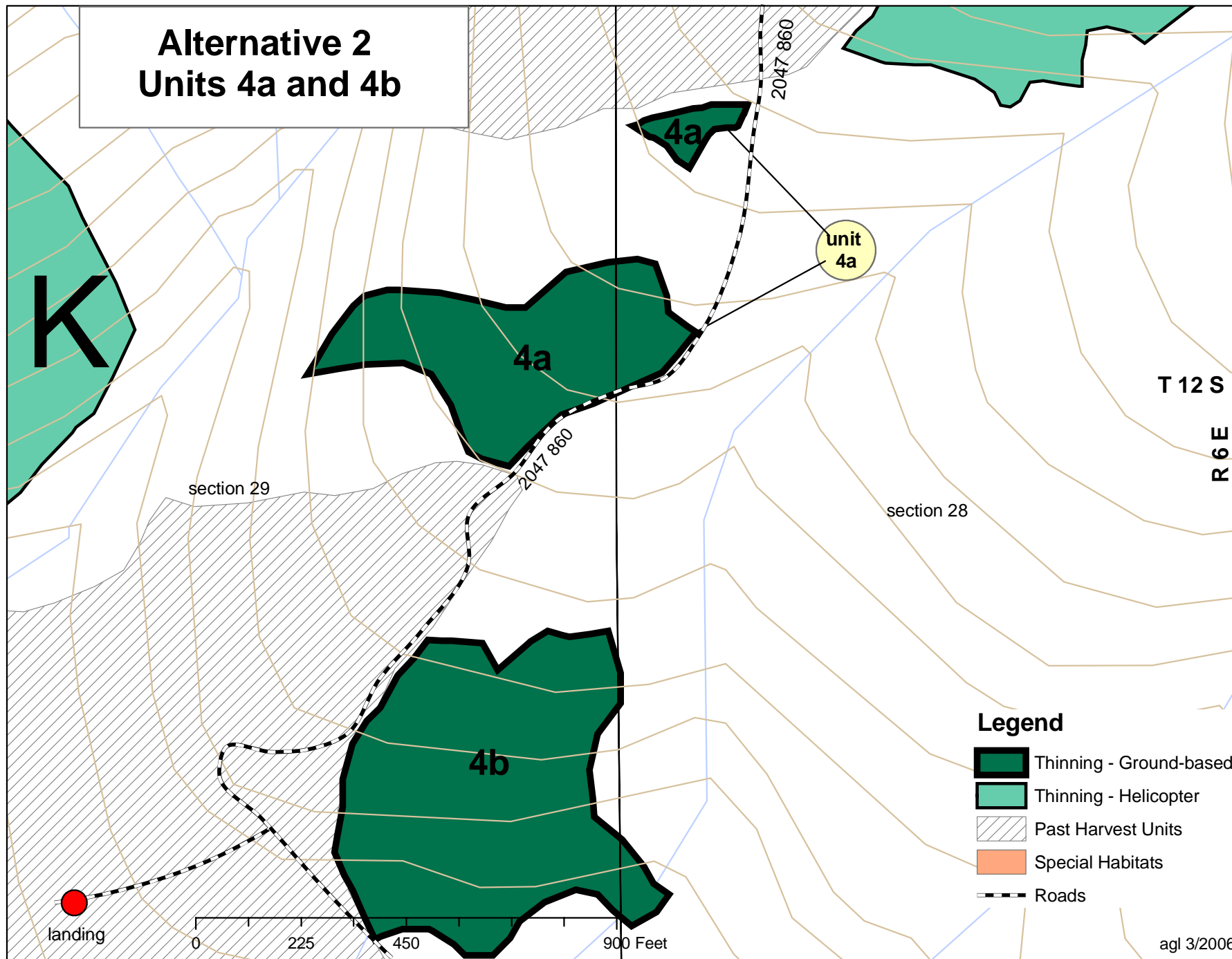
Alternatives	2	3	4
Landings			
Falling	Fall away from Riparian Reserves		
Suspension Requirements	Patial, some cable		
Yarding	Ground-based		
Hauling			

Seasonal Restrictions

Sap Flow	April 30 - June 30		
Northern spotted owl (if nesting)	March 1 - July 15		
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31		
Elk rifle season	mid-October		

Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds		
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)		
Fuels	Handpile 66 feet along 860 spur		
Fisheries	Post-harvest fuel survey		
Wildlife	Create snags and down wood		
	mineral blocks		

Alternative 2 Units 4a and 4b



T 12 S
R 6 E

section 29

section 28

Legend

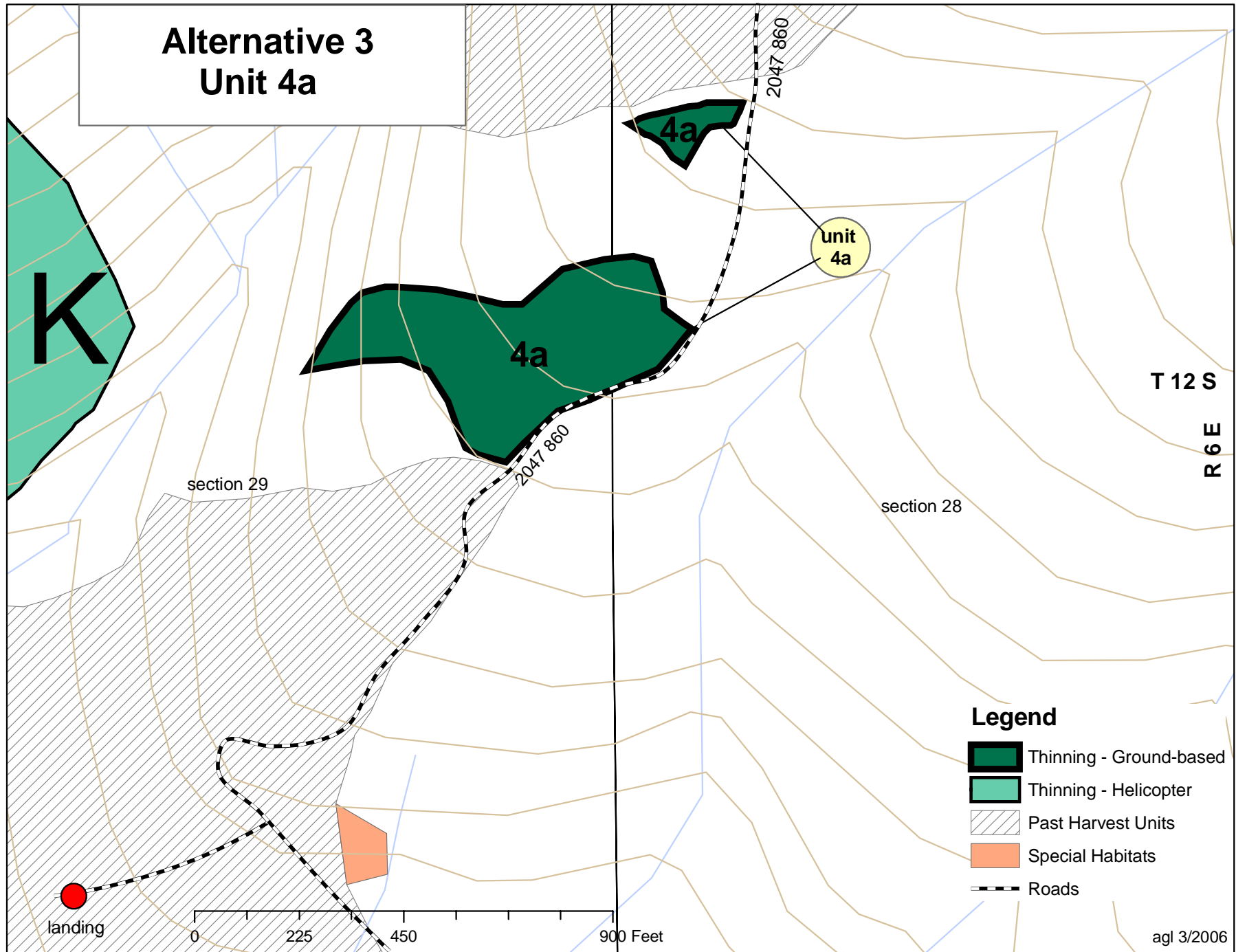
- Thinning - Ground-based
- Thinning - Helicopter
- Past Harvest Units
- Special Habitats
- Roads

landing

0 225 450 900 Feet

agl 3/2006

Alternative 3 Unit 4a



T 12 S
R 6 E

section 29

section 28

Legend

- Thinning - Ground-based
- Thinning - Helicopter
- Past Harvest Units
- Special Habitats
- Roads

landing

0 225 450 900 Feet

agl 3/2006

Sale Name : <u>South Pyramid</u> Unit Number: <u>4c</u>			
General Stand Information			
Stand Number(s)			
Location	T __ S, R __ E, Sections		
Subdrainages			
Management Allocations			
Other Considerations	11 acres in unroaded block, 11 acres in CHU for northern spotted owl		
Average Slope	15%	Elevation	4,000 feet
Aspect	S-SW	Stand Age	93 years
Stand Diameter	13" DBH	Stand Height	70 feet
Alternative	2	3	4
Unit Size	11 acres		
Volume	500		
Upland Harvest Rx	Thin to 50% canopy closure		
	Leave all cedars		
Riparian Harvest Rx	No harvest		
Logging Method	Helicopter		
Transportation			
Alternatives	2	3	4
Access Roads			
Construction			
Reconstruction			
Maintenance			
Closures			
Unit Layout and Marking			
Alternatives	2	3	4
Layout			
Marking			
Target Canopy Closure			
Logging Operation			
Alternatives	2	3	4
Landings			
Falling			
Suspension Requirements	Partial, some cable		
Yarding	Helicopter		
Hauling			
Seasonal Restrictions			
Sap Flow	April 30 - June 30		
Northern spotted owl (if nesting)	March 1 - July 15		
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31		
Elk rifle season	mid-October		

Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds		
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)		
Fuels	Yard Tops – leave top attached to last log		
	Post-harvest fuel survey		
Wildlife	Create snags and down wood		
	Mineral blocks		

Alternative 2 Unit 4c

Late-Successional Reserve

T 12 S

R 6 E
K

landing

2047 860

4c

4a

4a

Legend

- Thinning - Helicopter
- Thinning - Ground-based
- Project boundary
- Past Harvest Units
- Special Habitats
- Late-Successional Reserve
- Roads



Sale Name : <u>South Pyramid</u> Unit Number: <u>6a</u>			
General Stand Information			
Stand Number(s)			
Location	T __ S, R __ E, Sections		
Subdrainages			
Management Allocations			
Other Considerations	18 acres in unroaded block, 1.8 acres in CHU for northern spotted owl		
Average Slope	15%	Elevation	3,400 feet
Aspect	SW - W	Stand Age / Diameter / Height	147 years / 16" DBH / 105 ft. tall
Alternative	2	3	4
Unit Size	21 acres	21 acres	
Volume	902	2,565	
Upland Harvest Rx	Thin to 60% canopy closure Leave all cedar	Clearcut with reserve trees	
Riparian Harvest Rx	No harvest	No harvest	
Logging Method	Ground-based	Ground-based	
Transportation			
Access Roads			
Alternatives	2	3	4
Construction			
Reconstruction			
Maintenance			
Closures			
Unit Layout and Marking			
Alternatives	2	3	4
Layout	150 foot no harvest buffer on <i>Albatrellus ellisii</i> . 150 no-harvest buffer on <i>Polyozellus muptiPLEX</i> .	300 foot no-harvest buffer on <i>Albatrellus ellisii</i> . 300 no-harvest buffer on <i>Polyozellus muptiPLEX</i> .	
Marking	14' D x D		
Logging Operation			
Alternatives	2	3	4
Landings			
Falling	Fall away from Riparian Reserves Leave all cedar	Same	
Suspension Requirements	Partial, some cable	Same	
Yarding	Ground-based	Ground-based, limit number and size of skid roads	
Hauling			
Seasonal Restrictions			
Sap Flow	April 30 - June 30	N/A	
Northern spotted owl (if nesting)	March 1 - July 15		
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31	Same	
Elk rifle season	mid-October	Same	

Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds	Same	
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)	Same	
Fuels	Handpile along 864 spur within 66 feet of road	Broadcast burn	
	Post-harvest fuel survey	Post-harvest fuel survey	
Silviculture	Precommercial thinning	Planting	
		Animal damage control	
		Precommercial thinning	
Wildlife	Create snags and down wood	Same	
	Mineral blocks		

Alternative 2 Unit 4b

K

landing



2047 864

6a

Legend

-  Thinning - Ground-based
-  Thinning - Helicopter
-  Past Harvest Units
-  Roads
-  Private Land
-  Special Habitats

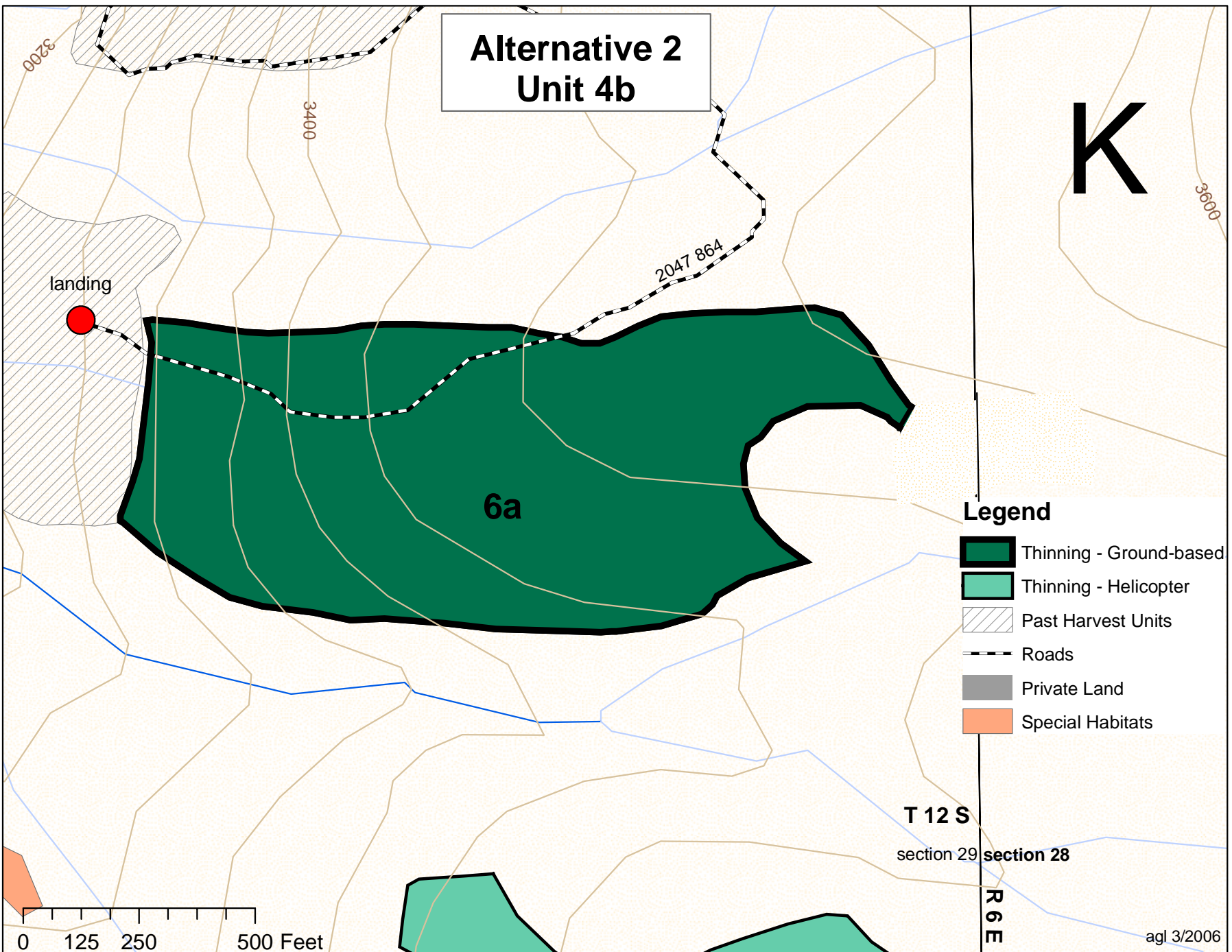
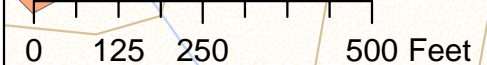
T 12 S

section 29

section 28

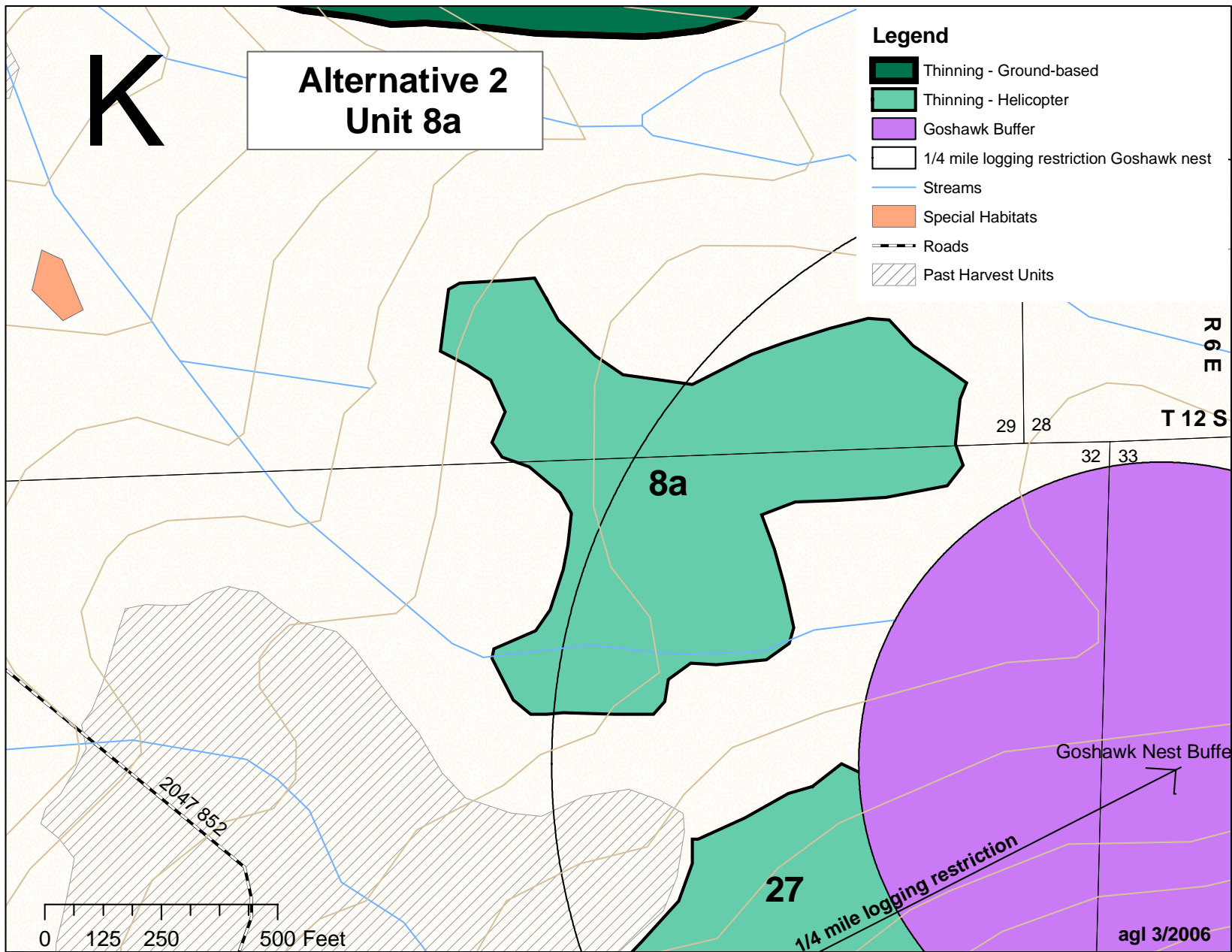
R 6 E

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Sale Name : <u>South Pyramid</u> Unit Number: <u>8a</u>			
General Stand Information			
Stand Number(s)			
Location	T 12 S, R 6 E, Sections		
Subdrainages			
Management Allocations			
Other Considerations	13 acres in unroaded block, 1.2 acres in CHU for nothern spotted owl		
Average Slope	35%	Elevation	3,500 feet
Aspect	W - NW	Stand Age	122 years
Stand Diameter	15" DBH	Stand Height	80 feet
Alternative	2	3	4
Unit Size	13		
Volume	352		
Upland Harvest Rx	Thin to 60% canopy closure		
	Do not harvest trees larger than 34" stump diameter. Leave all cedars.		
Riparian Harvest Rx	No harvest		
Logging Method	Helicopter		
Transportation			
Access Roads			
Alternatives	2	3	4
Construction			
Reconstruction			
Maintenance			
Closures			
Unit Layout and Marking			
Alternatives	2	3	4
Layout			
	150 foot no-harvest buffer on <i>Pseudocyphallria rainierensis</i> .		
	Wet meadow and Sitka alder wetland. Buffer		
Marking	14' D x D		
Logging Operation			
Alternatives	2	3	4
Landings			

Falling	Leave all cedar		
Suspension Requirements	Partial, some cable		
Yarding	Helicopter		
Hauling			
Seasonal Restrictions			
Hauling	No haul on weekends - July 4 - Labor Day		
Sap flow	No harvest April 30-June 30		
Goshawk nest	No harvest April 1 - July 30		
Northern spotted owl (if nesting)	March 1 - July 15		
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31		
Elk rifle season	mid-October		
Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds		
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)		
Fuels	Yard Tops – leave top attached to last log		
	Post-harvest fuel survey		
Wildlife	Create snags and down wood		
	Mineral blocks		










Sale Name : <u>South Pyramid</u> Unit Number: <u>8b</u>			
General Stand Information			
Stand Number(s)			
Location	T 12 S, R 6 E, Sections		
Subdrainages			
Management Allocations			
Other Considerations	6 acres in unroaded block, 6 acres in CHU for northern spotted owl		
Average Slope	30%	Elevation	3,900 feet
Aspect	NW	Stand Age	120 years
Stand Diameter	15" DBH	Stand Height	104 feet
Alternative	2	3	4
Unit Size	6 acres		
Volume	352		
Upland Harvest Rx	Thin to 50% canopy closure		
	Leave all cedars		
Riparian Harvest Rx	No harvest		
Logging Method	Helicopter		
Transportation			
Alternatives	2	3	4
Access Roads			
Construction			
Reconstruction			
Maintenance			
Closures			
Unit Layout and Marking			
Alternatives	2	3	4
Layout	300 foot buffer on meadow		
	150 foot buffer on wet area		
	Adjacent to private land		
Marking	16' D x D		
Target Canopy Closure			
Logging Operation			
Alternatives	2	3	4
Landings			
Falling	Leave all cedar		
Suspension Requirements	Partial, some cable		
Yarding	Yard Tops – leave top attached to last log		
Hauling			
Seasonal Restrictions			
Sap Flow	April 30 - June 30		
Goshawk	April 1 - July 31		
Northern spotted owl (if nesting)	March 1 - July 15		
Elk rifle season	mid-October		
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31		

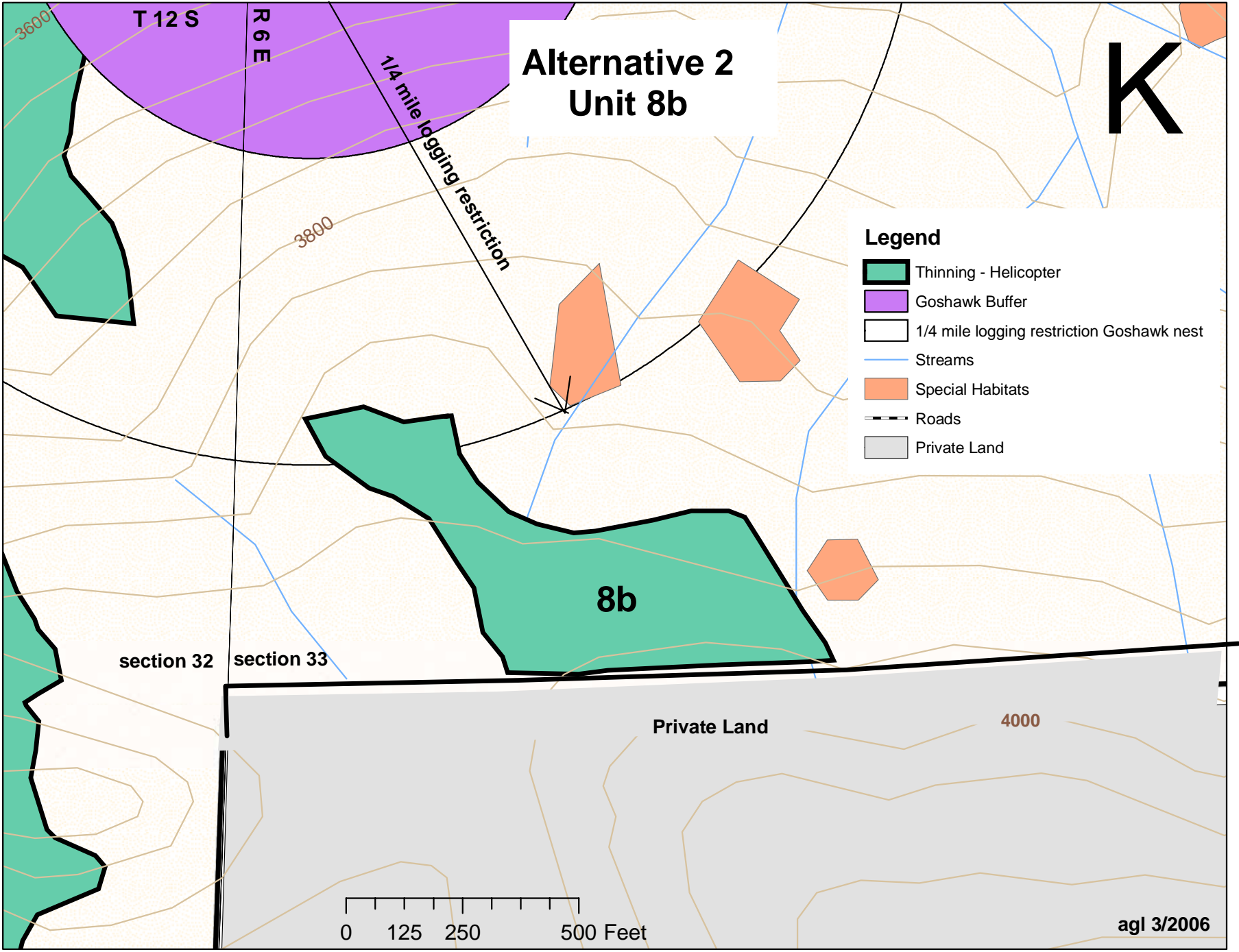
Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds		
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)		
Fuels	Post-harvest fuel survey		
	Handpile adjacent to private land. Handpile along road 2047 840.		
Wildlife	Create snags and down wood		
	Mineral blocks		

Alternative 2 Unit 8b

K

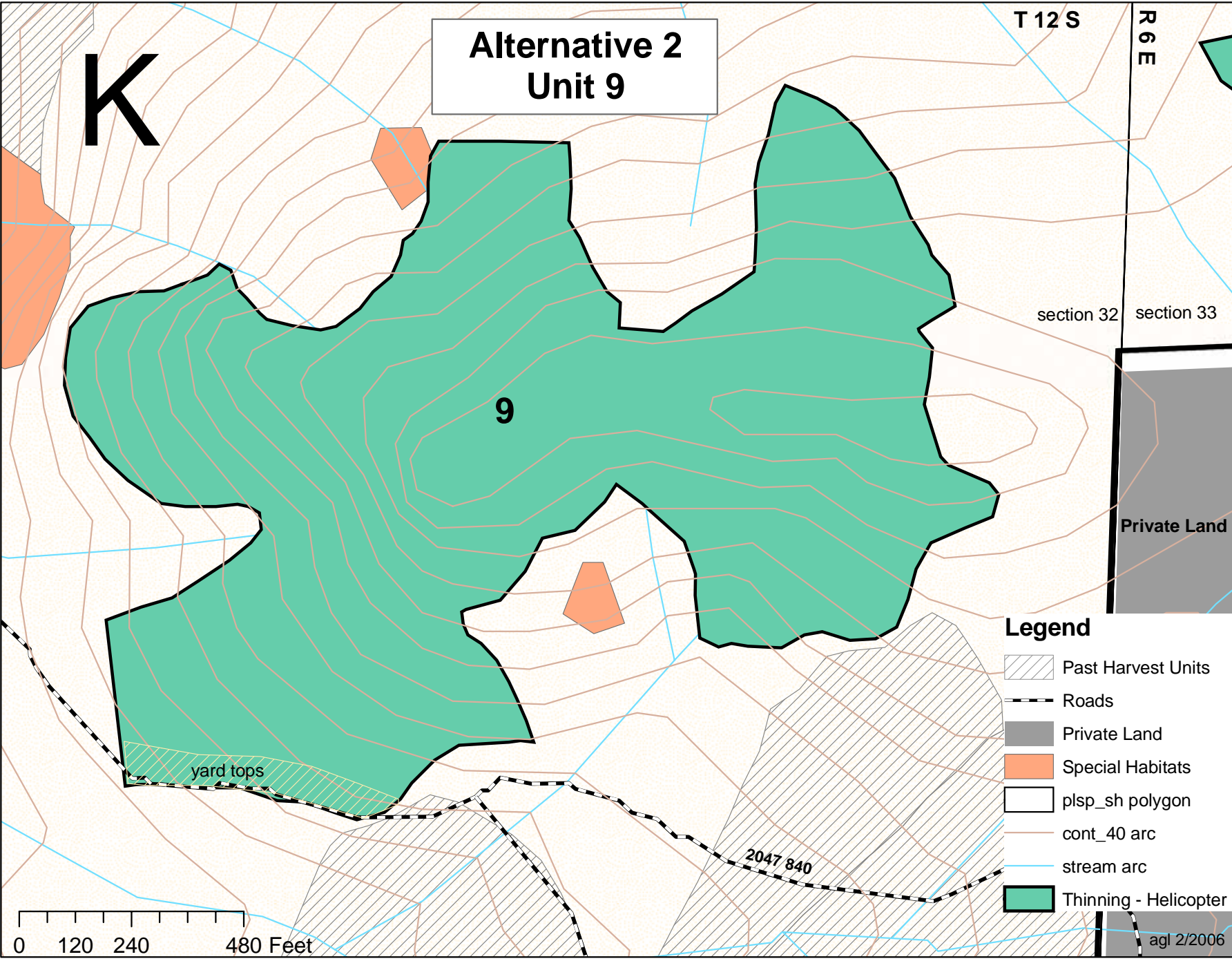
Legend

-  Thinning - Helicopter
-  Goshawk Buffer
-  1/4 mile logging restriction Goshawk nest
-  Streams
-  Special Habitats
-  Roads
-  Private Land



Sale Name : <u>South Pyramid</u> Unit Number: <u>9</u>			
General Stand Information			
Stand Number(s)			
Location	T12S, R6E, Sections		
Subdrainages			
Management Allocations			
Other Considerations	38 acres in unroaded block, 0.4 acres in CHU for northern spotted owl		
Average Slope	50%	Elevation	3,900 feet
Aspect	SW	Stand Age	140 years
Stand Diameter	15" DBH	Stand Height	110 feet
Alternative	2	3	4
Unit Size	38 acres		
Volume	2145		
Upland Harvest Rx	Thin to 50% canopy closure		
	Leave all western redcedar and incense cedar. Other coniferous species will be removed to release cedar.		
Riparian Harvest Rx	No harvest		
Logging Method	Helicopter		
Transportation			
Alternatives	2	3	4
Access Roads			
Construction			
Reconstruction			
Maintenance			
Closures			
Unit Layout and Marking			
Alternatives	2	3	4
Layout			
Marking			
Target Canopy Closure			
Logging Operation			
Alternatives	2	3	4
Landings			
Falling			
Suspension Requirements	Partial		
Yarding	Helicopter		
Hauling			
Seasonal Restrictions			
Sap Flow	April 30 - June 30		
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31		
Elk rifle season	mid-October		

Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds		
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)		
Fuels	Yard Tops within 66 feet of road 840		
	Post-harvest fuel survey		
Silviculture	Precommercial thinning		
Wildlife	Create snags and down wood		
	Mineral blocks		



Alternative 2
Unit 9

T 12 S

R 6 E

K









section 32

section 33

9

Private Land

Legend

-  Past Harvest Units
-  Roads
-  Private Land
-  Special Habitats
-  plsp_sh polygon
-  cont_40 arc
-  stream arc
-  Thinning - Helicopter

0 120 240 480 Feet

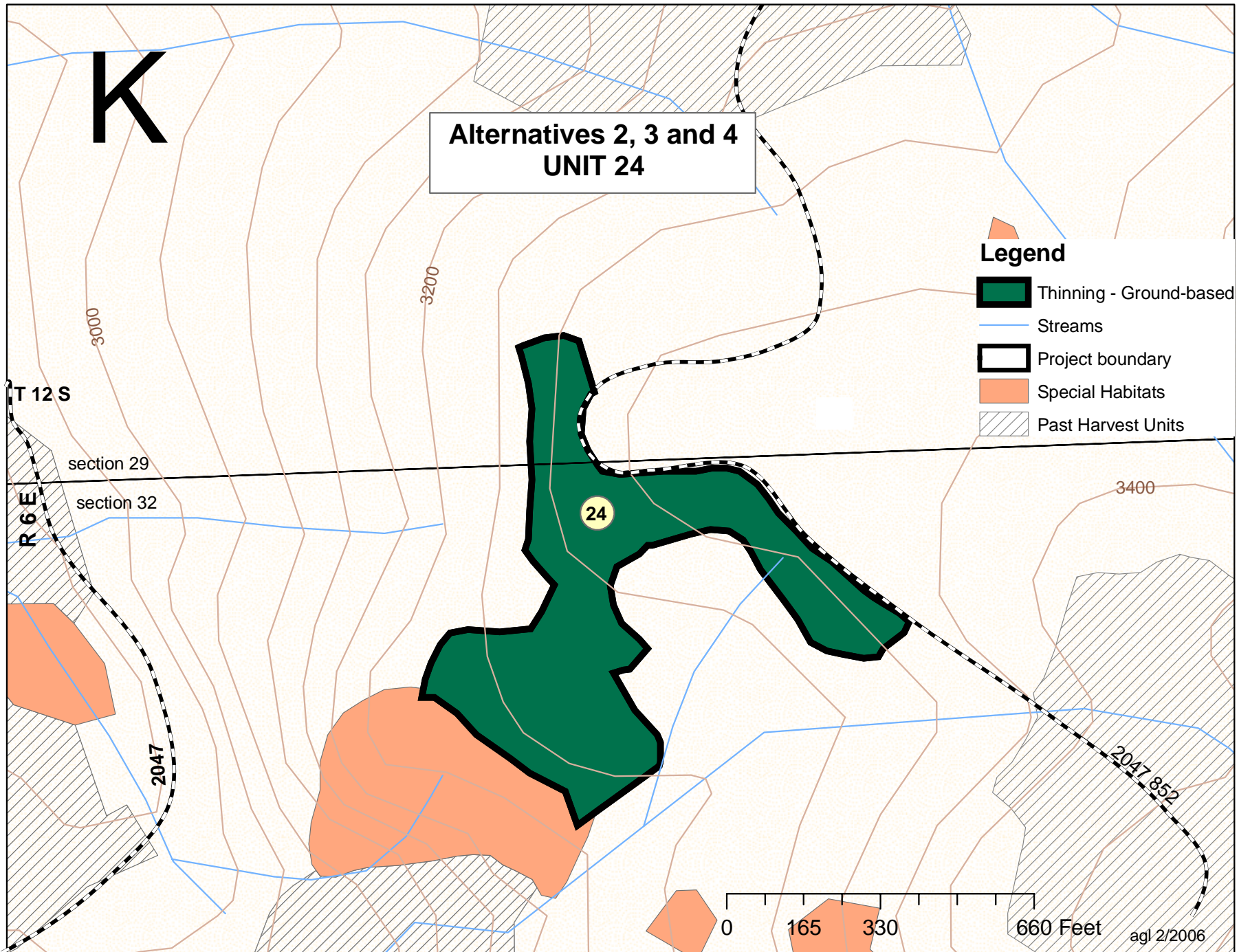
2047 840

agl 2/2006

yard tops

Sale Name : <u>South Pyramid</u> Unit Number: <u>24</u>			
General Stand Information			
Stand Number(s)			
Location	T12S, R6E, Section		
Subdrainages			
Management Allocations			
Other Considerations			
Average Slope	20%	Elevation	3,300 feet
Aspect	SW	Stand Age	75 years
Stand Diameter	13" DBH	Stand Height	65 feet
Alternative	2	3	4
Unit Size	7 acres	7 acres	7 acres
Volume	153	153	153
Upland Harvest Rx	Thin to 50% canopy closure	Thin to 50% canopy closure	Thin to 50% canopy closure
	Leave all cedars	Leave all cedars	Leave all cedars
Riparian Harvest Rx	No harvest	No harvest	No harvest
Logging Method	Ground-based	Ground-based	Ground-based
Transportation			
Alternatives	2	3	4
Access Roads	2047 and 2047 852		
	Tractor skid roads (existing or created) and landings that are not part of the dedicated transportation system or established for other future use, should be adequately scarified and/or subsoiled. Prior to cultivating skid roads after harvest activities, a re-entry survey must be conducted in those areas deemed high probability for the occurrence of heritage resources	Same	Same
	Obtain gravel from weed-free sources.	Same	Same
Reconstruction			
Maintenance			
Closures			
Unit Layout and Marking			
Alternatives	2	3	4
Layout			
Equipment	All road construction and logging equipment will be pressure washed prior to working in the area.	Same	Same
Falling	Leave all cedars		
	Directional falling next to untreated Riparian Reserves to avoid falling trees into or yarding through Riparian Reserves.	Same	Same
Marking	14' D x D		

Logging Operation			
Alternatives	2	3	4
Landings			
Falling	Directional falling next to untreated Riparian Reserves to avoid falling trees into or yarding through Riparian Reserves.	Same	Same
Suspension Requirements	Partial	Same	Same
Yarding	Ground-based	Same	Same
	Pre-designate skid roads not to exceed 15 feet in width, generally on slopes < 30%	Same	Same
Hauling			
Seasonal Restrictions			
Ground-based equip	Generally operate in dry season May - Oct.	Same	Same
Native-surface roads	Dry weather haul	Same	Same
Hauling	No haul on weekends - July 4 - Labor Day	Same	Same
Northern spotted owl (if nesting)	March 1 - July 15		
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31	Same	Same
Elk rifle season	mid-October	Same	Same
Sap flow	April 30-June 30	Same	Same
Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds	Same	Same
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)	Same	Same
Fuels	Handpile 66 feet along 852 spur	Handpile 66 feet along 852 spur	Handpile 66 feet along 852 spur
	Post-harvest fuel survey	Post-harvest fuel survey	Post-harvest fuel survey
Silviculture	Percommercial thinning	Percommercial thinning	Percommercial thinning
	Fertilization	Fertilization	Fertilization
Wildlife	Create snags and down wood	Same	Same
	Mineral blocks		



Sale Name : South Pyramid Unit Number: 27

General Stand Information

Stand Number(s)			
Location	T 12 S, R 6 E, Sections		
Subdrainages			
Management Allocations			
Other Considerations	11 acres in unroaded block and 2 acres in CHU for northern spotted owl		
Average Slope	40%	Elevation	3,800 feet
Aspect	NW	Stand Age	140 years
Stand Diameter	13" DBH	Stand Height	110 feet
Alternative	2	3	4
Unit Size	11 acres		
Volume	400		
Upland Harvest Rx	Thin to 50% canopy closure. Do not harvest trees larger than 24" stump diameter.		
	Leave all cedars.		
Riparian Harvest Rx	No harvest		
Logging Method	Helicopter		

Transportation

Alternatives	2	3	4
Access Roads	2047 and 2047 852		
Equipment	All road construction and logging equipment will be pressure washed prior to working in the area.		
	Obtain gravel for road work from weed-free rock source		
Closures			

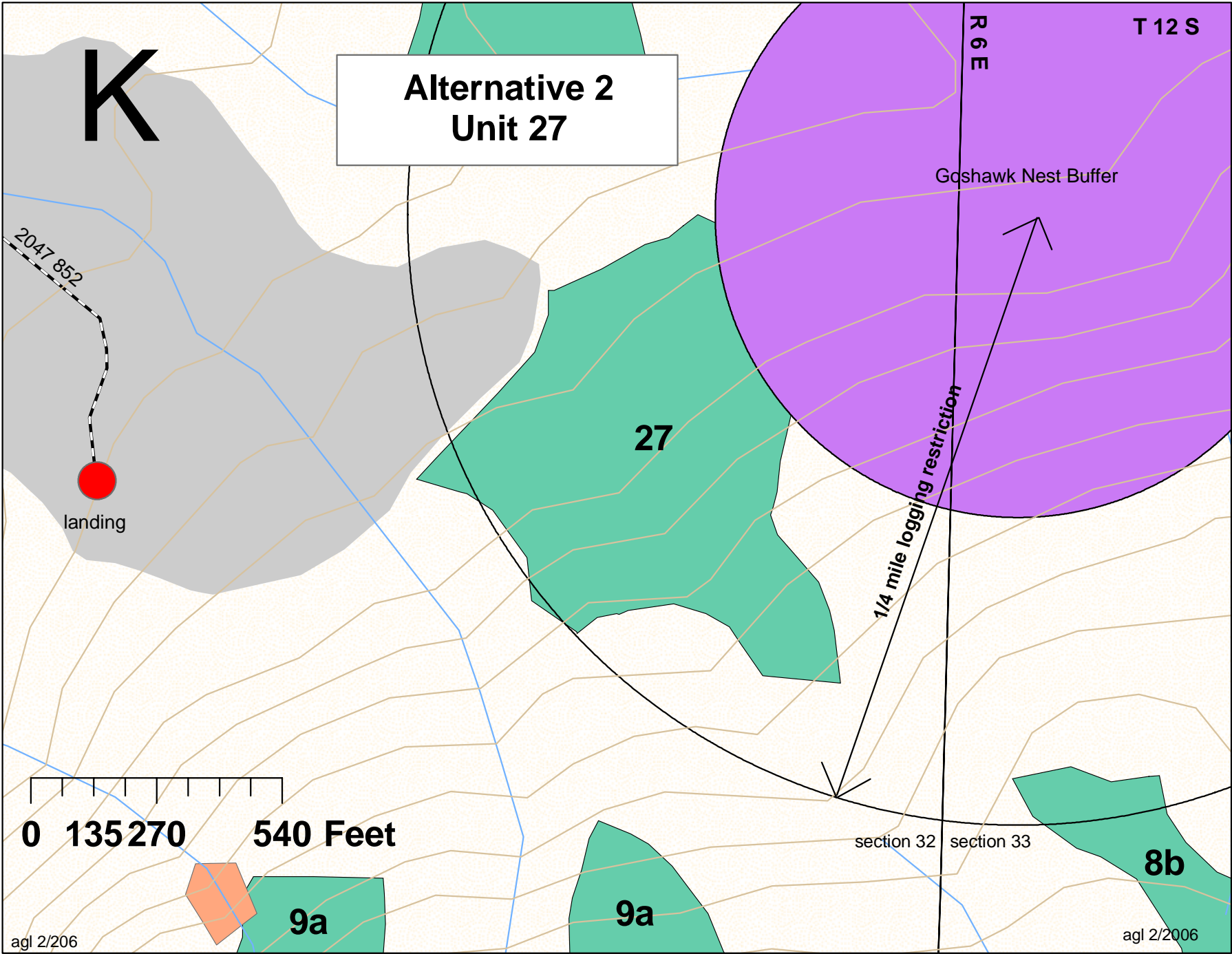
Unit Layout and Marking

Alternatives	2	3	4
Layout	Devil's club seep. Buffer = 50 feet		
	Riparian Reserves on three sides		
Falling	Directional falling next to untreated Riparian Reserves to avoid falling trees into or yarding through Riparian Reserves.		
	Leave all cedar and western white pine		
Marking	16' D x D		

Logging Operation

Alternatives	2	3	4
Landings	At end of 2047 852 road in plantation.		
Falling	Fall away from Riparian Reserves		
Suspension Requirements	Partial		
Yarding	Helicopter		
	Yard Tops - leave top attached to last log.		

Seasonal Restrictions			
Hauling	No haul on weekends - July 4 - Labor Day		
Sap flow	No harvest April 30-June 30		
Northern spotted owl (if nesting)	March 1 - July 15		
Goshawk nest	No harvest April 1 - July 30		
Peregrine Falcon (if discovered during sale operations)	Jan. 15 - July 31		
Elk rifle season	mid-October		
Post Logging			
Alternatives	2	3	4
Botany	Survey and control noxious weeds		
	Seed disturbed areas with native species (landings, subsoiled skid roads, reopened roads when closed)		
Fuels	Post- harvest fuel survey		
Silviculture	PCT		
Wildlife	Create snags and down wood		
	mineral blocks		



**Alternative 2
Unit 27**

K

2047 852

landing

27

Goshawk Nest Buffer

1/4 mile logging restriction

0 135 270 540 Feet

section 32 section 33

8b

9a

9a

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APPENDIX B: Post-Sale Activities

Silvicultural Post-Sale Activities

Essential Collections

Regeneration harvest prescriptions will require reforestation with coniferous species appropriate for the planning area. Stocking surveys will be completed for the first three years after reforestation to assess survival for all planted units. Broadcast burning and forage enhancement are planned for the regeneration harvest units; vexar tubing would be placed on every other tree to protect seedlings from animal damage. Vexar tubing would be maintained for two seasons.

Table 1: Essential Collections by Unit and Action Alternative

Alternative	2	3	4
Planting Units	None	1a, 1b, 4a, 6a	1a, 1b, 2b, 4a
Animal Control	None	1a, 1b, 4a, 6a	1a, 1b, 2b, 4a

Table 2: Total Essential Collections by Action Alternative

Alternative	2	3	4
Acres of Planting in HCR units (\$535/acre)	0 acres \$0	43 acres \$23,005	75 acres \$40,125
Acres of Exams (\$8/acre) For Three Years	0 acres \$0	129 acres \$1,032	225 acres \$1,800
Acres of Animal Damage Control (\$95/acres)	0 acres \$0	129 acres \$12,255	225 acres \$21,375
Total Essential Collections by Alternative	\$0	\$36,292	\$63,300

Timber Stand Improvement Projects

TSI projects will be completed in the managed stands within the planning area including precommercial thinning to enhance species diversity and increase the growth rate of dominant trees, aerial fertilization to improve stand vigor, and pruning to add value to stands for future. The following table shows the managed stands within the planned sale area and the specific needs for those stands.

Table 3: TSI needs by Alternative

ID Number	Acres	Year of Origin	Last Treatment	Next Treatment	Planned Unit	Alternative	Stand Number
119	50	1968	TSN 1993	SPC 2001	24	2, 3, 4	3001250
P107	21	1989	RPL 1991	SPC 2001	1a	2, 3, 4	3000990
199	11	1992	TVE 1996	SPC 2004	9	2	3001320
250	7	1992	RPL 1994	SPC 2004	9	2	3001308
P88	28	1992	RPL 1994	SPC 2004	2	2, 3, 4	3001002
194	12	1993	RPL 1995	SPC 2005	6a	2, 3	3001165
195	22	1993	RPL 1995	SPC 2005	27	2	3001240
200	13	1993	RPL 1995	SPC 2005	9	2	3001318
P87	22	1993	RPL 1995	SPC 2005	4a	2, 3	3001044
P89	37	1993	RPL 1995	SPC 2005	2	2, 3, 4	3001073
P86	9	1992	RPL 1996	SPC 2006	6a	2, 3	3001154
150	21	1978	SPC 1990	SPR/SFL 2005	24	2, 3, 4	3001228
P15	11	1976	SFL 1994	SPR/SFL 2004	1a	2, 3, 4	3001020
Totals	264						13 Stands

RPL = Certified restocked

SFL = Fertilization

SPC = Precommercial thinning:

TVE or TSN = Examines for stand improvement projects

SPR = Pruning.

A collection will be made to fertilize the commercially thinned stands to promote growth and reduce thinning shock.

Table 4: Total TSI Post-Sale Collections by Action Alternative

Alternative	2	3	4
Acres of Pre-commercial Thinning (SPC) (\$205/acre)	232 acres \$47,560	179 acres \$36,695	158 acres \$32,390
Acres of Fertilization (SFL) (\$110/acre)	221 acres (32 acres managed stands 189 acres commercial thinning) \$24,310	100 acres (32 acres managed stands 68 acres commercial thinning) \$11,000	47 acres (32 acres managed stands 15 acres commercial thinning) \$5,170
Acres of Pruning (SPR) (\$238/acre)	32 acres \$7,616	32 acres \$7,616	32 acres \$7,616
Total TSI Post-Sale Collections by Alternative	\$79,486	\$55,311	\$45,176

Table 5: Total Silvicultural Post-Sale Collections by Action Alternative

Item	Alternative 2	Alternative 3	Alternative 4
Essential POST-SALE	\$0	\$36,292	\$63,300
TSI POST-SALE	\$79,486	\$55,311	\$45,176
Totals by Alternative	\$79,486	\$91,603	\$108,476

Soil and Hydrology

Ground based yarding is proposed for Units 1a, 2a, 4a and 24 in all action alternatives, in addition Unit 6a in alternatives 2 and 3 and 4b in Alternative 2 only. Sub-soiling could be required to meet best management practices for erosion control and soil productivity. A collection will be made for 10% of the acres where ground-based logging systems will be utilized. There are 61 acres in Alternative 2, 59 acres in Alternative 3 and 34 acres in Alternative 4 of ground based logging systems planned. Sub-soiling will be completed soon after harvest. \$600 per acre will be collected to seed the subsoiled areas with native grasses.

Table 6: Soils Post-Sale Activities by Alternative

Item	Alternative 2	Alternative 3	Alternative 4
Subsoiling at \$400/acre	61 ac. x \$400/ac x 10% =\$2,440	59 ac. x \$400/ac x 10% = \$2,360	34 ac. x \$400/ac x 10% = \$1,360
Subsoiling at \$300/landing	12 landings x \$300/landing= \$3,600	7 landings x \$300/landing= \$2,100	6 landings x \$300/landing= \$1,800
Seeding with Native Species at \$600 per acre	61 ac x 10% x \$600/ac =\$3,660	59 ac x 10% x \$600/ac =\$3,540	34 ac x 10% x \$600/ac =\$2,040
Total	\$9,660	\$8,000	\$5,200

Wildlife Post-Sale Activities

Snags will be created within the units and adjacent riparian areas by topping after logging is complete. On average, 1.5 snags per acres will be created in all harvest units. Cost per snag created will be \$60.

An average of two trees/acre will be felled in all units to create large down woody debris after all logging and slash burning is complete. Cost of timber felling is \$26.00/tree.

Seeding and fertilization is planned for regeneration harvest units to provide quality forage. Cost of seeding and fertilization is \$300.00 per acre.

Road closures by creating a berm are planned for each alternative. Cost of each closure is \$250.00. An existing gate also needs to be repaired to maintain a closure. Gate repair costs \$500.00.

Fifty mineral blocks will be placed in each alternative to improve big game habitat. Cost of mineral blocks is \$10.00/each.

Monitoring is planned for units seeded and fertilized and fertilized only. Cost of monitoring will be \$20 per acre.

Table 7: Total Wildlife collections by Alternative

	Alt. 2	Alt. 3	Alt. 4
Snag Creation	284snags x \$60/snag =\$17,040	167 snags x \$60/snag =\$10,020	129snags x \$60/snag =\$7,740
Tree Felling for Down Woody Material	378 trees \$9,828	222 trees \$5,722	172 trees \$4,472
Seed/fertilization	\$0	43 acres \$12,900	71 acres \$21,300
Mineral Blocks	\$500	\$500	\$500
Road Closures	\$1000	\$1000	\$1000
Monitor	\$0	\$860	\$1,420
Total Collections	\$28,368	\$30,228	\$36,432

Botany Post Sale Activities

Noxious Weed Survey and Control

Ground-disturbing activities, including timber sales and road construction, increase the amount of habitat suitable for non-native, invasive plant species. Vehicles and logging equipment can contribute to the spread of these species by inadvertently carrying weed seed into the area on tires, caked-on mud, and undercarriages. Post-sale monies are collected to survey the project area annually for five years for the presence of noxious weeds and to control their spread. Control methods will include manual removal and the release of insects for biological control. Herbicides are used only as a last resort and may only be used in accordance with the *Willamette National Forest Integrated Weed Management EA* (USDA Forest Service 1993). See Figure XX for the location of all Noxious Weed post-sale projects.

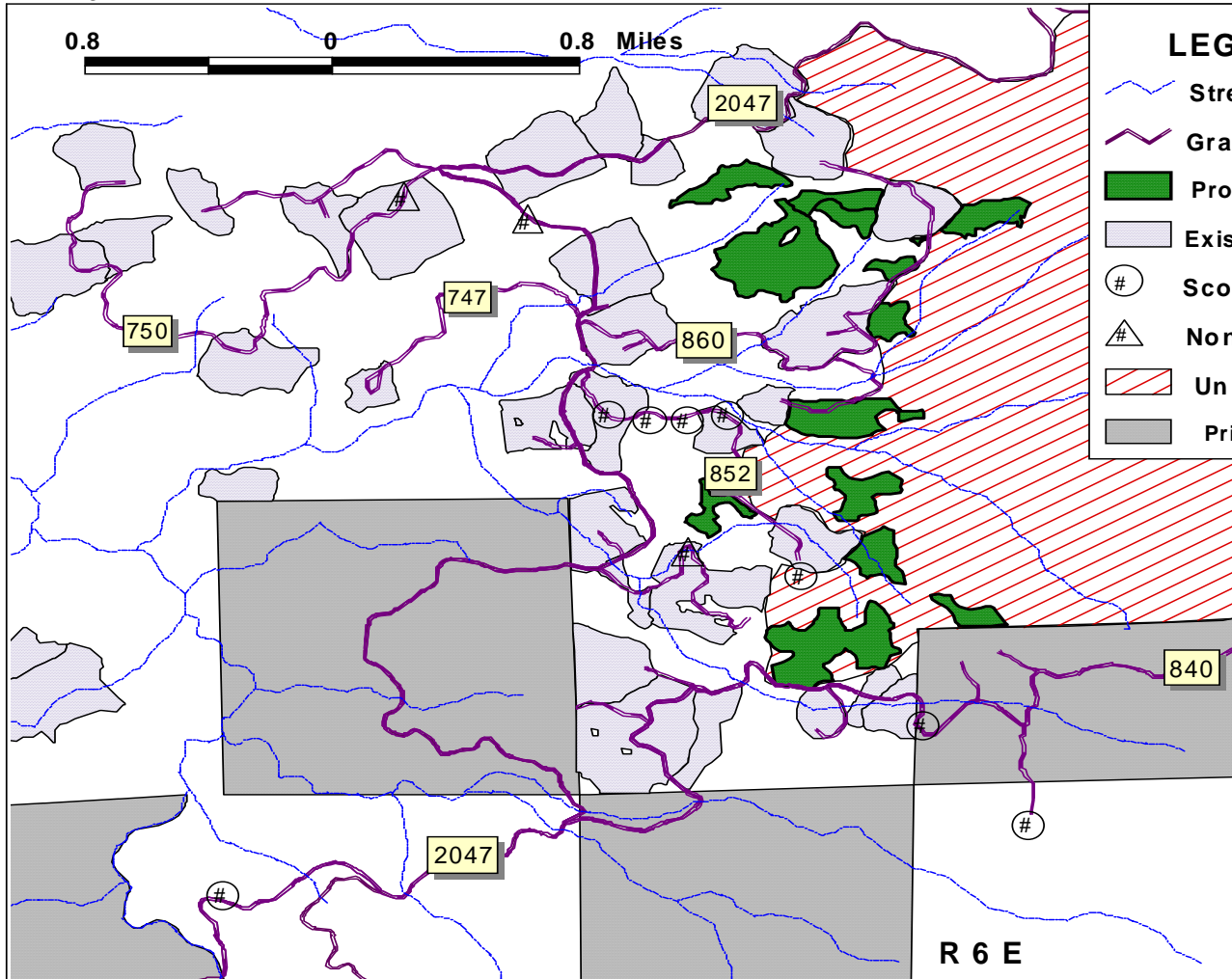
The cost of noxious weed control varies with the silvicultural prescription, as follows:

- HTH/HPR - \$6.00/acre
- Regen(15) and Regen (30) - \$10.00/acre
- Road construction and landing areas - \$20.00

Table 8: Total Noxious Weed Control by Alternative

Item	Alternative 2	Alternative 3	Alternative 4
Acres of HPR @ \$6.00/acre	189 for 5 years \$5,670	108 for 5 years \$3,240	15 for 5 years \$450
Acres of Regen @ \$10.00/acre	0	43 for 5 years \$2,150	71 for 5 years \$3,550
Acres Skid Road and Landing Areas @ \$20/acre	18 for 5 years \$1,800	13 for 5 years \$1,300	13 for 5 years \$1,300
Totals	\$7,470	\$5,520	\$5,300

Figure 7: Noxious Weed Sites



Sensitive Plant Species Monitoring

One population of adder's tongue will be monitored in Alternatives 2 and 4, and one population of pine broomrape will be monitored in all action alternatives. Cost is \$1000 per population, one visit per year for five years, \$200 per visit.

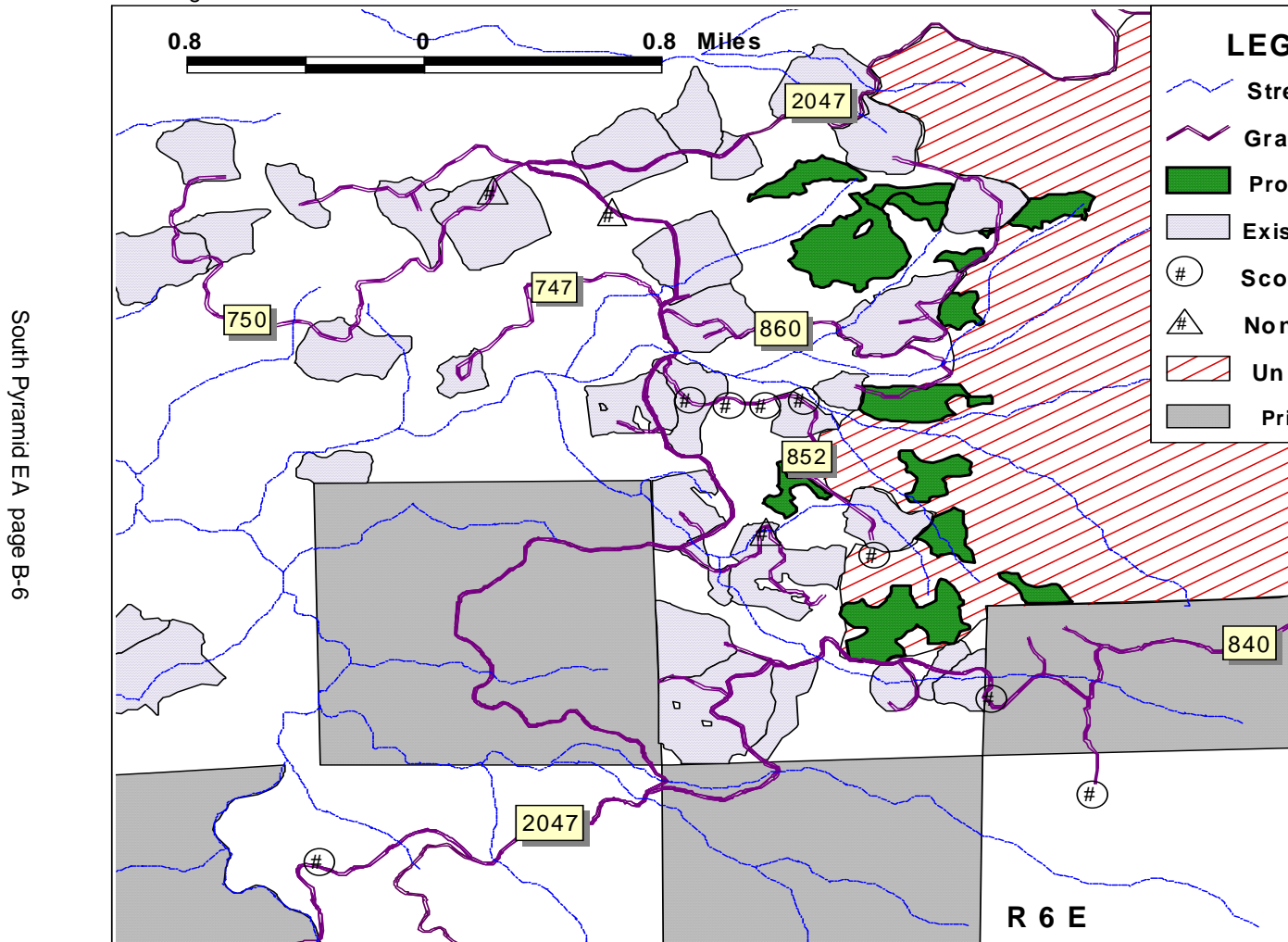
Table 9: Total Sensitive Species (Plants) Monitoring by Alternative

Item	Alternative 2	Alternative 3	Alternative 4
Pine broomrape populations	one site \$1000	one site \$1000	one site \$1000
Adder's-tongue population	one site \$1000	one site \$1000	one site \$1000
Total Cost	\$2,000	\$2,000	\$2,000

Table 10: Total Botany Collections by Alternative

	Alternative 2	Alternative 3	Alternative 4
Noxious Weed Control	\$7,470	\$5,520	\$5,300
Sensitive Species Monitoring	\$2,000	\$2,000	\$2,000
Totals	\$9,470	\$7,520	\$7,300

Figure 7: Noxious Weed Sites



Recreation Post-Sale Activities

Closed roads can provide excellent hunting area opportunities free from the disturbance of vehicles. When deciding to close new or existing roads in the watershed to meet desired resource objectives, closure devices (gates or berms) should be located to retain access to an existing or potential dispersed recreation site. Preferably sites are not too far up the road from its junction with the main collector or local road. If a suitable dispersed site cannot be left open or created near the closure device, then the closure location should allow for convenient day use parking for visitors using the closed road area.

Timber sale landings are frequently used during hunting seasons as campsites by visitors with campers or trailers. Landings used during sale operations should be cleaned of debris and leveled after sale operations to improve their usefulness as dispersed camping sites. Site improvements on landings (\$500 per landing) should be coordinated with road closure activities.

The South Pyramid Creek trail travels through the planning area and closely follows the creek. A section of the trail crosses steep terrain between the creek and local spur 2047-852. Past timber harvest above the trail has destabilized this steep terrain by failing to retain trees in the Riparian Reserve. Approximately 200 feet of trail requires reconstruction in the form of a retaining wall, tread reconstruction and 40 feet of puncheon.

Table 11: Total Recreation Collections by Alternative

Item	Alternative 2	Alternative 3	Alternative 4
Improved Landing Sites @ \$400.00 each	2 sites \$ 800	2 sites \$ 800	2 sites \$ 800
Improved Dispersed Site @ \$500.00 each	3 sites \$ 1500	3 sites \$ 1500	3 sites \$ 1500
Trail Reconstruction	\$ 4000	\$ 4000	\$ 4000
Total by Alternative	\$ 6,300	\$ 6,300	\$ 6,300

Firewood

\$2000 per timber sale will be necessary to administer firewood collection for public use. Up to two sales may occur with this project.

Table 12: Total Collections by Alternative

Item	Alternative 2	Alternative 3	Alternative 4
Silviculture - Essential	\$0	\$36,292	\$63,300
Silviculture - TSI	\$79,486	\$55,311	\$45,176
Soils	\$9,660	\$8,000	\$5,200
Wildlife	\$28,368	\$30,228	\$36,432
Botany	\$9,470	\$7,520	\$7,300
Recreation	\$ 6,300	\$ 6,300	\$ 6,300
Firewood	\$2,000	\$2,000	\$2,000
Total Cost	\$135,284	\$145,651	\$165,708

Post-Sale Collection Prioritization

First priority projects are required reforestation:

Tree Planting, Reforestation Exams, Animal Damage Control and Replant.

Second priority projects are to meet mitigation requirements:

Weed Control, Snag Creation, Felling for Down Woody Material, Subsoiling, Sensitive Species Monitoring, Native Seeding of New Roads

Third priority projects are opportunities and will be ranked as follows:

- (1) Firewood
- (2) Pre-commercial Thinning
- (3) Fertilization of Managed Stands
- (4) Forage Monitoring
- (5) Dispersed Recreation Site Enhancement
- (6) Fertilize Natural and Thinned Stands
- (7) Pruning
- (8) Trail Reconstruction
- (9) Mineral Block

Appendix C: Economic Analysis

All proposed action alternatives for the South Pyramid EA show a positive return to the treasury. Short-term dollar costs and incomes have been used to provide relative economic values associated with each alternative. Values are not meant to be comprehensive because of the difficulty of assigning values to resource benefits.

Timber values from a recent commercial thinning timber sale of comparable timber were used for this comparison.

All acreage and costs used are estimates.

Table 1: Economic Analysis

Item	Alternative 2	Alternative 3	Alternative 4
Gross Value (\$250/CCF)	8882 ccf x \$250/ccf= \$2,220,500	8034 ccf x \$250/ccf= \$2,008,500	7588 ccf x \$250/ccf= \$1,897,000
Associated Costs	\$1,130,974	\$909,031	\$1,039,663
Cost/Benefit Ratio	1.96	2.2	1.82
Present Value	\$1,089,526	\$1,099,469	\$1,757,337

Table 2: Logging Costs

Item	Alternative 2	Alternative 3	Alternative 4
Ground-based Logging (\$65 / CCF)	2602ccf x \$65/CCF = \$169,130	5231ccf X \$65/acre= \$340,015	2481ccf x \$65/acre = \$ 161,265
Helicopter Logging (\$120 / CCF)	6290ccf x \$120/CCF = \$754,800	2803ccf X \$120/acre= \$336,360	5107ccf x \$120/acre = \$612,840
Totals	\$923,930	\$676,375	\$774,105

Table 3: Road Maintenance Costs

Item	All action Alternatives
Road Maintenance (\$2000 / mile) x 27 miles	\$54,000
Total Road Costs	\$54,000

Table 4: Fuel Treatment Costs

Treatment	Cost/acre	Alternative 2	Alternative 3	Alternative 4
Hand pile/ Burn	\$1000	\$12,000	\$5,000	\$3,250
Yard tops attached	\$45	\$5,760	\$2,205	\$0
Broadcast burn	\$600	\$0	\$25,800	\$42,600
Totals		\$17,760	\$33,005	\$45,850

Table 5: Total Associated Costs

Item	Alternative 2	Alternative 3	Alternative 4
Logging Costs	\$923,930	\$676,375	\$774,105
Road Costs	\$54,000	\$54,000	\$54,000
Fuels Treatment Costs	\$17,760	\$33,005	\$45,850
Total <i>Post-Sale Activity</i> Costs *	\$135,284	\$145,651	\$165,708
Total Costs	\$1,130,974	\$909,031	\$1,039,663

* See Appendix B: *Post-Sale Activities for specifics of calculations.*

surveys, aerial photos and USGS topographical maps, and knowledge provided by individuals familiar with the area. Each species on the Willamette NF Sensitive Species List is considered. Effects of actions on sensitive species populations are analyzed and Conservation Strategies and the Willamette National Forest Land and Resource Management Plan were consulted to determine whether actions are consistent with direction.

In areas where pre-field review identified potential habitat, field reconnaissance was done. Surveys were done in the summers of 1998, 1999 and 2002. The entire project area was field-surveyed at level B, high intensity. Surveys were not conducted for fungi, except *Bridgeoporus nobilissimus*, because single pre-disturbance surveys for these species have been deemed impractical (USDA 1998; USDA 2000; USDA 2004). In general, the habitat requirements of fungal species found on the Willamette National Forest sensitive species list are poorly understood. The literature provides very general habitat characteristics for most of these species; therefore they are listed in Table 1 as having potential habitat in the project area.

Table 1 displays the results of pre-field review, the level of field surveys performed, and the results of the surveys:

Table 1: Summary of Evaluation Process for PETS Species in the South Pyramid Planning Area

Species	Prefield Review	Field Recon.	Species Presence
<i>Agoseris elata</i>	Habitat not present	NA	No
<i>Arabis hastatula</i>	Habitat not present	NA	No
<i>Arinica viscsoa</i>	Habitat not present	NA	No
<i>Asplenium septentrionale</i>	Habitat not present	NA	No
<i>Aster gormanii</i>	Habitat not present	NA	No
<i>Boletus pulcherrimus</i>	Habitat present	Not practical	Unknown
<i>Botrychium minganense</i>	Habitat present	Level B, high	No
<i>Botrychium montanum</i>	Habitat present	Level B, high	No
<i>Botrychium pumicola</i>	Habitat not present	NA	No
<i>Bridgeoporus nobillissimus</i>	Habitat not present	NA	No
<i>Calamagrostis breweri</i>	Habitat not present	NA	No
<i>Carex livida</i>	Habitat not present	NA	No
<i>Carex scirpoidea</i> var. <i>stenochlaena</i>	Habitat not present	NA	No
<i>Castilleja rupicola</i>	Habitat not present	NA	No
<i>Chaenotheca subroscida</i>	Habitat present	Level B, high	No
<i>Cimicifuga elata</i>	Habitat not present	NA	No
<i>Coptis trifolia</i>	Habitat not present	NA	No
<i>Cordyceps capitata</i>	Habitat present	Not practical	Unknown
<i>Cortinarius barlowensis</i>	Habitat present	Not practical	Unknown
<i>Corydalis aqua-gelidae</i>	Habitat present	Level B, high	No
<i>Cudonia monticola</i>	Habitat present	Not practical	Unknown

Species	Prefield Review	Field Recon.	Species Presence
<i>Dermatocarpon luridum</i>	Habitat present	Level B, high	No
<i>Eucephalis (Aster) vialis</i>	Habitat not present	NA	No
<i>Frasera umpquaensis</i>	Habitat not present	NA	No
<i>Gentiana newberryi</i>	Habitat not present	NA	No
<i>Gomphus kaufmanii</i>	Habitat present	Not practical	Unknown
<i>Gyromitra californica</i>	Habitat present	Not practical	Unknown
<i>Hypogymnia duplicata</i>	Habitat present	Level B, high	No
<i>Iliamna latibracteata</i>	Habitat not present	NA	No
<i>Leptogium burnetiae</i> var. <i>hirsutum</i>	Habitat present	Level B, high	No
<i>Leptogium cyanescens</i>	Habitat present	Level B, high	No
<i>Leucogaster citrinus</i>	Habitat present	Not practical	Unknown
<i>Lewisia columbiana</i> var. <i>columbiana</i>	Habitat not present	NA	No
<i>Lobaria linita</i>	Habitat not present	NA	No
<i>Lupinus sulphureus</i> var. <i>kincaidii</i>	Habitat not present	NA	No
<i>Lycopodiella inundata</i>	Habitat not present	NA	No
<i>Lycopodium complanatum</i>	Habitat present	Level B, high	No
<i>Montia howellii</i>	Habitat not present	NA	No
<i>Mycenia monticola</i>	Habitat not present	NA	Unkown
<i>Nephroma occultum</i>	Habitat present	Level B, high	Yes
<i>Ophioglossum pusillum</i>	Habitat present	Level B, high	Yes
<i>Pannaria rubiginosa</i>	Habitat present	Level B, high	No
<i>Pellaea andromedaifolia</i>	Habitat not present	NA	No
<i>Peltigera neckeri</i>	Habitat present	Level B, high	No
<i>Peltigera pacifica</i>	Habitat present	Level B, high	No
<i>Phaeocollybia attenuata</i>	Habitat present	Not practical	Unknown
<i>Phaeocollybia dissiliens</i>	Habitat present	Not practical	Unknown
<i>Phaeocollybia pseudofestiva</i>	Habitat present	Not practical	Unknown
<i>Phaeocollybia sipei</i>	Habitat present	Not practical	Unknown
<i>Pilophorus nigricaulis</i>	Habitat not present	NA	No
<i>Polystichum californicum</i>	Habitat not present	NA	No
<i>Potentilla villosa</i>	Habitat not present	NA	No
<i>Pseudocyphellaria rainierensis</i>	Habitat present	Level B, high	Yes
<i>Ramalina pollinaria</i>	Habitat not present	NA	No
<i>Ramaria amyloidea</i>	Habitat present	Not practical	Unknown
<i>Ramaria gelantiaaurantia</i>	Habitat present	Not practical	Unknown
<i>Ramaria largentii</i>	Habitat present	Not practical	Unknown
<i>Rhizomnium nudum</i>	Habitat not present	NA	No
<i>Romanzoffia thomsonii</i>	Habitat present	Level B, high	Yes

Species	Prefield Review	Field Recon.	Species Presence
<i>Scheuchzeria palustris</i> <i>var. americana</i>	Habitat not present	NA	No
<i>Schistostega pennata</i>	Habitat present	Level B, high	No
<i>Scirpus subterminalis</i>	Habitat not present	NA	No
<i>Sisyrinchium</i> <i>sarmentosum</i>	Habitat not present	NA	No
<i>Sowerbyella rhenana</i>	Habitat present	Not practical	Unknown
<i>Tetraphis geniculata</i>	Habitat present	Level B, high	No
<i>Tholurna disimilis</i>	Habitat not present	NA	No
<i>Usnea longissima</i>	Habitat not present	NA	No
<i>Utricularia minor</i>	Habitat not present	NA	No
<i>Wolffia borealis</i>	Habitat present	Level B, high	No
<i>Wolffia columbiana</i>	Habitat present	Level B, high	No

Potential Effects on PETS Species

Potential effects are documented in this Biological Evaluation in accordance with the formats put forth for listed species in the 1986 Endangered Species Act regulations, (50 CFR Part 402), and the March 1998 USFWS/NMFS Endangered Species Consultation Handbook; and for sensitive species, in the Forest Service manual section 2670 and in a memo issued August 17, 1995 by the Regional Foresters of Regions 1, 4, and 6. Attachment 3 gives details on the effects categories described in this memo. Table 2 shows conclusions for effects of proposed actions on sensitive species with respect to each alternative in the Environmental Assessment. Some effects information is also listed in the “Discussion of PETS Species” section below.

Key to Abbreviations in Table 2 (see Attachment 4)

NI	=	No Impact
MIIH	=	May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Loss of Viability for the Population or Species
WOFV*	=	Will Impact Individuals or Habitat with a Consequence That the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability for the Population or Species
BI	=	Beneficial Impact

*Considered a trigger for a significant action in NEPA

Table 2: South Pyramid Sensitive Species Biological Evaluation: Summary of Conclusion of Effects**

Species	Alt. 1	Alt. 2	Alt. 3	Alt. 4
<i>Boletus pulcherrimus</i>	NI	MIIH	MIIH	MIIH
<i>Botrychium minganense</i>	NI	NI	NI	NI

Species	Alt. 1	Alt. 2	Alt. 3	Alt. 4
<i>Botrychium montanum</i>	NI	NI	NI	NI
<i>Chaenotheca subroscida</i>	NI	NI	NI	NI
<i>Cordyceps capitata</i>	NI	MIH	MIH	MIH
<i>Cortinarius barlowensis</i>	NI	MIH	MIH	MIH
<i>Cordyialis aqua-gelidae</i>	NI	NI	NI	NI
<i>Cudonia monticola</i>	NI	MIH	MIH	MIH
<i>Dermatocarpon luridum</i>	NI	NI	NI	NI
<i>Gomphus kaufmanii</i>	NI	MIH	MIH	MIH
<i>Gyromitra californica</i>	NI	MIH	MIH	MIH
<i>Hypogymnia duplicata</i>	NI	NI	NI	NI
<i>Leptogium burnetiae</i> <i>var. hirsutum</i>	NI	NI	NI	NI
<i>Leptogium cyanescens</i>	NI	NI	NI	NI
<i>Leucogaster citrinus</i>	NI	MIH	MIH	MIH
<i>Lycopodium complanatum</i>	NI	NI	NI	NI
<i>Nephroma occultum</i>	NI	NI	NI	NI
<i>Pannaria rubiginosa</i>	NI	NI	NI	NI
<i>Pellaia andromedaefolia</i>	NI	NI	NI	NI
<i>Peltigera neckeri</i>	NI	NI	NI	NI
<i>Peltigera pacifica</i>	NI	NI	NI	NI
<i>Phaeocollybia attenuata</i>	NI	MIH	MIH	MIH
<i>Phaeocollybia</i> <i>pseudofestiva</i>	NI	MIH	MIH	MIH
<i>Phaeocollybia sipei</i>	NI	MIH	MIH	MIH
<i>Psuedocyphellaria</i> <i>rainierensis</i>	NI	NI	NI	NI
<i>Ramaria amyloidea</i>	NI	MIH	MIH	MIH
<i>Ramaria aurantiisiccescens</i>	NI	MIH	MIH	MIH
<i>Ramaria gelatiniaurantia</i>	NI	MIH	MIH	MIH
<i>Ramaria largentii</i>	NI	MIH	MIH	MIH
<i>Romanzoffia thompsonii</i>	NI	NI	NI	NI
<i>Schistotega pennata</i>	NI	NI	NI	NI
<i>Sowerbyella rhenana</i>	NI	MIH	MIH	MIH
<i>Tetraphis geniculata</i>	NI	NI	NI	NI
<i>Wolffia borealis</i>	NI	NI	NI	NI
<i>Wolffia columbiana</i>	NI	NI	NI	NI

Further Information and Effects on PETS Species Located

Nephroma occultum

Nephroma occultum (cryptic paw) is a bluish-gray lichen that grows closely appressed to conifer tree trunks and branches. Two sites of this lichen were found; one was found in Unit 2a and the other was found between Units 1a and 2a. Both sites are buffered by 150 feet to help protect the site from physical damage and maintain some microsite characteristics.

Ophioglossum pusillum

Ophioglossum pusillum is a spore-producing plant that is commonly called adder's tongue. It grows in wet meadows and along pond edges. One population was found in the

South Pyramid planning area in 1998. The area in which the population was found is no longer included in this project and will not be disturbed by harvest activity.

Pseudocyphellaria rainierensis

Pseudocyphellaria rainierensis (old-growth specklebelly) is a bluish-gray to greenish-gray flat, ribbon-like lichen that grows on a variety of substrates. It is most often found in old-growth conifer forest. This species is relatively abundant on the Sweet Home and Detroit Ranger Districts but is limited in abundance elsewhere. This species was found surrounding a wetland adjacent to Unit 8a and between Units 1a and 2a. Both sites are buffered by 150 feet to help protect the site from physical damage and maintain some microsite characteristics. *Pseudocyphellaria rainierensis* is thought to be dispersal limited rather than sensitive to microclimatic changes (Sillett 1995).

Romanzoffia thompsonii

Romanzoffia thompsonii (Thompson's mistmaiden) is a small annual that is endemic to Oregon. It prefers steep, vernal wet, open rocky slopes at low to middle elevations. A population occurs approximately ¼ mile northeast of Unit 8a, along a tributary to South Pyramid Creek. This site is outside of the area now being considered for timber harvest and no impacts are expected.

Effects Determination for those Species in which Surveys are Impractical

There are 16 species of fungi for which surveys were not conducted. Fungi fruit inconsistently and would require multiple surveys each year for several years to determine their presence. Eleven of these fungi are mycorrhizal, four are saprophytic on duff or wood and one is a parasite on truffles. The effect of thinning on these species is largely unknown.

Direct Effects of Alternatives: Under Alternative 1, No-action, no acres will be thinned or otherwise harvested, therefore there will be no direct effects to sensitive fungi, assuming they are present in the stands. Under the action alternatives, it seems likely that individual sites may be negatively affected in the short term by host tree removal, physical disturbance, soil compaction, and the disruption of mycelial networks (Kranabetter and Wylie 1998, Amaranthus and Perry 1994). Soil compaction resulting from harvesting equipment and the creation of temporary access roads can reduce host tree root growth and root tip availability for fungi (Amaranthus, et.al., 1996; Amaranthus and Perry, 1994). Reductions in the number of fruiting bodies of chanterelles, a common mycorrhizal species, were noted after initial thinning but appear to rebound after several years (Pilz et al 2003). Despite harvesting more acres, Alternative 2 presents the least risk of the action alternatives by limiting harvest to thinning. Mature trees left in the thinned stands will act as mycorrhizal hosts for fungi. Microclimatic changes will likely occur from thinning but will disappear over time as the canopies of residual trees expand and an understory develops.

Alternative 3 and 4 have direct negative affects to habitat because they include regeneration harvest of 43 acres and 75 acres, respectively. These harvested acres will no

longer provide habitat for sensitive fungi. Regeneration harvest of Unit 6a in Alternative 3 is notably because it has more characteristics of an older stand than other units.

Indirect Effects of Action Alternatives: Under Alternative 1, No-action, no acres will be thinned or otherwise harvested and the stands will undergo a slow decline before presumably opening up enough to provide an understory. Windthrow, snowdown, and insect and disease pockets will create openings. Coarse woody debris will be abundant as trees die due to overcrowding. Indirect effects to sensitive fungi would likely be minimal. Two studies have shown that fungal species richness declines in forest openings (Durall, et al, 1999, Kranabetter and Wylie, 1998) therefore, in the short term (40 years), Alternative 3 and 4 reduce habitat for sensitive mycorrhizal fungi due to regeneration harvest. However, thinning may enhance stand structure and understory development over the long term. The addition of understory trees and shrubs may benefit the sensitive mycorrhizal species. Duff retention and coarse woody debris creation can benefit both mycorrhizal and saprophytic species (Lindblad 1998). If this is the case then Alternative 2, which treats more acres than Alternative 3, may have an increased beneficial effect over the long term.

Cumulative Effects of Management Activities: A total of 8591 acres of old-growth forest was clear-cut in the Middle Santiam watershed from 1950 to 1990. These forests certainly contained multiple populations of sensitive botanical species. Fungal diversity declines with clear-cutting and fire (Byrd, et al, 2000, Bruns, et al 2002).

Pseudocyphellaria rainierensis and *Nephroma occultum* were most certainly in some of those old-growth stands. Numerous western redcedar stumps in wetlands attest to the past presence of a greater amount of cedar that may have provided habitat for the *Botrychium* species. There has been no timber sale activity on Forest Service lands in the Upper Middle Santiam subwatershed for nearly 15 years. Habitat disturbing activity has been limited to recreation and road maintenance that affect small areas.

Despite the large amount of past harvest activity there are 34,460 acres of forest greater than 150 years old remaining in the watershed. These forests serve as refugia for many sensitive species that will be able to re-colonize the younger stands as they mature and become more complex in structure and diversity.

Harvest of forests on private land is likely to occur in the future and may impact individual species and habitat for survey and manage and sensitive species. Loss of private habitat should not contribute to a trend towards Federal listing or cause a loss of species viability in this subwatershed.

The proposed actions may affect individuals or habitat but are not likely to contribute to a trend towards federal listing or a loss of the species viability in this subwatershed. Riparian Reserves and known site protective buffers will help maintain suitable habitat on matrix lands over the long term. Road and trail maintenance activities over the next 10 years in this subwatershed will have no significant effects on sensitive botanical species.

ATTACHMENT 1: Regional Forester’s Sensitive Plant List for the Willamette National Forest (Revised 2004). Species of federal, state, and local importance are included on the R-6 list.

Species	Occurrence on WNF	ONHP Status	State Status	Federal Status	Habitat Types
<i>Agoseris elata</i>	S	2			MM,DM
<i>Arabis hastatula</i>	D	1		SofC	RO
<i>Arnica viscosa</i>	S	2			RS
<i>Asplenium septentrionale</i>	S	2			RO
<i>Aster gormanii</i>	D	1			RS
<i>Boletus pulcherrimus</i>	D	1			CF
<i>Botrychium minganense</i>	D	2			RZ,CF
<i>Botrychium montanum</i>	D	2			RZ,CF
<i>Botrychium pumicola</i>	S	1	LT		HV
<i>Bridgeoporus nobilissimus</i>	D	1			CF
<i>Calamagrostis breweri</i>	D	2			MM,RZ
<i>Carex livida</i>	S	2			WM
<i>Carex scirpoidea</i>	D	2			RO
<i>var. stenochlaena</i>					
<i>Castilleja rupicola</i>	D	2			RO
<i>Chaenotheca subroscida</i>	D	3			CF
<i>Cimicifuga elata</i>	D	1	C		CF
<i>Coptis trifolia</i>	S	2			WM,CF
<i>Cordyceps capitata</i>	D	not listed			CF
<i>Cortinarius barlowensis</i>	D	2			CF
<i>Corydalis aqua-gelidae</i>	D	1	C		RZ,CF
<i>Cudonia monticola</i>	D	3			CF
<i>Dermatocarpon luridum</i>	S	3			RZ on rock
<i>Eucepahlis (Aster) vialis</i>	S	1	LT	SofC	CF
<i>Frasera umpquaensis</i>	D	1	C		MM
<i>Gentiana newberryi</i>	D	2			MM
<i>Gomphus kaufmanii</i>	D	3			CF
<i>Gyromitra californica</i>	D	2			CF
<i>Hypogymnia duplicata</i>	S	3			CF
<i>Iliamna latibracteata</i>	S	2			CF,RZ
<i>Lathyrus holochlorus</i>	D	1		SofC	MM,DM
<i>Leptogium burnetiae</i>	S	3			CF
<i>var. hirsutum</i>					
<i>Leptogium cyanescens</i>	D	3			CF
<i>Leucogaster citrinus</i>	D	3			CF
<i>Lewisia columbiana</i>	D	2			RS
<i>var. columbiana</i>					
<i>Lobaria linita</i>	D	2			RO
<i>Lupinus sulphureus</i>	S	1	LT	LT	MM,DM
<i>var. kinaidii</i>					

Species	Occurrence on WNF	ONHP Status	State Status	Federal Status	Habitat Types
<i>Lycopoiella inundata</i>	D	2			WM
<i>Lycopodium complanatum</i>	D	2			CF
<i>Montia howellii</i>	D	4	C		RZ
<i>Mycenia monticola</i>	D	not listed			CF
<i>Nephroma oculatum</i>	D	4			CF
<i>Ophioglossum pusillum</i>	D	2			WM
<i>Panaria rubiginosa</i>	D	2			CF
<i>Pellaea andromedaefolia</i>	S	2			RO
<i>Peltigera neckeri</i>	D	not listed			CF
<i>Peltigera pacifica</i>	D	not listed			CF
<i>Phaeocollybia attenuata</i>	D	4			CF
<i>Phaeocollybia dissiliens</i>	D	3			CF
<i>Phaeocollybia pseudofestiva</i>	D	3			CF
<i>Phaeocollybia sipei</i>	D	3			CF
<i>Pilophorus nigricaulis</i>	D	2			RO
<i>Polystichum californicum</i>	D	2			RO
<i>Potentilla villosa</i>	D	2			RS,RO
<i>Pseudocyphellaria mallota</i>	D	2			CF
<i>Pseudocyphellaria rainierensis</i>	D	4			CF,RZ
<i>Ramalina pollinaria</i>	D	2			CF,RZ
<i>Ramaria amyloidea</i>	D	2			CF
<i>Ramaria aurantiisiccescens</i>	D	4			CF
<i>Ramaria gelatiniaurantia</i>	D	3			CF
<i>Ramaria largentii</i>	D	3			CF
<i>Rhizomnium nudam</i>	D	2			CF
<i>Romanzoffia thompsonii</i>	D	1			RS
<i>Scheuchzeria palustris var. smericana</i>	D	2			WM
<i>Schistostega pennata</i>	D	2			CF
<i>Scirpus subterminalis</i>	D	2			SW,WM
<i>Sisyrinchium sarmentosum</i>	S	1	C	SofC	MM,DM
<i>Sowerbyella rhenana</i>	D	3			CF
<i>Tetraphis geniculata</i>	S	2			CF
<i>Tholurna disimilis</i>	D	2			CF
<i>Usnea longissima</i>	D	3			CF,RZ
<i>Utricularia minor</i>	D	2			SW
<i>Wolffia borealis</i>	S	2			SW
<i>Wolffia columbiana</i>	S	2			SW

Occurrence on Willamette National Forest:

S = Suspected

D = Documented

Oregon Natural Heritage Program (ORNHP):

- 1 = Taxa threatened or endangered throughout range.
- 2 = Taxa threatened or endangered in Oregon but more common or stable elsewhere
- 3 = Species for which more information is needed before status can be determined, but which may be threatened or endangered (Review).
- 4 = Species of concern not currently threatened or endangered (Watch).

Oregon State Status:

- LT = Threatened
- LE = Endangered
- C = Candidated

Federal Status: These plant species were originally published as CANDIDATE THREATENED (CT) in the Smithsonian Report, **Federal Register**, July 1, 1975, or as PROPOSED ENDANGERED (PE) in a later report, **Federal Register**, June 16, 1976. The latest **Federal Register** consulted was dated September 30, 1993. Updated listings appear periodically in the Notice of Review (USFWS); the status of several species is categorized as follows:

- LE = Listed as an Endangered Species
- LT = Listed as a Threatened Species
- PE = Proposed as an Endangered Species
- PT = Proposed as a Threatened Species
- C = Candidate for Listing as Threatened or Endangered
- SofC = Species of Concern; taxa for which additional information is needed to support proposal to list under the ESA.

Habitat Types:

- | | |
|-----------------------------------|----------------------------|
| MM = Mesic meadows | RS = Rocky slopes, scree |
| WM = Wet meadows | RO = Rock outcrops, cliffs |
| DM = Dry meadows | DW = Dry open woods |
| RZ = Riparian zones, flood plains | HV = High volcanic areas |
| CF = Coniferous forest | SW = Standing water |

ATTACHMENT 2: Field reconnaissance survey levels for determining presence potential for TES species.

Level A:	Aerial photo interpretation and review of existing site records. Determination of the potential for a listed species to occur within the proposed project area. No field surveys completed.
Low potential:	Less than 40% potential for listed species Inhabiting the project area.
Moderate potential:	40-60% potential for a listed species Inhabiting the proposed project area.
High potential:	Greater than 60% potential for listed species inhabiting the proposed project area.
Level B:	Single entry survey of probable habitats. Areas are identified by photos and existing field knowledge. Field surveys are conducted during the season most favorable for species identification.
Low intensity:	Selected habitat surveys (approximately 5-10% of area) are conducted with a single entry for listed species inhabiting the proposed project area.
Moderate intensity:	Selected habitat surveys (approximately 10-40% of area) are conducted with a single entry for listed species inhabiting the proposed project area
High intensity:	Selected habitat surveys (approximately 40-60% of area) are conducted with a single entry for listed species inhabiting the proposed project area
Level C:	Multiple entry surveys are conducted for listed species likely to inhabit the proposed project area.
Low intensity:	Selected habitat surveys (approximately 5-10% of area) are conducted with repeated entries for listed species inhabiting the proposed project area.

Moderate intensity: Selected habitat surveys approximately 10-60% of area) are conducted with repeated entries for listed species inhabiting the proposed project area.

High intensity: Selected habitat surveys (approximately 60-80% of area) are conducted with repeated entries for listed species inhabiting the proposed project area.

ATTACHMENT 3:
Conclusion Of Effects For Use In Biological Evaluation and Assessments
USDA Forest Service – Regions 1, 4, and 6
August, 1995

Listed Species:

1. No Effect

Occurs when a project or activity will not have any “effect” on a listed species or critical habitat.

2. May Affect – Likely to Adversely Affect (LAA)

If the determination in the biological assessment is that the project May Affect – Likely to Adversely Affect (LAA) a listed species or critical habitat, formal consultation must be initiated (50 CFR 402.12). Formal consultation must be requested in writing through the Forest Supervisor (FSM 2670.44) to the appropriate FWS Field Supervisor, or NOAA Fisheries office.

3. May affect – Not Likely To Adversely Affect (NLAA)

If it is determined in the biological assessment that there are “effects” to a listed species or critical habitat, but that those effects are May affect – Not Likely To Adversely Affect (NLAA), then written concurrence by the FWS or NOAA Fisheries is required to conclude informal consultation (50 CFR 402.13).

4. Beneficial Effect

Written concurrence is also required from the FWS or NOAA Fisheries if a beneficial effect determination is made. Requests for written concurrence must be initiated in writing from the Forest Supervisor to the State Field Supervisor (FWS or NOAA).

Proposed Species:

Whenever serious adverse effects are predicted for a proposed species or proposed critical habitat, conferencing is required with the FWS or NOAA.

1. No Effect

When there are “no effects” to proposed species, conferencing is not required with FWS or NOAA.

2. Not Likely to Jeopardize the Continued Existence of the Species of Result in Destruction or Adverse Modification of Proposed Critical Habitat

This conclusion is used where there are effects or cumulative effects, but where such effects would not have the consequence of losing key population or adversely effecting “proposed critical habitat”. No conferencing is required with FWS or NOAA if this conclusion is made. However, for any proposed activity that would

receive a “Likely To Adversely Affect” conclusion if the species were to be listed, conferencing may be initiated.

3. Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat

This conclusion must be determined if there are significant effects that could jeopardize the continued existence of the species, result in adverse modification or destruction of proposed critical habitat, and/or result in irreversible or irretrievable commitments of resources that could foreclose options to avoid jeopardy, should the species be listed. If this is the conclusion, conferencing with FWS or NOAA is required.

Sensitive Species:

1. No Impact(NI)

A determination of “No Impact” for sensitive species occurs when a project or activity will have no environmental effect on habitat, individuals, a population, or a species.

2. May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (MIIH)

Activities or actions that have effects that are immeasurable, minor, or are consistent with Conservation Strategies would receive this conclusion. For populations that are small – or vulnerable – each individual may be important for short and long-term viability.

3. Will Impact Individuals or Habitat with a Consequence that the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (WIFV)

Loss of individuals of habitat can be considered significant when the potential effect may be:

1. Contributing to a trend toward Federal listing (C-2 or C-2 species)
2. results in a significantly increased risk of loss of viability for a species
3. Results in a significantly increased risk of loss of viability for a significant population (stock)

4. Beneficial Impact (BI)

Projects or activities that are designed to benefit, or that measurably benefit a sensitive species should receive this conclusion.

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File Code: 1950 NEPA
2670 Threatened, Endangered, or Sensitive Plant and Animals

Date: March 04, 2006

Subject: South Pyramid, Biological Assessment, TES Fish Species

To: Sweet Home District, Middle Santiam Project Analysis File

The South Pyramid project has the potential to affect stream habitat within the Upper Middle Santiam Headwaters HUC6 watersheds. These watersheds historically provided habitat for Threatened Upper Willamette River (UWR) Chinook salmon and UWR steelhead, but these species are not currently utilizing this habitat due to the construction of Green Peter dam in 1967. This dam blocked the free upstream migration of anadromous fish to the habitat within the project area. The passage facility on Green Peter dam is ineffective and upstream movement of adult anadromous fish has not occurred through this facility since 1987. In 2004 and 2005 ODFW stocked juvenile spring chinook salmon into Quartzville Creek which is in a adjacent watershed. The stocked fish have not been observed moving upstream of the reservoir. Steelhead have not been moved over the dam.

The South Pyramid project area is located at least 26 miles upstream from Green Peter Reservoir, which is the nearest habitat currently occupied by ESA-listed fish species. Streams above Green Peter Dam were not included as critical habitat for UWR Chinook salmon or UWR steelhead in the 2005 designation.

The analysis of effect to water quality for this project indicated only minor, site-specific negative effects would be realized. These effects will not of sufficient magnitude to be transmitted downstream and result in any discernible negative effects or result in negative cumulative effects.

Therefore, there is a zero probability that the implementation of this project will result in any discernible effect to the ESA-listed fish species which are found at least 26 miles downstream from the project area. It is determined that this project will have No Effect on UWR Chinook salmon, No Effect on UWR steelhead, No Effect on UWR Chinook salmon designated critical habitat, and No Effect on UWR steelhead designated critical habitat.

Wade E. Sims

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South Pyramid Timber Sale

Sweet Home Ranger District, Willamette National Forest

Fish and Wildlife Biological Evaluation

Prepared By: _____
Virgil Morris
District Wildlife Biologist

Date

Prepared By: ___/s/ Wayne Somes _____
Wayne Somes
Zone Fish Biologist

Date

BIOLOGICAL EVALUATION

INTRODUCTION

The South Pyramid Timber Sale proposes to commercially thin 189 acres of natural stands in alternative 2, commercially thin 68 acres and regeneration harvest 43 acres of natural stands in alternative 3, and commercially thin 15 acres and regeneration harvest 75 acres of natural stands in alternative 4.

Alternative 1 is the no-action alternative. A variety of thinning prescriptions will be used in alternatives 2 – 4 and all prescriptions will maintain a minimum 40% canopy closure after treatment. Regeneration harvest will remove all existing canopy with the exception of green tree reserve areas and green replacement trees for future snags. Additional projects included in the action alternatives are snag and down wood creation, road closures, stand improvement projects, sub-soiling, plus additional projects. See the Environmental Assessment for further information.

This analysis addresses the potential effects of Alternatives 1- 4 on Threatened, Endangered, and Sensitive (TES) species identified on the USDA Forest Service – Pacific Northwest Region TES lists updated July, 2004. Species that are documented or suspected to occur on the Willamette National Forest are identified in Table 1. Only those species that have suitable habitat in the South Pyramid Planning Area are discussed in greater detail. There are no fish, or their habitat, listed on the Endangered Species Act, and no Essential Fish Habitat as listed under the Magnuson-Stevens Act within the project area.

SUMMARY OF EFFECTS

The northern spotted owl (*Strix occidentalis caurina*) is a threatened species known to occur within the South Pyramid planning area. Management activities identified in alternatives 2 – 4 “may affect, and are likely to adversely affect” northern spotted owls. This project was consulted on with the U.S. Fish and Wildlife Service and a Biological Opinion on received on September 29, 1998. The biological opinion concludes the finding of no jeopardy and no adverse modification of spotted owl critical habitat. The mandatory Terms and Conditions for this project are identified on pages 23 and 24.

The peregrine falcon (*Falcon peregrinus anatum*) is a R-6 sensitive species that may nest within or adjacent to the South Pyramid planning area. Surveys of suitable nest cliffs will be completed prior to conducting activities that may disturb nesting peregrine falcons. Restrictions will be required if nesting peregrine falcons are located. This project will have no impact on peregrine falcons.

Baird’s shrew (*Sorex bairdi permiliensis*), Pacific shrew (*Sorex pacificus cascadenis*), Pacific fringe-tailed Bat (*Myotis thysanodes respertinu*), Pacific fisher (*Martes pennanti*), and Oregon slender salamander (*Batrachoseps wrighti*) are R-6 sensitive species that may occur within the South Pyramid planning area. This project may impact individuals or their habitat.

The Cascade torrent salamander (*Rhyacotriton cascadae*), and Crater Lake tightcoil (*Pristoloma arcticum crateris*) are R-6 sensitive species that may occur within the South Pyramid planning area. Riparian buffers identified in the action alternatives should eliminate any impact to these species or their habitat.

Table 1: TES Species

Species	Step 1 Prefield Review	Step 2 Field Recon.	Step 3 Risk Assessment	Step 4 Analysis of Effect
Birds				
Spotted Owl	HP	Surveyed	Potential	MA-LAA
Bald Eagle	HNP			
Peregrine Falcon	HP	Surveyed	Potential	No Impact
Least Bittern	HNP			
Bufflehead	HNP			
Yellow Rail	HNP			
Black Swift	HNP			
Harlequin Duck	HNP			
Mammals				
Baird's Shrew	HP		Potential	May Impact
Pacific Shrew	HP		Potential	May Impact
Pacific Fringe-tailed Bat	HP		Potential	No Impact
Pacific Fisher	HP		Potential	May Impact
California Wolverine	HNP			
Herpetiles				
Foothill Yellow-legged Frog	HNP			
Oregon Slender Salamander	HP		Potential	May Impact
Cascade Torrent Salamander	HP		Potential	No Impact
Oregon Spotted Frog	HNP			
Northwestern Pond Turtle	HNP			
Fish				
Oregon Chub	HNP			
Upper Willamette River Chinook	HNP			
Upper Willamette River Steelhead	HNP			
Columbia River Bull Trout	HNP			
Insects				
Mardon skipper	HNP			
Mollusks				

Crater Lake Tightcoil	HP		Potential	No Impact
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HP = Habitat present

HNP = Habitat not present

MA-LAA = May Effect, Likely to Adversely Affect

MA-NLAA = May Effect, Not Likely to Adversely Affect

DESCRIPTION OF AFFECTED SPECIES

NORTHERN SPOTTED OWL

The Northern spotted owl (*Strix occidentalis caurina*) is listed as a threatened species that is known to occur within the South Pyramid planning area. A critical habitat unit (CHU) and an area of concern (AOC) for this species have been identified within the planning area. The Northern spotted owl occurs primarily within older timber stands with sufficient forest structure to provide food, cover, suitable nest sites, and protection from predators and weather. Suitable spotted owl habitat refers to nesting, roosting, and foraging (NRF) habitat and generally consists of forested stands over 80 years old, multi-storied with sufficient snags and down wood, and canopy closure generally exceeding 60%. Late seral forest is superior habitat and preferred by spotted owls over other habitat conditions (Thomas et al. 1990). Spotted owls also use dispersal habitat to move between stands of suitable habitat and for juveniles to disperse from natal territories. Dispersal habitat does not have a multi-storied canopy, large trees or large snags and down wood. This habitat generally consists of mid-seral stands between 40 and 80 years of age with canopy closures of 40% or greater and trees with a mean diameter of 11 inches or more (USDI, 2005).

Spotted owls may be affected if habitat is modified within their medium home range of 1.2 mile radius around the nest tree or activity center. The U.S. Fish and Wildlife Service has determined that the reduction of suitable spotted owl habitat to less than 40% (1182 acres) of the median home range has a notably higher likelihood of leading to disruption of essential breeding, feeding, and sheltering behaviors (USDI 1990). Habitat modification may occur in three different ways: (1) Degrade habitat – affect the quality of suitable owl habitat or dispersal-only habitat without altering the functionality of such habitat, (2) Downgrade habitat – alter the functionality of suitable habitat so that it no longer supports nesting, roosting, and foraging, and (3) Remove habitat – alter suitable or dispersal-only habitat to such an extent that the habitat no longer supports nesting, roosting, foraging, or dispersal.

Spotted owls may also be affected by noise disturbance above ambient levels during the nesting season (March 1 – September 30). Disturbance can occur from any activity producing above-ambient noise within 0.25 miles (0.5 miles for aircraft and 1.0 mile for blasting) of owls during the nesting season.

The proposed units (Table 2) consist of mature, dense conifer stands containing trees of various heights and diameter classes. Old growth trees, large snags, and large down wood, remnants from the previous stand, are sparsely distributed within the units. Most units do not possess multiple canopy layers or have only a few acres with multiple canopy levels but, except for unit 2b, they all contain sufficient structure to provide suitable, if marginal, spotted owl habitat in each unit. Unit 2b is dispersal habitat only, even though a portion of the unit contains some large trees, snags, and down wood.

This project could affect habitat within the home range (1.2 mile radius) of three owl sites (0670, 4462, 4520) within the project area. One site is within the Quartzville Late-Successional Reserve (LSR), one site is maintained as a small LSR's with 100 acres of the best habitat protected around the activity center, and one site will have a 330 foot radius no-harvest protection buffer (FW-171) as identified in the Willamette National Forest Plan. Timber harvest will not occur within these areas.

Project effects on spotted owls are characterized as the loss or degradation of suitable or dispersal habitat within their home range and/or disturbance during the nesting season. Disturbance during the critical nesting period (3/1 - 7/15) could have a greater impact on spotted owls than disturbance during the remainder of the nesting season (7/15 - 9/30). Disturbance can occur from any activity producing above-ambient noise within 0.25 mile (1.0 mile for blasting and 0.5 mile for aircraft) of owl nests during the nesting season.

Unit	*Acres of NRF Habitat	Acres of Dispersal Habitat	Total Unit Acres
1a	19	0	19
1b	3	0	3
2a	8	0	8
2b	0	49	49
4a	4	0	4
4b	8	0	8
4c	11	0	11
6a	21	0	21
8a	13	0	13
8b	6	0	6
9	38	0	38
24	7	0	7
27	11	0	11
*Nesting, roosting, foraging habitat			

This project has been consulted on with the U.S. Fish and Wildlife Service. The Biological Opinion received (USDI 1998) allows timber harvest activities to occur after June 30 (or later if deemed necessary by an agency wildlife biologist) within a 0.25 mile radius (or further) of owl centers or unsurveyed habitat.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to spotted owls, spotted owl habitat, or spotted owl critical habitat. Habitat within the proposed units will continue to function as dispersal and/or suitable habitat. Mid-seral habitat within the units will continue to increase in quality through natural processes and eventually become superior owl habitat.

Alternative 2: This alternative proposes to commercially thin 140 acres of suitable owl habitat and 49 acres of dispersal habitat. Suitable habitat in units 6a and 8a will be degraded but still function as suitable habitat since a minimum 60% canopy closure will remain. Dispersal habitat in unit 2b will also be degraded but will still function as dispersal habitat since a minimum 40% canopy closure will be retained. Habitat in all other treated units would be downgraded from suitable habitat to dispersal habitat since the canopy closures will be reduced to 40-50%. A portion or all of units 2a, 4a-c, 6a, 8a-b, 9, and 27 are located within CHU OR-15. A total of 31.8 acres of critical habitat will be affected. Remnant old-growth trees, snags, down wood, and trees exceeding 30 inches DBH will be retained with additional down wood and snags created where needed to meet Forest Plan direction. Improving diversity and increasing vertical and horizontal stand structure will improve the quality of owl habitat.

The amount of habitat being affected in the home ranges of individual spotted owls is shown in Table ???. The

greatest impact will be to owl pair 4462, due to 140 acres of suitable habitat being degraded or downgraded and 9 harvest units within 0.7 miles of the nest core. Recent Biological Opinions received from the U. S. Fish and Wildlife Service have recommend timber harvest be deferred within 0.7 miles of an active spotted owl nest between March 1 and September 30 to allow adult owls and their young to successfully utilize the core area for breeding, feeding, and sheltering prior to juvenile dispersal. Owl pair 4520 has 48 acres degraded or downgraded by thinning in its home range but only one unit occurs within 0.7 miles of it nest core. Owl pair 0670 has no units within its 0.7 mile core, but has 44 acres of suitable habitat in its home range downgraded to dispersal habitat from thinning. The amount of habitat remaining in individual spotted owl home ranges after this project is completed will exceed 40% (1182 acres) so disruption of essential breeding, feeding, and sheltering behaviors should be minimized. The greatest impact will likely be the short-term (preferably one season) impact of timber harvest within the 0.7 mile core of owl pair 4462. Units treated within this core area will remain at a minimum as dispersal habitat so spotted owls will continue to use this habitat following timber harvest.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to downgrading suitable habitat to dispersal habitat.

Alternative 3: This alternative proposes to regeneration harvest 43 acres of suitable owl habitat in units 1a, 1b, and 6a and downgrade 19 acres of suitable habitat in units 2a, 4a, and 24. The dispersal habitat in 2b (49 acres) will remain as dispersal habitat following treatment. Within the CHU, 3.8, acres of suitable habitat in units 2a and 4a will be downgraded to dispersal and 1.8 acres in 6a will be removed.

The amount of habitat being affected in the home ranges of individual spotted owls is shown in Table ??. The greatest impact will be to owl pair 4462, due to removing 34 acres and downgrading 19 acres of suitable habitat in 6 units in the home range. An additional 49 acres of dispersal habitat will be degraded in 2b. Six of the seven units being treated are within the 0.7 mile radius for this owl pair. Owl pair 4520 will have 28 acres treated in 5 units but none within the 0.7 mile core. There will be no habitat affected in the home range of owl pair 0670. There will be no habitat affected in the home range of owl pair 0670. The amount of habitat remaining in the two affected spotted owl home ranges following treatment will exceed 1182 acres.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to the removal and downgrading of suitable spotted owl habitat.

Alternative 4: This alternative proposes to regeneration harvest 26 acres of suitable in units 1a, 1b, and 4a and 49 acres of dispersal habitat in unit 2b. It will also downgrade 15 acres of suitable habitat in units 2a and 24. Within the CHU, 3.8 acres of suitable habitat in units 2a and 4a will be downgraded to dispersal habitat following treatment. The amount of habitat being affected in the home ranges of individual spotted owls is shown in Table ??.

The greatest impact will be to owl pair 4462, due to removing 17 acres of suitable habitat and downgrading 15 acres in the 1.2 mile home range radius. Three units are within the 0.7 mile radius but only 2b and 4a will be regeneration harvest, unit 24 will be downgraded. Owl pair 4520 will have 7 acres of habitat removed and 8 acres downgraded within the 1.2 mile home range. No acres within the 0.7 mile radius will be affected. There will be no habitat affected in the home range of owl pair 0670. The amount of habitat remaining in the two affected spotted owl home ranges following treatment will exceed 1182 acres.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to the removal and downgrading of suitable spotted owl habitat.

Table ??: Suitable Owl Habitat for Owl Pairs Affected by Action Alternatives.

Owl Pair	Acres of Suitable Habitat w/in 1.2 miles	Affected Acres Of Suitable Habitat w/in 1.2 miles**			Proposed Units within Home Ranges of Owl Pairs		
		Removed – Downgraded - Degraded			w/in 1.2 miles	w/in 0.7 miles	w/in 0.5 miles
		Alternative 2	Alternative 3	Alternative 4			
0670	1256	0 - 44 - 0	0 - 0 - 0	0 - 0 - 0	8b, 9, 27	0	0
4462	1780	0 - 106 - 34	34 - 19 - 0	17 - 15 - 0	1a, 2a, 2b*, 4a-c, 6a, 8a-b, 9, 24, 27	2b*, 4a-b, 6a, 8a-b, 9, 24, 27	4b, 6a, 8a, 9, 24, 27
4520	2206	0 - 34 - 14	16 - 12 - 0	7 - 8 - 0	1a, 2a, 2b*, 4a-c, 6a, 8a	4c	4c

*Dispersal habitat only – acres not included

** Numbers reflect overlaps in home ranges and therefore exceed total harvest acres described by alternative in the narrative. Some units are only partially within home ranges.

Hazard trees (snags and live defective trees) will likely need to be felled within the stands, adjacent to work areas, and along haul routes in both action alternatives. All hazard trees will be retained as down wood. Additional down wood and snags will be created as needed to meet Forest Plan direction. Habitat conditions for spotted owl prey species will be improved by the increased levels of snags and down wood.

Timber harvest activities under these 3 alternatives are expected to create disturbance to the three owl sites. All harvest activities, including log haul, will be scheduled outside the critical nesting season (March 1 - July 15) and, whenever possible, outside the 0.7 mile core areas July 15 – September 30. Timber harvest will likely occur over a two-year period due to snow conditions and the mandatory owl restriction period. Reproductive status of owl pairs 4462 and 4520 will be monitored during the years of harvest in order to minimize this disturbance during the latter part of the nesting season.

Cumulative Effects: Cumulative effects result from the incremental impacts of past, present, and foreseeable future actions that affect spotted owl habitat. Past timber harvest activities and road building have removed suitable spotted owl habitat and reduced interior forest habitat, due to edge effect of the created openings. Future harvest on public and private lands will have similar types of habitat effects on spotted owl habitat (described above). CHU OR-15 currently has 42,919 acres of which 45% (19,126 acres) is NRF habitat and 13% (5,540 acres) is dispersal habitat. Alternative 2 treats the most acres in the CHU (31.8 acres) but thinning these stands while retaining remnant old-growth trees, trees over 30 inches DBH, snags, and down wood, quality of this habitat will improve as the canopy increases. There are no additional habitat altering projects in suitable or dispersal spotted owl habitat currently being planned in the vicinity of this project at this time.

PEREGRINE FALCON

The peregrine falcon is a R-6 sensitive species that requires suitable cliffs with ledges for nest sites that are surrounded by a diversity of habitats to provide for prey species. Peregrine falcons will react to disturbances out to 3 air miles from the nest site (USDI, 1999).

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to peregrine falcons under this alternative.

Alternatives 2 - 4: Planned harvest activities will not impact potential nest sites. The light to moderate thinning and regeneration harvest planned in these alternatives will increase habitat diversity for Peregrine falcon prey species. Several of the proposed units are within 3 air miles of cliffs that could be used by peregrine falcons for nest sites. The cliffs have been surveyed to protocol in the past but no peregrine falcons were detected. With either seasonal restrictions or surveys during the year of operation, there should be no impact to peregrine falcons or cliff nesting habitat.

Cumulative Effects: Past timber management within the South Pyramid planning area has resulted in a variety of habitats surrounding suitable nest cliffs. This variety of habitats is likely beneficial in encouraging a range of bird species to provide peregrine falcon prey. This project will encourage plant and structural diversity within the units thereby improving habitat conditions for peregrine falcon prey species. There are no additional habitat altering projects being planned at this time within the South Pyramid planning area.

BAIRD’S SHREW

The Baird’s shrew (*Sorex bairdi permiliensis*) is a Region-6 Sensitive Species and endemic to Oregon (Verts and Carraway 1998).

Existing Condition

The Baird’s shrew is found in cool, moist areas, usually within coniferous or deciduous forests (Csuti 1997). They often utilize down wood or ground litter in riparian and uplands. They feed on a variety of invertebrate species. It is thought they occur on the Sweet Home Ranger District and possibly in the South Pyramid planning area, but have not been documented.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: It is undetermined what specific impact this project will have on individuals or the species population, but retention of no harvest stream buffers, less intense slash burns, and retention and creation of down wood and debris in this project will minimize impacts.

For the Baird’s shrew and its habitat, a “may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species” determination was made for alternatives 2 - 4. This impact should be of short duration.

Cumulative Effects: None expected

PACIFIC SHREW

The Pacific shrew (*Sorex pacificus cascadenis*) is a Region-6 Sensitive Species and is endemic to Oregon (Verts and Carraway 1998).

Existing Condition

The Pacific shrew prefers humid forests, marshes, and thickets, often near riparian vegetation. They require down logs, brushy thickets, or ground debris for cover and hiding (Csuti et. al. 1997). They have been found

in early successional forests. It is thought they occur on the Sweet Home Ranger District and possibly in the South Pyramid planning area, but they have not been documented.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: It is undetermined what specific impact this project will have on individuals or the species population, but retention of no harvest stream buffers, less intense slash burns, and retention and creation of down wood and debris in this project will minimize impacts.

For the Pacific shrew and it’s habitat, a may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species determination was made for alternatives 2 - 4. This impact should be of short duration.

Cumulative Effects: None expected

PACIFIC FRINGE-TAILED BAT

The Pacific fringe-tailed Bat (*Myotis thysanodes resperlini*) is a Region-6 Sensitive Species.

Existing Condition

The Pacific fringe-tailed bat occurs in the Cascade Range and Tillamook County in coniferous stands with numerous snags and large trees. Their distribution is patchy across their range. It is believed they forage insects off shrubs or the ground (Csuti et. al. 1997). This species is migratory and very sensitive to human disturbance. They are known to use caves. It is unknown if they occur on the Sweet Home Ranger District.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: Planned harvest activities may impact this species through habitat removal and disturbance. Increased ground and shrub cover, resulting from the reduction of the overhead conifer canopy, will benefit the Pacific fringe-tailed bat by improving habitat for prey species.

For the Pacific fringe-tailed bat and its habitat, a “may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species” determination was made for alternatives 2 - 4.

Cumulative Effects: None expected

PACIFIC FISHER

The Pacific fisher (*Martes pennanti*) is a Region 6 Sensitive Species.

Existing Condition

The Pacific fisher primarily use mature, closed canopy coniferous forest containing some deciduous component. They frequently use riparian corridors. They will use cutover areas as secondary habitat. Abundant snag and down wood habitat is important.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: Planned harvest activities may impact this species through reduction of the canopy and disturbance from logging. Retention of existing down wood plus the creation of snags and additional down wood will be beneficial to provide cover and to improve habitat for fisher prey species. Increased ground and shrub cover, resulting from the reduction of the overhead conifer canopy, will also improve habitat for prey

species.

For the Pacific fisher and its habitat, it may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species determination was made for alternatives 2 - 4. This impact should be of short duration.

Cumulative Effects: None expected

OREGON SLENDER SALAMANDER

The Oregon slender salamander (*Batrachoseps wrighti*) is a Region-6 Sensitive Species.

Existing Condition

The Oregon slender salamander typically occurs under bark and moss in mature and second-growth Douglas-fir forests (Csuti 1997). Bark heaps at the base of snags and down wood appears to be very important.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Oregon slender salamander under this alternative.

Alternatives 2 - 4: It is undetermined what specific impact this project will have on individuals or the species population, but retention of no harvest stream buffers, limited slash burning, and retention and creation of down wood and snags will minimize impacts to this species.

For the Oregon slender salamander and its habitat, it may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species determination was made for alternatives 2 - 4. This impact should be of short duration

Cumulative Effects: None expected

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8a	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8b	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9a	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

- 1) Primary Shade Zone: variable width zone based on slope and tree height, stream orientation, sinuosity, and aspect, stream width, along w
- 2) Potential Stream Recruitment Zone: variable width zone based primarily on existing tree height and slope which includes those trees that :

Unit	Acres by Yarding System			Typical Slope			LFH (Listed Fish Habitat)		
	Grd	Sky	Hel	Grd	Sky	Hel	Grd	Sky	Hel
1a	13	0	0	15%	NA	NA	>26 mile	-	-
2a	8	0	0	15%	NA	NA	>26 mile	-	-
2b	0	0	49	NA	NA	45%	-	-	>26 mile
4a	4	0	0	25%	NA	NA	>26 mile	-	-
4b	8	0	0	20%	NA	NA	>26 mile	-	-
4c	0	0	11	NA	NA	15%	-	-	>26 mile
6a	21	0	0	15%	NA	NA	>26 mile	-	-
8a	0	0	13	NA	NA	35%	-	-	>26 mile
8b	0	0	6	NA	NA	30%	-	-	>26 mile
9a	0	0	38	NA	NA	50%	-	-	>26 mile
24	7	0	0	20%	NA	NA	>26 mile	-	-
27	0	0	11	NA	NA	40%	-	-	>26 mile

Table 4. Yarding and Unit Proximity Information

Proximity is the distance downslope then through connecting stream channels.

Table 5. Skyline Corridor Yarding Information

Unit	Skyline Corridors Across Streams							
	LFH		Perennial			Intermittent		
	Number of Crossings	Affected Stream Length	Number of Crossings	Affected Stream Length	Distance to LFH	Number of Crossings	Affected Stream Length	Distance to LFH
1a	0		0			0		
2a	0		0			0		
2b	0		0			0		
4a	0		0			0		
4b	0		0			0		
4c	0		0			0		
6a	0		0			0		
8a	0		0			0		
8b	0		0			0		
9a	0		0			0		
24	0		0			0		
27	0		0			0		

Note: All measurements are in feet.

Table 6. Haul Route Information

Rule of thumb for drainage relief culverts is one every 500 feet excluding grade breaks. Bridges and cul

None of them for drainage relief culverts is one every 100 feet exceeding grade breaker. Bridges and culverts listed in this table are only pipes greater than 36" or live stream culverts. All crossings except one are more than a mile from any potential LFH. On road 2266000 a paved culvert crosses the N. Fork Santiam River. This road comes in perpendicular to the river so there is no length of haul adjacent to LFH.

Haul Route	Miles of Haul	Road Surface (P,A,N)	# of Loads	Number of Crossings Over:				Nearest Distance (ft) from Crossing To LFH by Type:	
				LFH		Other Peren	Inter.	Peren.	Inter.
				Bridges	Culverts				
2047 852	1.26	A	210	0	0	0		N/A	
2047 864	0.49	A	139	0	0	1		> 1 mile	
2047 860	1.94	A	673	0	0	2		> 1 mile	
2047 000	7.31	A	1064	0	0	11		> 1 mile	
2266 000	3.22	P	1087	0	1	2		0 feet	
2047 854	0.17	A	306	0	0	0		N/A	
2047 840	2.87	A	306	0	0	2		> 1 mile	
2067 560	3.05	A	306	0	0	2		> 1 mile	
2067 000	2.01	P	306	1	0	1		> 1 mile	

1) Road surface types are Paved, Aggregate, or Native.

2) Road length within 100' of LFH is a measure of "drawbottom" roads used by haul route, does not include distance at crossings, which is at

Table 7. Stream Culvert Installation or Replacement NONE

Road number	Mile point	New Culvert Diameter	Stream Type	Distance to LFH
N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A

Don't list ditch relief culverts here

Table 8. New Road Construction

Surface-type	Permanent (miles) ¹	Semi-permanent (miles) ²	Temporary (miles) ³
Natural	0	0	0
Aggregate	0	0	0
Paved	0	0	0
Total Miles	0	0	0

¹ Permanent – road will remain available for use after the sale ends

² Semi-permanent – road will be decommissioned at the end of the sale

³ Temporary – road will be built and decommissioned within the same dry season

Table 9. Road Maintenance/Renovation/Reconstruction.

Road work will consist of the purchaser providing minimum access required for purchasers operations and associated Forest Service contract administration and preventing resource or road damage. These actions could include blading and spot rocking. Brushing and ditch cleaning is unlikely.

Road number	Surface Type	Miles
2047 852	A	1.26

2047 864	A	0.49
2047 860	A	1.94
2047 840	A	1.74

Maintenance/Renovation/Reconstruction – includes blading, brushing, spot rocking, ditch cleaning

Area
Post
130
110
120
140
120
120
175
120
160
120
140
120

with other minor variables (Northwest Forest Plan Temperature TMDL Implementation Strategies, December 2004, FS and BLM) are most likely to fall and be recruited into the stream channel as woody material. Typically this zone extends one existing tree height from th

Proximity (feet) to:					
Perennial			Intermittent		
Grd	Sky	Hel	Grd	Sky	Hel
>26 mile	-	-	>26 mile	-	-
>26 mile	-	-	>26 mile	-	-
-	-	>26 mile	-	-	>26 mile
>26 mile	-	-	>26 mile	-	-
>26 mile	-	-	>26 mile	-	-
-	-	>26 mile	-	-	>26 mile
-	-	-	-	-	-
-	-	>26 mile	-	-	>26 mile
-	-	>26 mile	-	-	>26 mile
-	-	>26 mile	-	-	>26 mile
>26 mile	-	-	>26 mile	-	-
-	-	>26 mile	-	-	>26 mile

verts

more than
is paved

Road Length Within 100' of LFH
0
0
0
0
0
0
0
0
0
0

ready accounted for in the previous columns.

ie stream floodplain, however this can be extended if there are steep sideslopes.



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Department of
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South Pyramid Timber Sale

Sweet Home Ranger District, Willamette National Forest

Fish and Wildlife Biological Evaluation

Prepared By: _____
Virgil Morris
District Wildlife Biologist

Date

Prepared By: ___/s/ Wayne Somes _____
Wayne Somes
Zone Fish Biologist

_____/02/02/06_____
Date

BIOLOGICAL EVALUATION

INTRODUCTION

The South Pyramid Timber Sale proposes to commercially thin 189 acres of natural stands in alternative 2, commercially thin 68 acres and regeneration harvest 43 acres of natural stands in alternative 3, and commercially thin 15 acres and regeneration harvest 75 acres of natural stands in alternative 4.

Alternative 1 is the no-action alternative. A variety of thinning prescriptions will be used in alternatives 2 – 4 and all prescriptions will maintain a minimum 40% canopy closure after treatment. Regeneration harvest will remove all existing canopy with the exception of green tree reserve areas and green replacement trees for future snags. Additional projects included in the action alternatives are snag and down wood creation, road closures, stand improvement projects, sub-soiling, plus additional projects. See the Environmental Assessment for further information.

This analysis addresses the potential effects of Alternatives 1- 4 on Threatened, Endangered, and Sensitive (TES) species identified on the USDA Forest Service – Pacific Northwest Region TES lists updated July, 2004. Species that are documented or suspected to occur on the Willamette National Forest are identified in Table 1. Only those species that have suitable habitat in the South Pyramid Planning Area are discussed in greater detail. There are no fish, or their habitat, listed on the Endangered Species Act, and no Essential Fish Habitat as listed under the Magnuson-Stevens Act within the project area.

SUMMARY OF EFFECTS

The northern spotted owl (*Strix occidentalis caurina*) is a threatened species known to occur within the South Pyramid planning area. Management activities identified in alternatives 2 – 4 “may affect, and are likely to adversely affect” northern spotted owls. This project was consulted on with the U.S. Fish and Wildlife Service and a Biological Opinion on received on September 29, 1998. The biological opinion concludes the finding of no jeopardy and no adverse modification of spotted owl critical habitat. The mandatory Terms and Conditions for this project are identified on pages 23 and 24.

The peregrine falcon (*Falcon peregrinus anatum*) is a R-6 sensitive species that may nest within or adjacent to the South Pyramid planning area. Surveys of suitable nest cliffs will be completed prior to conducting activities that may disturb nesting peregrine falcons. Restrictions will be required if nesting peregrine falcons are located. This project will have no impact on peregrine falcons.

Baird’s shrew (*Sorex bairdi permiliensis*), Pacific shrew (*Sorex pacificus cascadenis*), Pacific fringe-tailed Bat (*Myotis thysanodes respertinu*), Pacific fisher (*Martes pennanti*), and Oregon slender salamander (*Batrachoseps wrighti*) are R-6 sensitive species that may occur within the South Pyramid planning area. This project may impact individuals or their habitat.

The Cascade torrent salamander (*Rhyacotriton cascadae*), and Crater Lake tightcoil (*Pristoloma arcticum crateris*) are R-6 sensitive species that may occur within the South Pyramid planning area. Riparian buffers identified in the action alternatives should eliminate any impact to these species or their habitat.

Table 1: TES Species

Species	Step 1 Prefield Review	Step 2 Field Recon.	Step 3 Risk Assessment	Step 4 Analysis of Effect
Birds				
Spotted Owl	HP	Surveyed	Potential	MA-LAA
Bald Eagle	HNP			
Peregrine Falcon	HP	Surveyed	Potential	No Impact
Least Bittern	HNP			
Bufflehead	HNP			
Yellow Rail	HNP			
Black Swift	HNP			
Harlequin Duck	HNP			
Mammals				
Baird's Shrew	HP		Potential	May Impact
Pacific Shrew	HP		Potential	May Impact
Pacific Fringe-tailed Bat	HP		Potential	No Impact
Pacific Fisher	HP		Potential	May Impact
California Wolverine	HNP			
Herpetiles				
Foothill Yellow-legged Frog	HNP			
Oregon Slender Salamander	HP		Potential	May Impact
Cascade Torrent Salamander	HP		Potential	No Impact
Oregon Spotted Frog	HNP			
Northwestern Pond Turtle	HNP			
Fish				
Oregon Chub	HNP			
Upper Willamette River Chinook	HNP			
Upper Willamette River Steelhead	HNP			
Columbia River Bull Trout	HNP			
Insects				
Mardon skipper	HNP			
Mollusks				

Crater Lake Tightcoil	HP		Potential	No Impact
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HP = Habitat present

HNP = Habitat not present

MA-LAA = May Effect, Likely to Adversely Affect

MA-NLAA = May Effect, Not Likely to Adversely Affect

DESCRIPTION OF AFFECTED SPECIES

NORTHERN SPOTTED OWL

The Northern spotted owl (*Strix occidentalis caurina*) is listed as a threatened species that is known to occur within the South Pyramid planning area. A critical habitat unit (CHU) and an area of concern (AOC) for this species have been identified within the planning area. The Northern spotted owl occurs primarily within older timber stands with sufficient forest structure to provide food, cover, suitable nest sites, and protection from predators and weather. Suitable spotted owl habitat refers to nesting, roosting, and foraging (NRF) habitat and generally consists of forested stands over 80 years old, multi-storied with sufficient snags and down wood, and canopy closure generally exceeding 60%. Late seral forest is superior habitat and preferred by spotted owls over other habitat conditions (Thomas et al. 1990). Spotted owls also use dispersal habitat to move between stands of suitable habitat and for juveniles to disperse from natal territories. Dispersal habitat does not have a multi-storied canopy, large trees or large snags and down wood. This habitat generally consists of mid-seral stands between 40 and 80 years of age with canopy closures of 40% or greater and trees with a mean diameter of 11 inches or more (USDI, 2005).

Spotted owls may be affected if habitat is modified within their medium home range of 1.2 mile radius around the nest tree or activity center. The U.S. Fish and Wildlife Service has determined that the reduction of suitable spotted owl habitat to less than 40% (1182 acres) of the median home range has a notably higher likelihood of leading to disruption of essential breeding, feeding, and sheltering behaviors (USDI 1990). Habitat modification may occur in three different ways: (1) Degrade habitat – affect the quality of suitable owl habitat or dispersal-only habitat without altering the functionality of such habitat, (2) Downgrade habitat – alter the functionality of suitable habitat so that it no longer supports nesting, roosting, and foraging, and (3) Remove habitat – alter suitable or dispersal-only habitat to such an extent that the habitat no longer supports nesting, roosting, foraging, or dispersal.

Spotted owls may also be affected by noise disturbance above ambient levels during the nesting season (March 1 – September 30). Disturbance can occur from any activity producing above-ambient noise within 0.25 miles (0.5 miles for aircraft and 1.0 mile for blasting) of owls during the nesting season.

The proposed units (Table 2) consist of mature, dense conifer stands containing trees of various heights and diameter classes. Old growth trees, large snags, and large down wood, remnants from the previous stand, are sparsely distributed within the units. Most units do not possess multiple canopy layers or have only a few acres with multiple canopy levels but, except for unit 2b, they all contain sufficient structure to provide suitable, if marginal, spotted owl habitat in each unit. Unit 2b is dispersal habitat only, even though a portion of the unit contains some large trees, snags, and down wood.

This project could affect habitat within the home range (1.2 mile radius) of three owl sites (0670, 4462, 4520) within the project area. One site is within the Quartzville Late-Successional Reserve (LSR), one site is maintained as a small LSR's with 100 acres of the best habitat protected around the activity center, and one site will have a 330 foot radius no-harvest protection buffer (FW-171) as identified in the Willamette National Forest Plan. Timber harvest will not occur within these areas.

Project effects on spotted owls are characterized as the loss or degradation of suitable or dispersal habitat within their home range and/or disturbance during the nesting season. Disturbance during the critical nesting period (3/1 - 7/15) could have a greater impact on spotted owls than disturbance during the remainder of the nesting season (7/15 - 9/30). Disturbance can occur from any activity producing above-ambient noise within 0.25 mile (1.0 mile for blasting and 0.5 mile for aircraft) of owl nests during the nesting season.

Unit	*Acres of NRF Habitat	Acres of Dispersal Habitat	Total Unit Acres
1a	19	0	19
1b	3	0	3
2a	8	0	8
2b	0	49	49
4a	4	0	4
4b	8	0	8
4c	11	0	11
6a	21	0	21
8a	13	0	13
8b	6	0	6
9	38	0	38
24	7	0	7
27	11	0	11
*Nesting, roosting, foraging habitat			

This project has been consulted on with the U.S. Fish and Wildlife Service. The Biological Opinion received (USDI 1998) allows timber harvest activities to occur after June 30 (or later if deemed necessary by an agency wildlife biologist) within a 0.25 mile radius (or further) of owl centers or unsurveyed habitat.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to spotted owls, spotted owl habitat, or spotted owl critical habitat. Habitat within the proposed units will continue to function as dispersal and/or suitable habitat. Mid-seral habitat within the units will continue to increase in quality through natural processes and eventually become superior owl habitat.

Alternative 2: This alternative proposes to commercially thin 140 acres of suitable owl habitat and 49 acres of dispersal habitat. Suitable habitat in units 6a and 8a will be degraded but still function as suitable habitat since a minimum 60% canopy closure will remain. Dispersal habitat in unit 2b will also be degraded but will still function as dispersal habitat since a minimum 40% canopy closure will be retained. Habitat in all other treated units would be downgraded from suitable habitat to dispersal habitat since the canopy closures will be reduced to 40-50%. A portion or all of units 2a, 4a-c, 6a, 8a-b, 9, and 27 are located within CHU OR-15. A total of 31.8 acres of critical habitat will be affected. Remnant old-growth trees, snags, down wood, and trees exceeding 30 inches DBH will be retained with additional down wood and snags created where needed to meet Forest Plan direction. Improving diversity and increasing vertical and horizontal stand structure will improve the quality of owl habitat.

The amount of habitat being affected in the home ranges of individual spotted owls is shown in Table ??.

greatest impact will be to owl pair 4462, due to 140 acres of suitable habitat being degraded or downgraded and 9 harvest units within 0.7 miles of the nest core. Recent Biological Opinions received from the U. S. Fish and Wildlife Service have recommend timber harvest be deferred within 0.7 miles of an active spotted owl nest between March 1 and September 30 to allow adult owls and their young to successfully utilize the core area for breeding, feeding, and sheltering prior to juvenile dispersal. Owl pair 4520 has 48 acres degraded or downgraded by thinning in its home range but only one unit occurs within 0.7 miles of it nest core. Owl pair 0670 has no units within its 0.7 mile core, but has 44 acres of suitable habitat in its home range downgraded to dispersal habitat from thinning. The amount of habitat remaining in individual spotted owl home ranges after this project is completed will exceed 40% (1182 acres) so disruption of essential breeding, feeding, and sheltering behaviors should be minimized. The greatest impact will likely be the short-term (preferably one season) impact of timber harvest within the 0.7 mile core of owl pair 4462. Units treated within this core area will remain at a minimum as dispersal habitat so spotted owls will continue to use this habitat following timber harvest.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to downgrading suitable habitat to dispersal habitat.

Alternative 3: This alternative proposes to regeneration harvest 43 acres of suitable owl habitat in units 1a, 1b, and 6a and downgrade 19 acres of suitable habitat in units 2a, 4a, and 24. The dispersal habitat in 2b (49 acres) will remain as dispersal habitat following treatment. Within the CHU, 3.8, acres of suitable habitat in units 2a and 4a will be downgraded to dispersal and 1.8 acres in 6a will be removed.

The amount of habitat being affected in the home ranges of individual spotted owls is shown in Table ??. The greatest impact will be to owl pair 4462, due to removing 34 acres and downgrading 19 acres of suitable habitat in 6 units in the home range. An additional 49 acres of dispersal habitat will be degraded in 2b. Six of the seven units being treated are within the 0.7 mile radius for this owl pair. Owl pair 4520 will have 28 acres treated in 5 units but none within the 0.7 mile core. There will be no habitat affected in the home range of owl pair 0670. There will be no habitat affected in the home range of owl pair 0670. The amount of habitat remaining in the two affected spotted owl home ranges following treatment will exceed 1182 acres.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to the removal and downgrading of suitable spotted owl habitat.

Alternative 4: This alternative proposes to regeneration harvest 26 acres of suitable in units 1a, 1b, and 4a and 49 acres of dispersal habitat in unit 2b. It will also downgrade 15 acres of suitable habitat in units 2a and 24. Within the CHU, 3.8 acres of suitable habitat in units 2a and 4a will be downgraded to dispersal habitat following treatment. The amount of habitat being affected in the home ranges of individual spotted owls is shown in Table ??.

The greatest impact will be to owl pair 4462, due to removing 17 acres of suitable habitat and downgrading 15 acres in the 1.2 mile home range radius. Three units are within the 0.7 mile radius but only 2b and 4a will be regeneration harvest, unit 24 will be downgraded. Owl pair 4520 will have 7 acres of habitat removed and 8 acres downgraded within the 1.2 mile home range. No acres within the 0.7 mile radius will be affected. There will be no habitat affected in the home range of owl pair 0670. The amount of habitat remaining in the two affected spotted owl home ranges following treatment will exceed 1182 acres.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to the removal and downgrading of suitable spotted owl habitat.

Table ??: Suitable Owl Habitat for Owl Pairs Affected by Action Alternatives.

Owl Pair	Acres of Suitable Habitat w/in 1.2 miles	Affected Acres Of Suitable Habitat w/in 1.2 miles**			Proposed Units within Home Ranges of Owl Pairs		
		Removed – Downgraded - Degraded			w/in 1.2 miles	w/in 0.7 miles	w/in 0.5 miles
		Alternative 2	Alternative 3	Alternative 4			
0670	1256	0 - 44 - 0	0 - 0 - 0	0 - 0 - 0	8b, 9, 27	0	0
4462	1780	0 - 106 - 34	34 - 19 - 0	17 - 15 - 0	1a, 2a, 2b*, 4a-c, 6a, 8a-b, 9, 24, 27	2b*, 4a-b, 6a, 8a-b, 9, 24, 27	4b, 6a, 8a, 9, 24, 27
4520	2206	0 - 34 - 14	16 - 12 - 0	7 - 8 - 0	1a, 2a, 2b*, 4a-c, 6a, 8a	4c	4c

*Dispersal habitat only – acres not included

** Numbers reflect overlaps in home ranges and therefore exceed total harvest acres described by alternative in the narrative. Some units are only partially within home ranges.

Hazard trees (snags and live defective trees) will likely need to be felled within the stands, adjacent to work areas, and along haul routes in both action alternatives. All hazard trees will be retained as down wood. Additional down wood and snags will be created as needed to meet Forest Plan direction. Habitat conditions for spotted owl prey species will be improved by the increased levels of snags and down wood.

Timber harvest activities under these 3 alternatives are expected to create disturbance to the three owl sites. All harvest activities, including log haul, will be scheduled outside the critical nesting season (March 1 - July 15) and, whenever possible, outside the 0.7 mile core areas July 15 – September 30. Timber harvest will likely occur over a two-year period due to snow conditions and the mandatory owl restriction period. Reproductive status of owl pairs 4462 and 4520 will be monitored during the years of harvest in order to minimize this disturbance during the latter part of the nesting season.

Cumulative Effects: Cumulative effects result from the incremental impacts of past, present, and foreseeable future actions that affect spotted owl habitat. Past timber harvest activities and road building have removed suitable spotted owl habitat and reduced interior forest habitat, due to edge effect of the created openings. Future harvest on public and private lands will have similar types of habitat effects on spotted owl habitat (described above). CHU OR-15 currently has 42,919 acres of which 45% (19,126 acres) is NRF habitat and 13% (5,540 acres) is dispersal habitat. Alternative 2 treats the most acres in the CHU (31.8 acres) but thinning these stands while retaining remnant old-growth trees, trees over 30 inches DBH, snags, and down wood, quality of this habitat will improve as the canopy increases. There are no additional habitat altering projects in suitable or dispersal spotted owl habitat currently being planned in the vicinity of this project at this time.

PEREGRINE FALCON

The peregrine falcon is a R-6 sensitive species that requires suitable cliffs with ledges for nest sites that are surrounded by a diversity of habitats to provide for prey species. Peregrine falcons will react to disturbances out to 3 air miles from the nest site (USDI, 1999).

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to peregrine falcons under this alternative.

Alternatives 2 - 4: Planned harvest activities will not impact potential nest sites. The light to moderate thinning and regeneration harvest planned in these alternatives will increase habitat diversity for Peregrine falcon prey species. Several of the proposed units are within 3 air miles of cliffs that could be used by peregrine falcons for nest sites. The cliffs have been surveyed to protocol in the past but no peregrine falcons were detected. With either seasonal restrictions or surveys during the year of operation, there should be no impact to peregrine falcons or cliff nesting habitat.

Cumulative Effects: Past timber management within the South Pyramid planning area has resulted in a variety of habitats surrounding suitable nest cliffs. This variety of habitats is likely beneficial in encouraging a range of bird species to provide peregrine falcon prey. This project will encourage plant and structural diversity within the units thereby improving habitat conditions for peregrine falcon prey species. There are no additional habitat altering projects being planned at this time within the South Pyramid planning area.

BAIRD’S SHREW

The Baird’s shrew (*Sorex bairdi permiliensis*) is a Region-6 Sensitive Species and endemic to Oregon (Verts and Carraway 1998).

Existing Condition

The Baird’s shrew is found in cool, moist areas, usually within coniferous or deciduous forests (Csuti 1997). They often utilize down wood or ground litter in riparian and uplands. They feed on a variety of invertebrate species. It is thought they occur on the Sweet Home Ranger District and possibly in the South Pyramid planning area, but have not been documented.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: It is undetermined what specific impact this project will have on individuals or the species population, but retention of no harvest stream buffers, less intense slash burns, and retention and creation of down wood and debris in this project will minimize impacts.

For the Baird’s shrew and its habitat, a “may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species” determination was made for alternatives 2 - 4. This impact should be of short duration.

Cumulative Effects: None expected

PACIFIC SHREW

The Pacific shrew (*Sorex pacificus cascadenis*) is a Region-6 Sensitive Species and is endemic to Oregon (Verts and Carraway 1998).

Existing Condition

The Pacific shrew prefers humid forests, marshes, and thickets, often near riparian vegetation. They require down logs, brushy thickets, or ground debris for cover and hiding (Csuti et. al. 1997). They have been found

in early successional forests. It is thought they occur on the Sweet Home Ranger District and possibly in the South Pyramid planning area, but they have not been documented.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: It is undetermined what specific impact this project will have on individuals or the species population, but retention of no harvest stream buffers, less intense slash burns, and retention and creation of down wood and debris in this project will minimize impacts.

For the Pacific shrew and it’s habitat, a may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species determination was made for alternatives 2 - 4. This impact should be of short duration.

Cumulative Effects: None expected

PACIFIC FRINGE-TAILED BAT

The Pacific fringe-tailed Bat (*Myotis thysanodes resperlini*) is a Region-6 Sensitive Species.

Existing Condition

The Pacific fringe-tailed bat occurs in the Cascade Range and Tillamook County in coniferous stands with numerous snags and large trees. Their distribution is patchy across their range. It is believed they forage insects off shrubs or the ground (Csuti et. al. 1997). This species is migratory and very sensitive to human disturbance. They are known to use caves. It is unknown if they occur on the Sweet Home Ranger District.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: Planned harvest activities may impact this species through habitat removal and disturbance. Increased ground and shrub cover, resulting from the reduction of the overhead conifer canopy, will benefit the Pacific fringe-tailed bat by improving habitat for prey species.

For the Pacific fringe-tailed bat and its habitat, a “may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species” determination was made for alternatives 2 - 4.

Cumulative Effects: None expected

PACIFIC FISHER

The Pacific fisher (*Martes pennanti*) is a Region 6 Sensitive Species.

Existing Condition

The Pacific fisher primarily use mature, closed canopy coniferous forest containing some deciduous component. They frequently use riparian corridors. They will use cutover areas as secondary habitat. Abundant snag and down wood habitat is important.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: Planned harvest activities may impact this species through reduction of the canopy and disturbance from logging. Retention of existing down wood plus the creation of snags and additional down wood will be beneficial to provide cover and to improve habitat for fisher prey species. Increased ground and shrub cover, resulting from the reduction of the overhead conifer canopy, will also improve habitat for prey

species.

For the Pacific fisher and its habitat, it may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species determination was made for alternatives 2 - 4. This impact should be of short duration.

Cumulative Effects: None expected

OREGON SLENDER SALAMANDER

The Oregon slender salamander (*Batrachoseps wrighti*) is a Region-6 Sensitive Species.

Existing Condition

The Oregon slender salamander typically occurs under bark and moss in mature and second-growth Douglas-fir forests (Csuti 1997). Bark heaps at the base of snags and down wood appears to be very important.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Oregon slender salamander under this alternative.

Alternatives 2 - 4: It is undetermined what specific impact this project will have on individuals or the species population, but retention of no harvest stream buffers, limited slash burning, and retention and creation of down wood and snags will minimize impacts to this species.

For the Oregon slender salamander and its habitat, it may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species determination was made for alternatives 2 - 4. This impact should be of short duration

Cumulative Effects: None expected

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BIOLOGICAL EVALUATION

INTRODUCTION

The South Pyramid Timber Sale proposes to commercially thin 189 acres of natural stands in alternative 2, commercially thin 68 acres and regeneration harvest 43 acres of natural stands in alternative 3, and commercially thin 15 acres and regeneration harvest 75 acres of natural stands in alternative 4.

Alternative 1 is the no-action alternative. A variety of thinning prescriptions will be used in alternatives 2 – 4 and all prescriptions will maintain a minimum 40% canopy closure after treatment. Regeneration harvest will remove all existing canopy with the exception of green tree reserve areas and green replacement trees for future snags. Additional projects included in the action alternatives are snag and down wood creation, road closures, stand improvement projects, sub-soiling, plus additional projects. See the Environmental Assessment for further information.

This analysis addresses the potential effects of Alternatives 1- 4 on Threatened, Endangered, and Sensitive (TES) species identified on the USDA Forest Service – Pacific Northwest Region TES lists updated July, 2004. Species that are documented or suspected to occur on the Willamette National Forest are identified in Table 1. Only those species that have suitable habitat in the South Pyramid Planning Area are discussed in greater detail.

SUMMARY OF EFFECTS

The northern spotted owl (*Strix occidentalis caurina*) is a threatened species known to occur within the South Pyramid planning area. Management activities identified in alternatives 2 – 4 “may affect, and are likely to adversely affect” northern spotted owls. This project was consulted on with the U.S. Fish and Wildlife Service and a Biological Opinion on received on September 29, 1998. The biological opinion concludes the finding of no jeopardy and no adverse modification of spotted owl critical habitat. The mandatory Terms and Conditions for this project are identified on pages 23 and 24.

The peregrine falcon (*Falcon peregrinus anatum*) is a R-6 sensitive species that may nest within or adjacent to the South Pyramid planning area. Surveys of suitable nest cliffs will be completed prior to conducting activities that may disturb nesting peregrine falcons. Restrictions will be required if nesting peregrine falcons are located. This project will have no impact on peregrine falcons.

Baird’s shrew (*Sorex bairdi permiliensis*), Pacific shrew (*Sorex pacificus cascadenis*), Pacific fringe-tailed Bat (*Myotis thysanodes respertinu*), Pacific fisher (*Martes pennanti*), and Oregon slender salamander (*Batrachoseps wrighti*) are R-6 sensitive species that may occur within the South Pyramid planning area. This project may impact individuals or their habitat.

The Cascade torrent salamander (*Rhyacotriton cascadae*), and Crater Lake tightcoil (*Pristoloma arcticum crateris*) are R-6 sensitive species that may occur within the South Pyramid planning area. Riparian buffers identified in the action alternatives should eliminate any impact to these species or their habitat.

Table 1: TES Species

Species	Step 1 Prefield Review	Step 2 Field Recon.	Step 3 Risk Assessment	Step 4 Analysis of Effect
Birds				
Spotted Owl	HP	Surveyed	Potential	MA-LAA
Bald Eagle	HNP			
Peregrine Falcon	HP	Surveyed	Potential	No Impact
Least Bittern	HNP			
Bufflehead	HNP			
Yellow Rail	HNP			
Black Swift	HNP			
Harlequin Duck	HNP			
Mammals				
Baird's Shrew	HP		Potential	May Impact
Pacific Shrew	HP		Potential	May Impact
Pacific Fringe-tailed Bat	HP		Potential	No Impact
Pacific Fisher	HP		Potential	May Impact
California Wolverine	HNP			
Herpetiles				
Foothill Yellow-legged Frog	HNP			
Oregon Slender Salamander	HP		Potential	May Impact
Cascade Torrent Salamander	HP		Potential	No Impact
Oregon Spotted Frog	HNP			
Northwestern Pond Turtle	HNP			
Insects				
Mardon skipper	HNP			
Mollusks				
Crater Lake Tightcoil	HP		Potential	No Impact

HP = Habitat present

HNP = Habitat not present

MA-LAA = May Effect, Likely to Adversely Affect

MA-NLAA = May Effect, Not Likely to Adversely Affect

DESCRIPTION OF AFFECTED SPECIES

NORTHERN SPOTTED OWL

The Northern spotted owl (*Strix occidentalis caurina*) is listed as a threatened species that is known to occur within the South Pyramid planning area. A critical habitat unit (CHU) and an area of concern (AOC) for this species have been identified within the planning area. The Northern spotted owl occurs primarily within older timber stands with sufficient forest structure to provide food, cover, suitable nest sites, and protection from predators and weather. Suitable spotted owl habitat refers to nesting, roosting, and foraging (NRF) habitat and generally consists of forested stands over 80 years old, multi-storied with sufficient snags and down wood, and canopy closure generally exceeding 60%. Late seral forest is superior habitat and preferred by spotted owls over other habitat conditions (Thomas et al. 1990). Spotted owls also use dispersal habitat to move between stands of suitable habitat and for juveniles to disperse from natal territories. Dispersal habitat does not have a multi-storied canopy, large trees or large snags and down wood. This habitat generally consists of mid-seral stands between 40 and 80 years of age with canopy closures of 40% or greater and trees with a mean diameter of 11 inches or more (USDI, 2005).

Spotted owls may be affected if habitat is modified within their medium home range of 1.2 mile radius around the nest tree or activity center. The U.S. Fish and Wildlife Service has determined that the reduction of suitable spotted owl habitat to less than 40% (1182 acres) of the median home range has a notably higher likelihood of leading to disruption of essential breeding, feeding, and sheltering behaviors (USDI 1990). Habitat modification may occur in three different ways: (1) Degrade habitat – affect the quality of suitable owl habitat or dispersal-only habitat without altering the functionality of such habitat, (2) Downgrade habitat – alter the functionality of suitable habitat so that it no longer supports nesting, roosting, and foraging, and (3) Remove habitat – alter suitable or dispersal-only habitat to such an extent that the habitat no longer supports nesting, roosting, foraging, or dispersal.

Spotted owls may also be affected by noise disturbance above ambient levels during the nesting season (March 1 – September 30). Disturbance can occur from any activity producing above-ambient noise within 0.25 miles (0.5 miles for aircraft and 1.0 mile for blasting) of owls during the nesting season.

The proposed units (Table 2) consist of mature, dense conifer stands containing trees of various heights and diameter classes. Old growth trees, large snags, and large down wood, remnants from the previous stand, are sparsely distributed within the units. Most units do not possess multiple canopy layers or have only a few acres with multiple canopy levels but, except for unit 2b, they all contain sufficient structure to provide suitable, if marginal, spotted owl habitat in each unit. Unit 2b is dispersal habitat only, even though a portion of the unit contains some large trees, snags, and down wood.

This project could affect habitat within the home range (1.2 mile radius) of three owl sites (0670, 4462, 4520) within the project area. One site is within the Quartzville Late-Successional Reserve (LSR), one site is maintained as a small LSR's with 100 acres of the best habitat protected around the activity center, and one site will have a 330 foot radius no-harvest protection buffer (FW-171) as identified in the Willamette National Forest Plan. Timber harvest will not occur within these areas.

Project effects on spotted owls are characterized as the loss or degradation of suitable or dispersal habitat within their home range and/or disturbance during the nesting season. Disturbance during the critical nesting period (3/1 - 7/15) could have a greater impact on spotted owls than disturbance during the remainder of the nesting season (7/15 - 9/30). Disturbance can occur from any activity producing above-ambient noise within 0.25 mile (1.0 mile for blasting and 0.5 mile for aircraft) of owl nests during the nesting season.

Unit	*Acres of NRF Habitat	Acres of Dispersal Habitat	Total Unit Acres
1a	19	0	19
1b	3	0	3
2a	8	0	8
2b	0	49	49
4a	4	0	4
4b	8	0	8
4c	11	0	11
6a	21	0	21
8a	13	0	13
8b	6	0	6
9	38	0	38
24	7	0	7
27	11	0	11
*Nesting, roosting, foraging habitat			

This project has been consulted on with the U.S. Fish and Wildlife Service. The Biological Opinion received (USDI 1998) allows timber harvest activities to occur after June 30 (or later if deemed necessary by an agency wildlife biologist) within a 0.25 mile radius (or further) of owl centers or unsurveyed habitat.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to spotted owls, spotted owl habitat, or spotted owl critical habitat. Habitat within the proposed units will continue to function as dispersal and/or suitable habitat. Mid-seral habitat within the units will continue to increase in quality through natural processes and eventually become superior owl habitat.

Alternative 2: This alternative proposes to commercially thin 140 acres of suitable owl habitat and 49 acres of dispersal habitat. Suitable habitat in units 6a and 8a will be degraded but still function as suitable habitat since a minimum 60% canopy closure will remain. Dispersal habitat in unit 2b will also be degraded but will still function as dispersal habitat since a minimum 40% canopy closure will be retained. Habitat in all other treated units would be downgraded from suitable habitat to dispersal habitat since the canopy closures will be reduced to 40-50%. A portion or all of units 2a, 4a-c, 6a, 8a-b, 9, and 27 are located within CHU OR-15. A total of 31.8 acres of critical habitat will be affected. Remnant old-growth trees, snags, down wood, and trees exceeding 30 inches DBH will be retained with additional down wood and snags created where needed to meet Forest Plan direction. Improving diversity and increasing vertical and horizontal stand structure will improve the quality of owl habitat.

The amount of habitat being affected in the home ranges of individual spotted owls is shown in Table ??.

greatest impact will be to owl pair 4462, due to 140 acres of suitable habitat being degraded or downgraded and 9 harvest units within 0.7 miles of the nest core. Recent Biological Opinions received from the U. S. Fish and Wildlife Service have recommend timber harvest be deferred within 0.7 miles of an active spotted owl nest between March 1 and September 30 to allow adult owls and their young to successfully utilize the core area for breeding, feeding, and sheltering prior to juvenile dispersal. Owl pair 4520 has 48 acres degraded or downgraded by thinning in its home range but only one unit occurs within 0.7 miles of it nest core. Owl pair 0670 has no units within its 0.7 mile core, but has 44 acres of suitable habitat in its home range downgraded to dispersal habitat from thinning. The amount of habitat remaining in individual spotted owl home ranges after this project is completed will exceed 40% (1182 acres) so disruption of essential breeding, feeding, and sheltering behaviors should be minimized. The greatest impact will likely be the short-term (preferably one season) impact of timber harvest within the 0.7 mile core of owl pair 4462. Units treated within this core area will remain at a minimum as dispersal habitat so spotted owls will continue to use this habitat following timber harvest.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to downgrading suitable habitat to dispersal habitat.

Alternative 3: This alternative proposes to regeneration harvest 43 acres of suitable owl habitat in units 1a, 1b, and 6a and downgrade 19 acres of suitable habitat in units 2a, 4a, and 24. The dispersal habitat in 2b (49 acres) will remain as dispersal habitat following treatment. Within the CHU, 3.8, acres of suitable habitat in units 2a and 4a will be downgraded to dispersal and 1.8 acres in 6a will be removed.

The amount of habitat being affected in the home ranges of individual spotted owls is shown in Table ??. The greatest impact will be to owl pair 4462, due to removing 34 acres and downgrading 19 acres of suitable habitat in 6 units in the home range. An additional 49 acres of dispersal habitat will be degraded in 2b. Six of the seven units being treated are within the 0.7 mile radius for this owl pair. Owl pair 4520 will have 28 acres treated in 5 units but none within the 0.7 mile core. There will be no habitat affected in the home range of owl pair 0670. There will be no habitat affected in the home range of owl pair 0670. The amount of habitat remaining in the two affected spotted owl home ranges following treatment will exceed 1182 acres.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to the removal and downgrading of suitable spotted owl habitat.

Alternative 4: This alternative proposes to regeneration harvest 26 acres of suitable in units 1a, 1b, and 4a and 49 acres of dispersal habitat in unit 2b. It will also downgrade 15 acres of suitable habitat in units 2a and 24. Within the CHU, 3.8 acres of suitable habitat in units 2a and 4a will be downgraded to dispersal habitat following treatment. The amount of habitat being affected in the home ranges of individual spotted owls is shown in Table ??.

The greatest impact will be to owl pair 4462, due to removing 17 acres of suitable habitat and downgrading 15 acres in the 1.2 mile home range radius. Three units are within the 0.7 mile radius but only 2b and 4a will be regeneration harvest, unit 24 will be downgraded. Owl pair 4520 will have 7 acres of habitat removed and 8 acres downgraded within the 1.2 mile home range. No acres within the 0.7 mile radius will be affected. There will be no habitat affected in the home range of owl pair 0670. The amount of habitat remaining in the two affected spotted owl home ranges following treatment will exceed 1182 acres.

A “may affect, and is likely to adversely affect” determination was made for this alternative due to the removal and downgrading of suitable spotted owl habitat.

Table ??: Suitable Owl Habitat for Owl Pairs Affected by Action Alternatives.

Owl Pair	Acres of Suitable Habitat w/in 1.2 miles	Affected Acres Of Suitable Habitat w/in 1.2 miles**			Proposed Units within Home Ranges of Owl Pairs		
		Removed – Downgraded - Degraded			w/in 1.2 miles	w/in 0.7 miles	w/in 0.5 miles
		Alternative 2	Alternative 3	Alternative 4			
0670	1256	0 - 44 - 0	0 - 0 - 0	0 - 0 - 0	8b, 9, 27	0	0
4462	1780	0 - 106 - 34	34 - 19 - 0	17 - 15 - 0	1a, 2a, 2b*, 4a-c, 6a, 8a-b, 9, 24, 27	2b*, 4a-b, 6a, 8a-b, 9, 24, 27	4b, 6a, 8a, 9, 24, 27
4520	2206	0 - 34 - 14	16 - 12 - 0	7 - 8 - 0	1a, 2a, 2b*, 4a-c, 6a, 8a	4c	4c

*Dispersal habitat only – acres not included

** Numbers reflect overlaps in home ranges and therefore exceed total harvest acres described by alternative in the narrative. Some units are only partially within home ranges.

Hazard trees (snags and live defective trees) will likely need to be felled within the stands, adjacent to work areas, and along haul routes in both action alternatives. All hazard trees will be retained as down wood. Additional down wood and snags will be created as needed to meet Forest Plan direction. Habitat conditions for spotted owl prey species will be improved by the increased levels of snags and down wood.

Timber harvest activities under these 3 alternatives are expected to create disturbance to the three owl sites. All harvest activities, including log haul, will be scheduled outside the critical nesting season (March 1 - July 15) and, whenever possible, outside the 0.7 mile core areas July 15 – September 30. Timber harvest will likely occur over a two-year period due to snow conditions and the mandatory owl restriction period. Reproductive status of owl pairs 4462 and 4520 will be monitored during the years of harvest in order to minimize this disturbance during the latter part of the nesting season.

Cumulative Effects: Cumulative effects result from the incremental impacts of past, present, and foreseeable future actions that affect spotted owl habitat. Past timber harvest activities and road building have removed suitable spotted owl habitat and reduced interior forest habitat, due to edge effect of the created openings. Future harvest on public and private lands will have similar types of habitat effects on spotted owl habitat (described above). CHU OR-15 currently has 42,919 acres of which 45% (19,126 acres) is NRF habitat and 13% (5,540 acres) is dispersal habitat. Alternative 2 treats the most acres in the CHU (31.8 acres) but thinning these stands while retaining remnant old-growth trees, trees over 30 inches DBH, snags, and down wood, quality of this habitat will improve as the canopy increases. There are no additional habitat altering projects in suitable or dispersal spotted owl habitat currently being planned in the vicinity of this project at this time.

PEREGRINE FALCON

The peregrine falcon is a R-6 sensitive species that requires suitable cliffs with ledges for nest sites that are surrounded by a diversity of habitats to provide for prey species. Peregrine falcons will react to disturbances out to 3 air miles from the nest site (USDI, 1999).

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to peregrine falcons under this alternative.

Alternatives 2 - 4: Planned harvest activities will not impact potential nest sites. The light to moderate thinning and regeneration harvest planned in these alternatives will increase habitat diversity for Peregrine falcon prey species. Several of the proposed units are within 3 air miles of cliffs that could be used by peregrine falcons for nest sites. The cliffs have been surveyed to protocol in the past but no peregrine falcons were detected. With either seasonal restrictions or surveys during the year of operation, there should be no impact to peregrine falcons or cliff nesting habitat.

Cumulative Effects: Past timber management within the South Pyramid planning area has resulted in a variety of habitats surrounding suitable nest cliffs. This variety of habitats is likely beneficial in encouraging a range of bird species to provide peregrine falcon prey. This project will encourage plant and structural diversity within the units thereby improving habitat conditions for peregrine falcon prey species. There are no additional habitat altering projects being planned at this time within the South Pyramid planning area.

BAIRD’S SHREW

The Baird’s shrew (*Sorex bairdi permiliensis*) is a Region-6 Sensitive Species and endemic to Oregon (Verts and Carraway 1998).

Existing Condition

The Baird’s shrew is found in cool, moist areas, usually within coniferous or deciduous forests (Csuti 1997). They often utilize down wood or ground litter in riparian and uplands. They feed on a variety of invertebrate species. It is thought they occur on the Sweet Home Ranger District and possibly in the South Pyramid planning area, but have not been documented.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: It is undetermined what specific impact this project will have on individuals or the species population, but retention of no harvest stream buffers, less intense slash burns, and retention and creation of down wood and debris in this project will minimize impacts.

For the Baird’s shrew and its habitat, a “may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species” determination was made for alternatives 2 - 4. This impact should be of short duration.

Cumulative Effects: None expected

PACIFIC SHREW

The Pacific shrew (*Sorex pacificus cascadenis*) is a Region-6 Sensitive Species and is endemic to Oregon (Verts and Carraway 1998).

Existing Condition

The Pacific shrew prefers humid forests, marshes, and thickets, often near riparian vegetation. They require down logs, brushy thickets, or ground debris for cover and hiding (Csuti et. al. 1997). They have been found

in early successional forests. It is thought they occur on the Sweet Home Ranger District and possibly in the South Pyramid planning area, but they have not been documented.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: It is undetermined what specific impact this project will have on individuals or the species population, but retention of no harvest stream buffers, less intense slash burns, and retention and creation of down wood and debris in this project will minimize impacts.

For the Pacific shrew and it’s habitat, a may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species determination was made for alternatives 2 - 4. This impact should be of short duration.

Cumulative Effects: None expected

PACIFIC FRINGE-TAILED BAT

The Pacific fringe-tailed Bat (*Myotis thysanodes resperlini*) is a Region-6 Sensitive Species.

Existing Condition

The Pacific fringe-tailed bat occurs in the Cascade Range and Tillamook County in coniferous stands with numerous snags and large trees. Their distribution is patchy across their range. It is believed they forage insects off shrubs or the ground (Csuti et. al. 1997). This species is migratory and very sensitive to human disturbance. They are known to use caves. It is unknown if they occur on the Sweet Home Ranger District.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: Planned harvest activities may impact this species through habitat removal and disturbance. Increased ground and shrub cover, resulting from the reduction of the overhead conifer canopy, will benefit the Pacific fringe-tailed bat by improving habitat for prey species.

For the Pacific fringe-tailed bat and its habitat, a “may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species” determination was made for alternatives 2 - 4.

Cumulative Effects: None expected

PACIFIC FISHER

The Pacific fisher (*Martes pennanti*) is a Region 6 Sensitive Species.

Existing Condition

The Pacific fisher primarily use mature, closed canopy coniferous forest containing some deciduous component. They frequently use riparian corridors. They will use cutover areas as secondary habitat. Abundant snag and down wood habitat is important.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Baird’s shrew under this alternative.

Alternatives 2 - 4: Planned harvest activities may impact this species through reduction of the canopy and disturbance from logging. Retention of existing down wood plus the creation of snags and additional down wood will be beneficial to provide cover and to improve habitat for fisher prey species. Increased ground and shrub cover, resulting from the reduction of the overhead conifer canopy, will also improve habitat for prey

species.

For the Pacific fisher and its habitat, it may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species determination was made for alternatives 2 - 4. This impact should be of short duration.

Cumulative Effects: None expected

OREGON SLENDER SALAMANDER

The Oregon slender salamander (*Batrachoseps wrighti*) is a Region-6 Sensitive Species.

Existing Condition

The Oregon slender salamander typically occurs under bark and moss in mature and second-growth Douglas-fir forests (Csuti 1997). Bark heaps at the base of snags and down wood appears to be very important.

Alternative 1 – No Action: There will be no direct, indirect, or cumulative effects to Oregon slender salamander under this alternative.

Alternatives 2 - 4: It is undetermined what specific impact this project will have on individuals or the species population, but retention of no harvest stream buffers, limited slash burning, and retention and creation of down wood and snags will minimize impacts to this species.

For the Oregon slender salamander and its habitat, it may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species determination was made for alternatives 2 - 4. This impact should be of short duration

Cumulative Effects: None expected

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I. COVER INFORMATION

Reply to: 2550 Soil Management
2520 Watershed Protection and Management

Subject: Soil and Watershed Report
South Pyramid Timber Sale

To: District Ranger, Sweet Home Ranger District
ATTN: Brian McGinley, Planner

By: Douglas C. Shank, District Geologist

Date: March 14, 2003

I. INTRODUCTION

A. Summary

The Sweet Home Ranger District of the Willamette National Forest has determined that a need exists to implement Forest Plan direction and conduct timber harvest and other silvicultural activities on suited and available lands within the Matrix land allocation in the Pyramid Creek subwatershed for the purpose of:

1. Contributing wood fiber toward the District's timber target by harvesting 100 to 200 acres with partial or regeneration silvicultural treatments;
2. Reducing stocking levels in at least 40 to 50 acres currently with high relative density, to lessen competition for nutrients, sunlight, and growing space;
3. Improving the growth and vigor of the remaining trees resulting in healthier stands of trees that are more resistant to insects and disease and to reduce future losses from fire;
4. Thinning the smaller diameter, suppressed trees before they die for use as commercial wood products and to reduce long-term fuel buildup and fire risk.

Intensive field reconnaissance of the proposed units revealed no significant concerns for the protection of the soil and geology resource. With normal soil protection measures and mitigations, all appropriate standards and guides can be met.

B. Proposed Action & Connected Actions

The District Ranger for the Sweet Home Ranger District of the Willamette National Forest proposes to implement the following actions during the next year or two on up to 200 acres within various management allocations. The project includes the following proposed actions:

- numerous parts or portions of stands, varying in size from about 4 to 49 acres, could be treated with a thinning or regeneration harvest to improve the growth and vigor of the remaining trees or start new stands.
- Harvested trees could be removed under a timber sale contract with a combination of ground based, skyline, or helicopter logging systems. No new roads would need to be constructed. Reconstruction of selected sites on existing system roads may be required.
- Slash would either be retained for nutrient development or treated by a combination of hand and/or grapple piling, or broadcast burning.

C. Regulatory Framework

1. **Laws and Regulations** -- 36 C.F.R. 219.14(a) directs the Forest Service to classify lands under their jurisdiction as not suited for timber production if they fall into any of four categories: 1) Non-forest, 2) Irreversible soil or watershed damage (from NFMA 6(g)(3)(E)(i)), 3) No assurance of reforestation within five years, and 4) Legislatively or administratively withdrawn. This report considers the first three categories of land. On the Willamette National Forest these areas are defined by land type, which will be explained later in this report.
2. **Regional Guidelines** -- Forest Service Manual R-6 Supplement No. 2500.98-1 (Title 2520 – Watershed Protection and Management) clarifies direction for planning and implementing activities in areas where soil quality standards are exceeded from prior activities; redefines soil displacement; provides guidance for managing soil organic matter and moisture regimes. In addition, the USDA FS Pacific Northwest Region handbook on General Water Quality Best Management Practices (November, 1988) provides a guide about practices which are applicable in conducting land management activities to achieve water quality standards to ensure compliance with the Clean Water Act, as amended, and Oregon Administrative Rules.
3. **Forest Plan Direction** – Chapter IV of the Willamette Forest Plan states the Forest-wide Standards and Guidelines for a variety of resources and activities. Soil and Water Quality protection are addressed in the section from FW-079 to FW-114. Based on direction in the Forest Wide Standards and Guides, FW-079 and FW-080 and BMP T-1, T-2 and T-3, the following activities were performed as part of the planning process: A. verifying the present SRI land type boundaries; B) determining the location of unsuited and unmanageable land types; C) prescribing slash treatment and suspension objectives for the possible units; and D) evaluating potential watershed impacts from management of the timber resource.

D. Procedures and Methodology

On numerous days throughout the 1998 and 1999 field seasons, I conducted a field reconnaissance of potential harvest units for the South Pyramid project, at the request of Brian McGinley, Sale Planner. The major portion of this aspect of the field investigation was directed at distinguishing the various identifiable landtype components within the study area and mapping them on the photo overlays. The information was then transferred to registered overlays in order to represent the data on a standard map base. Too large to be included with this report at a meaningful scale, a complete copy of the remapped SRI landtypes for this particular project area is on file at the GIS (Geographic Information Systems) facility on the Sweet Home Ranger District. In general, the field investigation confirmed some of the original 1973 SRI designations, but considerable refinement and subdivision of the various boundaries were developed. Many of the landtypes have several components which were not separated in the original SRI because of the small mapping scale that was utilized (one-inch-equals-one-mile). My field investigation of landtypes and their

specific attributes formed the basis for the site- specific recommendations and mitigations that follow in this report.

E. Description and Discussion of Landtypes

- 1. Unsited and unmanageable landtypes** have been delineated within the project area as part of the landtype mapping process (FW-180). Unsited and unmanageable landtypes occur in two basic categories - those acres that are unregenerable and those where harvest will cause irreversible impacts. Those landtypes which are considered to have regeneration difficulties (BMP T-20) could include 1, 2, 3, 4, 5, 6, 7, 62, 210, 310, 610, and 710 or combinations of these landtypes. Almost all have numerous rock outcrops and cliffs, shallow gravelly soils with rock fragment content generally greater than 70%, and talus. Landtypes 6 and 7 are wet and dry meadows, respectively, and most areas of Landtype 6 are considered "wetlands" (BMP T-17 and W-3). All are currently considered noncommercial forest land or nonreforestable in the five-year time frame. Officially, 210, 310, and 610 are defined as marginally reforestable at least to extensive levels on easterly and northerly aspects, and nonreforestable in the five-year time frame on southerly and westerly aspects. However, almost no successful timber management has ever occurred on any aspect related to these specific landtypes on the Sweet Home District. Consequently, the north and east aspects of 210, 310, and 610 are considered unmanageable (no sufficient assurance of regeneration within the five year time frame) land in this report.
- 2. Landtypes considered unsited because harvest will result in irreversible resource damage** are primarily those that are actively unstable or potentially highly unstable (FW-105, BMP T-6). They could include the primary Landtypes 25 and 35, and the complexes of 255 (25 plus 35), 256, and 356. Landtypes 256 and 356 have actively unstable areas very closely associated and generally in direct contact with stream riparian areas or stream courses. These areas all commonly display slump type topography and include such features as tension cracks, bare soil scarps, leaning and fallen trees, sags and depressions, seeps, and disrupted drainages. Failure depths are such that root strength probably has little affect. However, the instability problem can be aggravated by timber harvest, as removing the trees tends to raise ground water levels due to the loss of evapotranspiration. This in turn reduces the soil strength and can cause increased or renewed instability. Other landtype complexes that contain elements of 25 or 35, such as 251, need to be evaluated on a case by case basis as management activities are proposed.
- 3. Landtype complexes**, such as 13-212 or 212-214 have elements of both landtypes that were either not differentiateable at the photo scale, or sufficient field time was not available to distinguish the various components.

4. The **remaining landtypes** are adequately discussed in the Soils Resource Inventory. This document, first developed in 1973 and updated in 1990, was made to provide some basic soil, bedrock and landform information for management interpretations in order to assist forest land managers in applying multiple use principles. A copy is on file at the Sweet Home Ranger District.

III. EXISTING CONDITION and AFFECTED ENVIRONMENT

The Pyramid Creek subwatershed, located within the upper Middle Santiam landform block, lies completely within the Western Cascades physiographic region, and is composed primarily of older Tertiary lava flows, tuffs and breccias generally from 32 million to 17 million years old. Also included within this strata are mudflow (lahar) deposits and massive to fine bedded, fine to coarse grained tuffaceous sedimentary rocks and volcanic conglomerates (Walker and Duncan, 1989). The clastic or sedimentary portion of the assemblage forms a prominent escarpment along the northern boundary of the watershed from Knob Rock east to Trappers Butte. In addition, younger andesite and basalt flows generally form a broad crescent-shaped cap on the higher elevation main ridges that extend east from Swamp Mountain to Scar Mountain, south to the Pyramids, Crescent Mountain, North Peak, South Peak, and Iron Mountain, and finally back towards the west to end at Harter Mountain. This flow unit lies unconformably on the older Tertiary deposits and ranges in age from 17 million to 10 million years old. Overlying these broad upland deposits are even younger, ridge capping basalt flows of the early High Cascade volcanic sequence that range in age from about 10 to 1 million years (Walker and Duncan, 1989).

The surface expression of these rock formations has been extensively modified by erosion since late Pliocene time, especially with Pleistocene to Holocene glacial activity and slope instability. Glacially derived soils are common to the higher elevation tablelands, especially at the headwaters of Pyramid and South Pyramid Creek. Ice cap glaciers probably covered the High Cascade platform to the east of this watershed many times during the Pleistocene, sometimes with sheets of ice hundreds of feet thick. During the early and most extensive glacial periods, valley glaciers surged away from the large ice mounds along the Cascade crest and traveled west down the Pyramid drainage as they acted as outlets for excess ice accumulation for the large ice platforms to the east. More recent late Pleistocene glaciations were likely much smaller and localized valley glaciers carved cirques on the north and east aspects of the higher peaks. However, evidence for much of this is scanty, as it has been obscured by subsequent large-scale slope instability.

The rocks and strata of the older Tertiary volcanics weather to form deep colluvial and residual soils that can give rise to unstable soils. Stabilized slump earth flow features, such as sag ponds, bench and scarp topography, and disrupted drainages are common throughout this project area. It seems likely that slump / earthflow instability has been a significant factor in slope development and stream channel morphology for the last several thousand years, certainly since the end of the Pleistocene. In many

drainages, localized areas of active instability still remain as remnants of these once mighty earth flow systems.

This complex relatively recent geologic history has produced a myriad of diverse landforms and soils. In general soils on these side slopes have been stable and productive for at least several hundreds of years. Soils formed either directly on the underlying volcanic bedrock, on the extensive glacial deposits, or on the jumbled combinations of the two formed in the slump complexes. Both types have similar size gradations that range from silt loams to gravelly or cobbly sandy loams. Depth to bedrock, when it is present, is usually around 5 to greater than 10 feet. The various landtypes are generally well drained where permeability is rapid in the surface soils, and rapid to slow in the subsoil. Because of high infiltration rates, overland flow is generally uncommon. In the proposed units, side slopes range from near zero to about 80%, but are generally less than 40%. Offsite erosion is generally not a concern because of the extensive vegetative ground cover and usually gentle side slopes.

Much of this drainage was burnt in an extensive stand replacement fires approximately one hundred to two hundred years ago. Some areas were likely reburnt or underburnt in fires since then. These fires consumed considerable amounts of the above ground organic matter, and a wide range in the above ground tonnage of decomposing organic matter now exists. The older timber harvest plantations display a commensurate removal of above ground nutrient matter similar to the large fires. More recent timber harvest has generally retained about as much organic matter as is displayed in the less intensive fire regimes.

Road development in this subwatershed is less extensive than adjacent areas, and large blocks of unroaded forest still remain near the project area. The roads that have been constructed for the most part are located on stable benches, flats or ridges. Few if any side cast roads exist, and most road cuts and fills are heavily vegetated. Consequently, erosion from roads is not considered a concern.

All the proposed units are located within stands that have had no previous management activity. Consequently cumulative effects from past logging entries are not a concern.

IV. ISSUES and CONCERNS

A. Key Issues

Key issues are those that will drive alternative formulation. Given that, no soils or geology issues exist for the proposed action. All action alternatives will contain the same soil protection measures.

B. Concerns

The proposed units are located on stable, productive terrain with few regeneration problems. Unsited, unregenerable soils have been avoided with project planning and the potential for insufficient survival with regeneration harvest is not a concern. Potentially or actively unstable terrain has been located with the soil mapping process and for the most part avoided. Given the retention of a live intact root mat with the thinning alternative and other mitigations, the potential for management induced slope instability though present, is low. It will be discussed further later in this document. All units show considerable potential for regeneration of conifer and brush. With standard mitigation measures, the potential for excessive disturbance and off-site erosion is not a concern

The field review indicated that previous adverse impacts of harvest from compaction or skyline yarding are not present. The potential for cumulative significant adverse effect from ground-based systems with this proposed entry is not present if applicable standards and guides are followed. The potential for cumulative significant adverse impact from skyline yarding, since it affects less than 1% of the ground, is not a concern.

Fire is a natural ecological component of the Cascade Range ecosystem. Fire recurrence intervals of 100 to 200 years are apparent in the natural system, with shorter intervals recorded in some critical high lightning areas. Fire suppression in the last century has interrupted that natural cycle in much of the West Cascades. Considering one aspect of long term productivity – nutrient recycling, thinning with little or no slash treatment is the preferred scenario at this point in time in order to allow for additional buildup of organic matter and duff in the soil. On the other hand, NO ACTION IS NOT considered beneficial for long-term soil productivity either. Overstocked stands will rapidly see density increase, growth slow, and mortality rise. Fuel accumulations from blow down, snow down, and bug kill provide an ever-increasing amount of fuel loading. The actual thinning or harvest of these units is not as much concern as the concomitant slash and natural fuel accumulation and the potential for wild fire. Considerable evidence has shown that uncontrolled fire at high fuel loadings can significantly increase fire severity and cause nutrient loss, and nearly permanent soil damage. This concern is compounded by the condition that this project area is near a popular camping and tourist attraction, and this section of the District has a high incidence of lightning initiated fires. Consequently, activities that reduce stocking levels, improve stand vigor, and reduce excessive fuel loading over the long term, are favored.

V. DIRECT and INDIRECT EFFECTS

The major short-term impacts to soil productivity from harvest activity, as discussed in the Willamette National Forest Final Environmental Impact Statement (FEIS 1990), include displacement, compaction, nutrient loss, and instability. In most situations, preventing soil impacts is the most effective and feasible way of ensuring long-term (post harvest) soil productivity. The following sections discuss in more detail (1) how the various alternatives may affect the soil resource or (2) mitigations that can be utilized to avoid potentially undesirable effects. In summary, the direct effects by the any action alternative on the soils resource are very limited in scope. There are no concerns from a cumulative effect standpoint as long as the standards and guides are adhered to and controls are in place to ensure that this does occur.

Alternative 1. No Action Alternative

Stands will continue to develop. Intermediate and suppressed trees would slowly be removed from the stand through mortality and decay. In areas of heavy stocking, stands would stagnate. Overstocked stands will rapidly see density increase, growth slow, and mortality rise. Fuel accumulations from blow down, snow down, and bug kill would continue to increase. Short-term impacts from harvest, such as soil disturbance and compaction, dust, noise and slash accumulation, would not occur.

Action alternatives:

Alternative 2 focuses on thinning mid-seral stands to improve stand vigor and growth while avoiding the loss of dispersal habitat. Alternative 3 meets the same volume objectives with fewer harvest acres and with both thinning and regeneration harvest. Alternative 2 operates on 189 acres, Alternative 3 requires about 111 acres and Alternative 4 operates on 86 acres. On a per acre basis, where logging activity is proposed with ground based harvesting, all action alternatives will require the development of a similar skid road system. The volume removed in these alternative is sufficient to compact the ground, and the effects to the soils for the action alternatives are considered similar. Alternatives 3 and 4 operate on fewer acres, but this factor of total acres, in and of itself, is not considered an effect to the soil resource and in this case, is not cumulatively significant.

Considering fuel reduction, again Alternative 2 operates on more acres, but would tend to leave more fuel, as it is a thinning. Alternatives 3 and 4 harvest fewer acres, but the proposed broadcast burns in the regeneration cuts would remove more fuel. As before, both options are roughly similar from a soil perspective.

A. Displacement

To maintain long-term soil productivity, Willamette National Forest Land and Resource Management Plan (LRMP) Standards and Guides require that the total acreage of all detrimental soil conditions not exceed 20% of the total land within each harvest unit, including skid roads and landings. The logging

suspension requirement for a proposed unit is mandated in the LMRP to protect the soil from excessive disturbance or displacement (FW-081 and BMP T-12). The area near tail trees and landings is generally excluded from this suspension constraint. Unless otherwise stated or mitigated, all designated streams require full suspension or yarding away from the stream course during the yarding process (FW-092). All ground based yarding will require LTSR (Located Tractor Skid Road), and/or line pulling and directional falling, as appropriate. In a related manner, parts of some units have areas of gentle to moderate side slopes (30 to 45%) where falling with a ground-based processor with swinging head is feasible, but they are too steep for forwarder operation. Since research and monitoring have shown that, when properly implemented, processors cause almost no disturbance or compaction, processor falling is generally considered an acceptable practice under the appropriate weather conditions and with the preapproval of the Timber Sale Officer. Note that these steeper portions of some units, which may be processor felled, would still be skyline yarded. Generally, yarding away from internal streams is preferred. When that is not feasible, yarding with full suspension over the stream and immediately adjacent riparian area is required.

B. Compaction

The major source of compaction (and also much disturbance) is ground-based skidding equipment. Unrestricted tractor yarding and tractor piling are not considered an option on those landtypes where sideslopes are gentle enough (generally less than 30%) to support tractor usage (BMP T-9 and VM-1, and FW-083). The silty nature of the fine-grained soils, and evidence that significant soil moisture is available most of the year indicate that any type of unrestricted tractor yarding and piling (even low ground pressure) would lead to unacceptable soil compaction and/or disturbance. Restricted tractor yarding from predesignated skid roads is considered an option if the adversely affected area is less than 15% of the activity area (BMP T-11). With tractor yarding, skid roads are predesignated, approved in advance of use by the Timber Sale Officer and generally 150 to 200 feet apart. With a processor/forwarder system the skid roads are usually only about 50 to 60 feet apart, but the number of trips for each individual road are substantially less than with skidding. Tractor operations are generally restricted to side slopes less than 30%, but in site specific instances slopes to 40% may be acceptable, if preapproved by the Timber Sale Officer. Monitoring has shown that when designated skid roads are properly utilized in conjunction with line pulling and directional falling, compaction from ground based tractor operations generally remains at about 9 to 12%. Skyline operations in thinning units with small wood and intermediate supports impact considerably less than 1% of the unit area.

C. Nutrient Loss:

Duff Retention is the percent of effective ground cover (generally considered the duff and litter layer and based on the existing premanagement condition) that needs to remain after cessation of management activities (FW-084 and FW-085) in order to minimize nutrient loss, and to protect against erosion (BMP T-2 and F-3). In most cases since fire is a natural component of the west Cascades ecology, broadcast burning appears to be an acceptable slash treatment alternative, but nonburning options should also be

considered (FW-250 and FW-251). Another aspect of long term nutrient availability and ectomycorrhizal formation is the amount of larger woody material retained on site. Management activities will be planned to maintain enough large woody debris (dead and down) to provide for a healthy forest ecosystem and ensure adequate nutrient cycling (FW-085). At this time, site specific needs will be considered commensurate with wildlife objectives as outlined in FW-212a and FW-213a (as amended). In most instances, PUM yarding is not recommended in order to provide for the retention of additional woody debris to further minimize sloughing and raveling on the steeper slopes (FW-084), and to provide for added nutrient recycling (FW-085) and wildlife habitat (FW-212a). Grapple piling (on the gentler slopes), the minor spot burning of concentrations, or hand pile and burn may be another options to evaluate. This will have to be considered on a case-by-case basis in conjunction with silvicultural and slash treatment objectives.

On typical thinning, hand piles number about 40 per acre and occupy about 20 square feet per pile for a total of about 800 square feet per acre or about 1.8% per acre. Burning the piled slash may develop sufficient heat to affect the underlying soil. However, pile burning is usually done in the spring or winter months when duff and soil moistures are higher, and this helps reduce the heat effects soil. Consequently, burning in this manner is considered a minor effect when considering the limited overall acreage involved and is not cumulatively significant.

Grapple piling may be utilized in some units. These machines generally proceed in an orderly manner through a unit and require only one pass to complete their task. When working, they almost always utilize existing skid roads, or sit on concentrations of slash. They are similar in operation to a processor in a processor / forwarder system. Extensive monitoring of both processor and grapple operations has shown that excessive compaction is very limited to nonexistent. Consequently, this is not considered a cumulative concern.

The analysis for burning grapple piles is similar to the previous discussion for hand piles. Grapple piles are much larger than hand piles, but correspondingly, there are fewer of them, perhaps only 5 to 10 per acre. Consequently, the acreage affected remains about the same, and grapple pile burning is not considered significant.

D. Instability

The South Pyramid project area, located in the Western Cascades physiographic province, lies on both steep stable sideslopes of eroded Tertiary volcanic strata and more gently sloping fluvioglacial deposits from Pleistocene glaciation. The present topography is predominately the result of large scale slope instability from slump/earthflows that occurred many hundreds to thousands of years ago. These slumps have now stabilized and very little actively unstable ground remains in the project area. For example, the 1996 storm brought few changes to the landscape. Only a couple of small shallow soil failures (less than one quarter acre) were observed near the project area from that storm. Potentially unstable soil areas

generally involve small (less than one tenth acre) soil pockets on steep sideslopes along incised drainages. These areas were avoided as part of the location of proposed units, except for Unit 27.

Unit 27 is bisected by a distinct band of soils that is, in part, considered potentially highly unstable, not suited. This designation includes landtypes that are prone to debris chute or small slope failures, and root strength is commonly a stabilizing factor. In this particular instance, a steeper, but narrow, slope break extends through the unit. It appears that after the catastrophic fires that established this stand, an occasional small soil failure moved off this slope and dropped to the bench below. Important points are as follows:

1. These failures were limited in size, usually less than 1/20 of an acre;
2. They contained from 50 to 150 cubic yards of soil material;
3. They extended down slope approximately 50 to 150 yards and stopped on a stable bench;
4. They restabilized and were naturally regenerated with Douglas fir second growth;
5. They occur intermittently within a specific and distinct band of soil on which Unit 27 sits.
6. Tree root strength and evapotranspiration play an important role in maintaining slope stability.

Unit 27 is proposed for thinning which is viewed as promoting long-term slope stability. Thinning promotes tree growth. Crowns increase in size and root systems expand. These factors all promote greater slope stability. Field review of previously thinned units has shown no increase in slope instability in either the uplands or riparian reserves. An intact root mat will be maintained throughout the unit. In addition, critical areas on the steeper, sensitive slope will either not be marked for thinning or only marked lightly. Thinning and removal of suppressed trees will promote a stand with greater root and crown growth. Leave trees will become larger, more vigorous, and stress resistant. Existing rates of evapotranspiration will be maintained and increase over time. These factors should maintain or enhance long-term slope stability in this sensitive area.

E. Transportation System

Existing, rocky roads access almost all units. For the most part, ditches and cut banks are overgrown with vegetation and show little or no active erosion. Most routes have ditch relief culverts, though some may need maintenance. Occasionally, a few water bars may also be present. Most roads have solid subgrades, which are suitable for dry season haul with perhaps a little spot rocking in a few critical areas. Extended season or wet weather haul may require additional rocking of some local access roads. At the completion of logging activities, these roads should be storm proofed with water bars as appropriate to control seepage or storm run-off. In summary, maintenance of the transportation system for this sale will maintain slope stability, will produce little or no off-site erosion, and will provide opportunity to improve road drainage in selected areas.

VI. INDIRECT AND CUMMULATIVE EFFECTS ASSESSMENT

The effects by the action alternatives on the soils resource are very limited in scope. At this time, no single unit of measure of long-term (post harvest) soil productivity is widely used. Information on the survival and growth of planted seedlings may indicate short-term changes in site productivity. However, the relationship between short-term (life of the timber sale) changes and long-term (post harvest) productivity is not full understood at present. Experience indicates that the potential impacts on soils are best evaluated on a site-specific, project-by-project basis. The major soils concerns – compaction, nutrient loss, displacement, and instability – are most effectively evaluated, for both short and long term effects, at the project level. With proper project implementation, as specified by my recommendations, unacceptable cumulative effects on the soils resource are not anticipated from any action alternatives. Consequently, the utilization of soil protection measures and best management practices as defined in this report will generally preclude the need for additional cumulative effects analysis. Deviations from the standards and guidelines would be the primary trigger for additional cumulative effects review, and no deviations are planned.

VII. MITIGATION MEASURES, by unit and common to all action alternatives

These recommendations were developed based on direction in the Forest Wide Standards and Guides (primarily FW-079, FW-090 and FW-179) to maintain or enhance soil productivity and stability, and to reduce or eliminate off-site erosion. This data table addresses suspension requirements and duff retention objectives, as well as pertinent specific comments for particular units (where necessary). A description of suspension options follows:

Tractor: ground based equipment is acceptable with LTSR (locate tractor skid roads) as a minimum requirement (BMP T-11). Also tractor operations should not generally occur on slopes greater than 30% (FW-083). Refer to Section C for a more in depth discussion of ground based systems.

- Cable: Cable yarding is recommended but log suspension is not required.
- Partial: Skyline yarding with one end of the log suspended off the ground.
- Full: Full suspension of the log from log bed to landing is required.
- Cable/Tractor: Either is acceptable depending on other resource constraints.
- Partial/Cable: Either is acceptable depending on other resource constraints.
- P, some C: Partial is the desired suspension requirement, but some ground lead is acceptable in particular areas.
- Partial-Full: Partial suspension is the minimum suspension requirement. Full suspension, although not necessary, is desirable.

Unit	SRI	Suspension	Duff Retention(%)	Comments
1A	55	P, some C	40-60	Some ground based yarding.
1B	212	Partial	50-70	
1C	55	P,some C	40-60	Some ground based yarding
2A	13-212, 55	Partial	50-70	
2B	201, 13-212, 13	Partial	50-70	
4A	135	P, some C	40-60	
4B	135	P,some C	40-60	
4C	136, 444	Partial	40-60	
5	135	P, some C	40-60	
6A	135, 214-446	P,some C	40-60	
6B	135	P, some C	40-60	
6C	135, 202	P, some C	50-70	
7A	135	P, some C	40-60	
7B	135, 441	Partial	50-70	
8A	135	Tractor/Cable	30-50	Yarding depends on sideslope.
8B	135	P, some C	40-60	Some areas of tractor available.
9	44, 214, 135, 55, 13	Partial	50-70	
14A	55	Cable/Tractor	30-50	Yarding depends on sideslope.
14B	55	Cable/Tractor		Yarding depends on sideslope.
14C	55	Cable/Tractor	30-50	Yarding depends on sideslope.
16A	55	P, some C	40-60	Some tractor available.
16B	55	P, some C	40-60	Some tractor available.
24	13, 19	Partial	50-70	
25A	135	P, some C	30-50	
25B	135	P, some C	30-50	
26	135	Partial	40-60	
27	135, 44-252	Partial	50-70	

IMPORTANT NOTES:

1. Some possible units may not be proposed in any action alternative.
2. All ground-based harvest requires LTSR – Locate tractor skid road, in the contract.
3. On many units, helicopter yarding may be required contractually to reduce the need for an expanded transportation system. This is desirable because it minimizes soil disturbance, but it is not required for adequate soil protection.

Other mitigation measures that are common to all Action Alternatives:

1. Ground-based equipment should generally operate in the dry season, generally considered May through October, unless otherwise restricted by other resource concerns or agreed to by Forest Service personnel.
2. Harvested trees should generally be topped and limbed in the units in order to provide for nutrient recycling and control of ravel and slough on steep side slopes.
3. Ground-based equipment shall generally be limited to slopes less than 30%, unless otherwise directed by Forest Service personnel, in order to reduce soil disturbance.
4. Ground-based skidding equipment or forwarders shall stay on designated skid trails. Ground-based skid trails will be predesignated and preapproved before use (LTSR). They should not exceed 15 feet in width, and where practical the skidder, cat or processor/ forwarder should travel on slash. Traveling on slash has been shown to reduce off site soil erosion or lessen soil compaction.
5. Partial or one end suspension is required on skyline units, except at tail trees and landings. Given the uneven terrain in some units, small areas of ground lead may occur along ridge lines or benches.
6. The reopening of temporary, unclassified roads should occur in the dry season, June through October to avoid surface erosion from exposed soil. Open roads should be storm proofed if they have to set through extended periods of wet weather.
7. Where practical, at the completion of harvest activities, limbs and woody debris should be placed on areas of exposed soil to reduce the potential for off-site soil erosion, unless these areas are designated for future subsoiling.
8. Unclassified or temporary roads used outside the standard operating season, may need to be rocked to reduce the potential for off-site erosion.
9. Cable corridors spacing should be set to both minimize damage to vegetation as well as the underlying soil.
10. Trees, not designated for harvest in riparian buffers that need to be cut to facilitate harvest operations, should be dropped into the stream if possible to aid in woody debris recruitment.
11. Avoid disturbance to the existing down woody debris as much as is practical.
12. At the completion of harvest activities, tractor skid roads (existing or created) and landings that are not part of the dedicated transportation system or established for other future use, should be adequately subsoiled with a "Forest cultivator" or an equivalent winged ripper in order to return the site to near original productivity, unless otherwise waived by the Forest Service. This can be accomplished either by the timber sale contractor or through the KV process.

Prescriptions for soil protection, watershed considerations and riparian needs of the sub-basin take into account past and predicted future land management activities. The soils mitigation measures, as well as the streamside management zones, are designed to provide a level of riparian habitat protection and erosion control that is consistent with the standards and guidelines of the Willamette National Forest's Land and Resource Management Plan. On-site sedimentation is anticipated to be within National Forest and Oregon State Guidelines. All prescriptions or mitigation measures discussed in this report are designed to meet or exceed the requirements outlined in the General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988). Standard contract language should provide for sufficient erosion control measures during timber sale operations (BMP T-13). Revegetation of areas disturbed by harvest activities (such as landings, temporary roads, and equipment storage areas) is required with an appropriate grass seed mix (BMP T-14, T-15, and T-16).

IX. MONITORING REQUIREMENTS

Other applicable Standards and Guides and/or Best Management Practices may exist which were not directly referenced in this document. Their exclusion does not indicate that they were overlooked or are inapplicable. As project development proceeds, appropriate constraints or mitigations may be added or changed in order to better meet the intent of adequate resource protection or enhancement as directed in the Willamette LRMP. As the proposed project is initiated, it will be monitored to evaluate implementation efficiency, prescription adequacy, and to update sale area rehabilitation needs or protection.

The Timber Sale Officer will conduct implementation monitoring at the contract administration phase of the project. The logger will be required to maintain adequate suspension during the harvest process. In addition, numerous other contract requirements dealing with such items as erosion control, hazardous material use, fire restrictions, etc. will be enforced. Duff retention will be monitored as part of any post-sale activity that affects the soil resource.

X. IDENTIFICATION OF IRREVERSIBLE OR IRRETRIEVABLE RESOURCES

No irreversible and /or irretrievable use of the soils or geology resource is anticipated, beyond that which has been previously identified in the Willamette National Forest Land and Resource Management Plan, as amended.

XI. REFERENCES

Legard, Harold A. and Meyer, LeRoy C., 1973: Willamette National Forest Soil Resource Inventory, Pacific Northwest Region, 167 p.

Walker, George W. and Duncan, Robert A., 1989, Geologic Map of the Salem 1 (degree) by 2 (degree) Quadrangle, Western Oregon: Miscellaneous Investigations Series, U. S. Geological Survey, 1989G.

XII. CONSULTATION WITH OTHERS -

None occurred with this project.

DOUGLAS C. SHANK

District Geologist



Re: South Pyramid Timber Sale:
Hydrology/Watershed Input.

File Code: 2520 Watershed protection and
Management:

Date: January 31, 2006

To: Mike Rassbach; District Ranger
Donna Short; Plans Staff

I. Introduction:

This report will discuss the hydrology, stream channel, water quality, and riparian components for the South Pyramid Timber sale project area. South Pyramid Timber Sale was initially proposed in April 1998 with its initial timeline having the release of the EA in January 1999. Due to changes in survey protocols and priorities this decision was not released until June 2004. Upon release it was determined at the regional office level to postpone any decision that dealt with un-roaded areas due to court rulings occurring in other parts of the Nation. This placed the project on hold until this year, 2006. The purpose of this report is to insure that the project is current in its effects and disclosure of effects. Changes that have occurred since the initial report include: A 2004 listing of the Middle Santiam River as temperature impaired for summer rearing. Initially information in this report was incorporated in the EA for the project. This information is presented in a report format to allow the project record to show the analysis and thought process used in determination of effects. Field review was completed in 1998 and 1999.

Proposed Project Overview:

The proposed project area is located in the Headwaters Middle Santiam River subwatershed, 20, 777 acres, (HUC 170900060102) within the Middle Santiam watershed in Linn County, Oregon. The project area is north of Highway 20 and west of Highway 22 and sits between the Three Pyramids Special Interest Area (SIA) and the Middle Santiam Wilderness. The legal description is T12S, R5E, sections 19, 28-34 (see Figure 1). The sub-watershed lies between 2,000 feet elevation near the Middle Santiam River and 5,618 feet elevation on the Middle Pyramid Peak. The planning area contains 3,292 acres, and includes most of the South Pyramid Creek planning sub-drainage, except for private lands in sections 31 and 33 and the Three Pyramids SIA (see Figures 1), for a total of 3,868 acres. Proposed timber harvest would occur only on lands in the planning area east of road 2047.

Purpose and Need: (Taken from Project initiation letter 2/5/1999)

The South Pyramid subwatershed is classified by the Northwest Forest Plan as Matrix - General Forest (MA-14a). Management direction calls for attaining a broad spectrum of resource objectives, including fiber production through timber harvest. Congress directs the Willamette National Forest, through the budgeting process and the Forest's harvest

scheduling models, to attain an annual timber harvest target. Expectations under the Northwest Forest Plan clearly look to Matrix lands to produce much of the annual timber target.

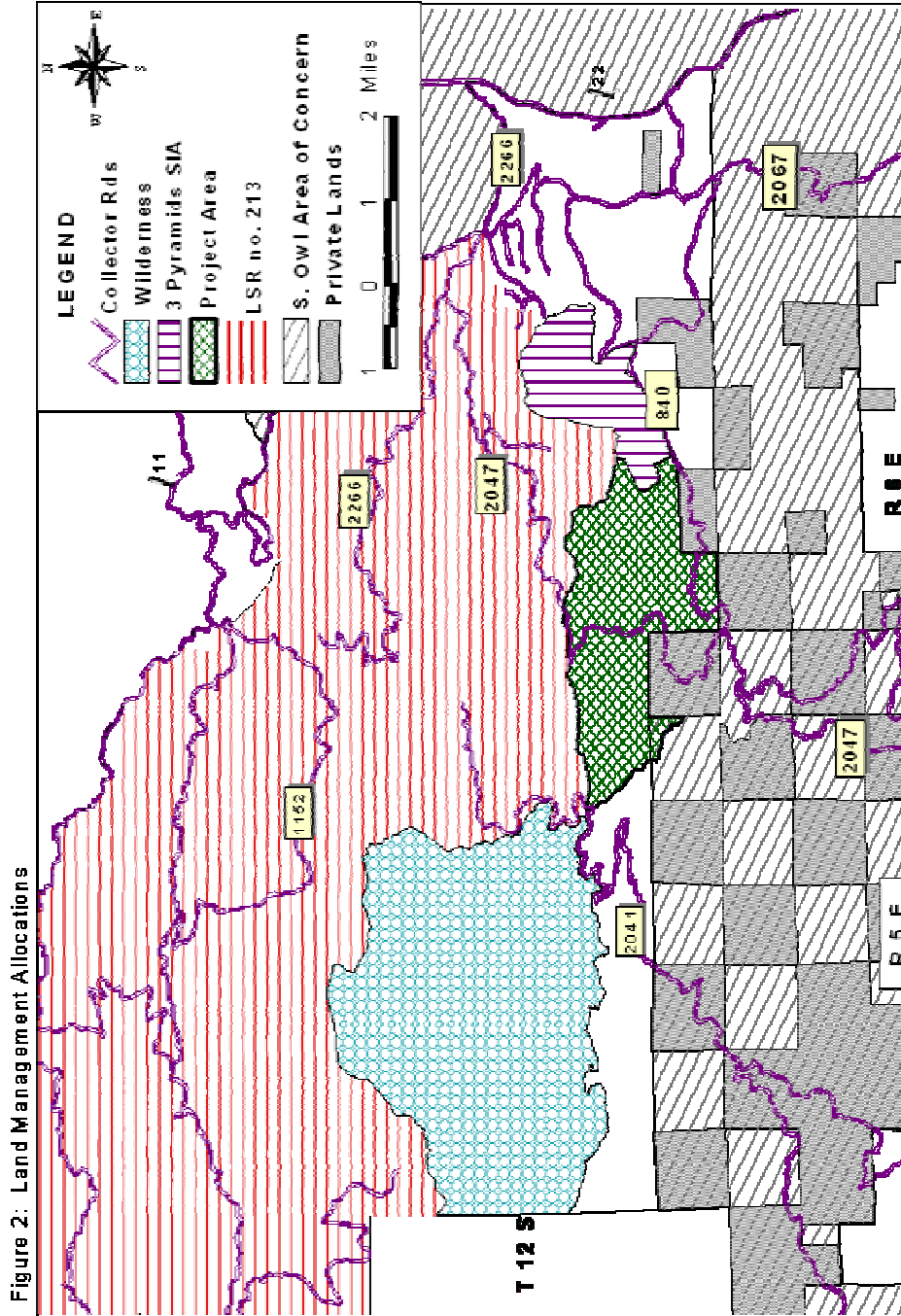


Figure 1: Proposed Project Area

The South Pyramid subwatershed is one of the few Matrix blocks on the District with substantial opportunities for timber harvest, while meeting other resource objectives. The last substantial harvest operation within the subwatershed was in 1990.

The project planning area encompasses most of the subwatershed. Private lands and the Three Pyramids Special Interest Area have been omitted from the project area. The south boundary of the area follows private landlines and the Middle Santiam River forms the western boundary. A large Late Successional Reserve (LSR) shares the northern boundary, while the Three Pyramids Special Interest Area traces the eastern edge of the project area.

Existing natural vegetation in the eastern half of the area suggests that natural fire has been a consistent and sometimes substantial process on the landscape. Field surveys reveal high fuel loadings in many of the mid-seral stands established after the last major fires about 80-150 year ago. This subwatershed lies in direct line with westerly storm patterns running up the Middle Santiam watershed.

The adjacent LSR in the Pyramid subwatershed to the north is a mix of young plantations, older second growth stands and old growth remnants. Windstorms and flood events since 1990 have dramatically increased the fuel loadings in the LSR to significant levels. Reducing fuel loading in the second growth stands in the South Pyramid subwatershed may provide some protection against habitat loss within the LSR from catastrophic fires.

Stocking levels within many mid-seral forest communities in the east half of the planning area is relatively high. These stands range in age from 80-150 years old and are likely the product of a number of stand replacement wildfires. Overstocking conditions have slowed tree growth in most stands and prevented understory vegetation development in some stands. Additionally very little vertical diversity exists in the canopies of many of these overstocked stands.

Landscape planning will be needed to identify the wildlife travel corridors which should be promoted and enhanced through thinning. Tree growth and stand development toward late seral conditions could be accelerated by thinning overstocked mid-seral stands within travel corridors.

This project proposes to harvest timber using prescriptions that contribute to the following management objectives:

- Meet district timber targets and contribute wood products to the local and regional markets through harvest prescriptions to produce at least 7001 ccf.
- Improve productive growth rates in at least 10% of the overstocked mid-seral stands for growing future wood fiber.

Additionally this project will provide useful resource information to help evaluate proposed changes to the western boundary of the Three Pyramids SIA.

Proposed Action

Initially the proposal was to commercially thin up to 400 acres of forest stands to improve tree growth, to increase development of late seral conditions in wildlife corridors, and to reduce fuel levels on the landscape. Upon implementing the Forest Plan standards and guidelines the proposed action evaluates approximately 190 acres of forest stands.

Employ conventional logging systems and existing roads to harvest timber unless resource conditions merit the use of helicopter logging for protection.

Regeneration harvest up to 71 acres of late seral stands to meet timber target goals and stand rotation objectives for Matrix - General Forest lands.

No harvest is proposed at this time within 1/4 mile of the Middle Santiam River, which has been proposed as a Wild and Scenic River.

II. Regulatory Framework:

The South Pyramid Thin Project Initiation Letter's Proposed Action to: "Commercially thin up to 400 acres of forest stands to improve tree growth, to increase development of late seral conditions in wildlife corridors, and to reduce fuel levels on the landscape are supported and directed by the Forest plan objectives to:

- *Manage the area consistent with the desired future condition for the various management allocations and in a way that reflects the range of historic conditions described in Middle Santiam Watershed Analysis(April 1996).*
- *Meet objectives outlined in the Aquatic Conservation Strategy (specifically Aquatic Conservation Strategy Objectives - ACSO #'s 1, 2, 4, 8 and 9).*
- *Manage forested stands at the landscape level, while considering habitat diversity, the size and shape of contiguous habitat blocks, and habitat function.*

This report will by no means be able to cover all of the Laws, Acts, Executive Orders, and Standards and Guidelines associated with water quality and riparian management, however, the thought processes of the Hydrologist conducting the review of this project will be covered.

A. Willamette National Forest Land and Resource Management Plan:

The 1990 Land and Resource Management Plan (LRMP) for the Willamette National Forest identified water quality as a significant issue to guide its development, it described the desired future condition of water quality in 10 and 50 years; and it designed standards and guidelines creating operational requirements to meet water quality objectives.

“This Forest Plan responds to the high level of concern for water and riparian resources by requiring strict application of Best Management Practices, including: retaining live trees along wetlands and Class IV streams where needed; scheduling no harvest in riparian areas along Class I, II, and III streams and adjacent lakes; accounting for the potential for adverse cumulative effects in scheduling of timber harvest; proposing watershed improvement projects to stabilize existing high risk conditions; and by implementing a comprehensive program to monitor water quality and related habitat.” (LRMP III-3-4)

B. Memorandum of Understanding, Oregon Department Environmental Quality:

The Pacific Northwest Region entered into an agreement with the State of Oregon adopting “General Water Quality Best Management Practices” in November 1988. Best Management Practices are practices or combinations of practices determined by the State after problem assessment, examination of alternative practices and appropriate public participation, to be the most effective, practicable means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals. (Federal Register, Volume 40, No.230 dated 11/28/75) These practices are cited in this hydrology report on page30.

Specific Forest Management Direction Includes:

Strategic goal:

Maintain the integrated ecological functions of rivers, streams, wetlands, lakes, and the associated riparian areas Forest -wide. (LRMP IV-3).

Resource management goal:

Maintain water quality through acceptable levels of water temperature, suspended sediment, chemicals, and bacteria. (LRMP IV-4)

Standards and Guides (S&G’s):

S&G’s help the manager stay within the constraints prescribed by law as well as provide environmental safeguards for management activities.

Forest-Wide: 28 separate S&G’s including Federal and state statute and regional guidelines address road construction and maintenance, streamside protection, and management of mass movement. There is also a forest-wide S&G to address watershed enhancement.

Management Areas:

Eight S&G’s address water quality in Management areas (MA’s) other than riparian; 41 for MA 15/riparian; and 8 specific to water quality.

C. Additional Directional Documents:

1.) FEMAT: In 1993: The Forest Ecosystem Management Assessment Team Report (FEMAT) for the Pacific Northwest and Northern California identified the Aquatic Conservation Strategy (ACS) “aimed at maintaining and restoring the ecological health of aquatic ecosystems.” One of the objectives of the ACS is to “Maintain and

restore water quality...” (FEMAT V-30). Components of the strategy are Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration.

2.) NWFP: In 1994 the Northwest Forest Plan (NWFP) included the ACS as an integral component. The NWFP amends land allocations and S&G’s in the Forest LRMP, however, the most restrictive S&G’s of the two would be maintained. It establishes Riparian Reserves and Key Watersheds across the landscape and sets forth detailed requirements land managers must meet within those reserves in accordance with the ACS.

3.) ACSO: In October of 2003 a Final Supplemental Environmental Impact Statement was released entitled: “Clarification of Language in the 1994 Record of Decision for the Northwest Forest Plan National Forest and Bureau of Land Management districts Within the Range of the Northern Spotted Owl Proposal to amend Wording about the Aquatic Conservation Strategy”. Within this supplement clarification language was provided to consider actions effects upon the aquatic system. While this language clarifies it does not change the original intent of FEMAT or the direction found within the NWFP in the management of ACSO’s.

A key feature of the NWFP is that Watershed Analysis be performed as a systematic way to characterize aquatic, riparian and terrestrial features in a watershed. Watershed Analysis “consists of technically rigorous and defensible procedures designed to identify processes that are active within a watershed, how those processes are distributed in time, and space, the current upland and riparian conditions of the watershed, and how all of these factors influence riparian habitat and other beneficial uses.” (NWFP S&G B-21) The Middle Santiam Watershed Analysis was completed in April 1996 by the USFS.

Information found in these analyses is used by managers to refine interim riparian reserves widths assigned in the NWFP, while prescribing land management activities including watershed restoration and developing monitoring programs. Information from watershed analysis is used in project specific National Environmental Policy Act (NEPA) planning.

Thought process: Incorporating the above direction into prescribing specific prescription for each unit and disclosing the effect of these activities in the Direct and Indirect Effects section of this report would meet intent of the LRMP. Site-specific prescriptions were used to provide the “most effective, practicable means of preventing or reducing the amount of pollution generated by non-point sources....” (Federal Register, Volume 40, No. 230 dated 11/28/75). Full riparian reserve widths would be utilized for all streams wetlands and unstable areas found within the project area, (172 either side of non fish bearing streams, wetlands and unstable areas within the western hemlock plant association and 150 feet for true fir plant associations, and 344’ either side of fish bearing streams western hemlock plant association and 300 feet on true fir plant associations.) In applying these full leave reserves

Willamette's standards and guidelines for riparian areas will be met and aquatic and upland dependent species will be restored.

D. Municipal Watershed and Management Activities Effects on Water Users.

Forestry related activities and related water quality center around the requirements of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500). This act revises and reenacts previous Federal Water Pollution Control Acts of 1970, 1965, 1956, and 1948 to restore and maintain the chemical, physical, and biological integrity of the nation's waters by eliminating pollutant discharges into the waters of the United States and providing surface waters suitable for uses. Section 208 of this law deals with non-point pollution of which forestry type activities are included. A previous revision (1970) requires Federal agency compliance with water quality standards.

As part of the Clean Water Act, the states were required to develop a state-wide Water Quality Management Plan and to set standards for water quality. In December of 1978, the Region -6 of the Forest Service and the Oregon Department of Environmental Quality (DEQ), signed an MOU delineating the responsibilities of each pursuant to the implementation of the Statewide Water Quality Management Plan. This agreement was where both parties, FS and DEQ, laid out the terms of the Best Management Practices and the State determined if Forest Service practices meet or exceed state BMP's. These reviews occur periodically and the state determines if the BMP's will meet the revised state standards. The current BMP's are determined to meet or exceed state standards set for waters of the state. These were last published in November of 1988 for the Pacific Northwest Region.

Thought Process: Provided Best Management Practices are being met and the State feels waters of the State are being protected, utilization of those practices on site specific basis will protect the municipal waters of the state. Forest wide standard and guides, S&G's, also play a role in meeting these standards. Riparian reserve delineation on all streams and unstable landscapes adds additional assurance that waters are being protected. Watershed analysis is completed for the area, site-specific prescriptions will be implemented utilizing BMP's, ACS objectives are discussed, and effects of various alternatives are discussed. All prescriptions are under the guidance of the NWFP which is the legal document providing direction for the protection of water quality along with Willamette National Forest's Land and Resource Management Plan. Therefore water users are considered and protected.

Currently (September 9, 2005) the USDA Forest Service and the Bureau of Land Management have created a *Sufficiency Analysis for Stream Temperature Evaluation of the adequacy of the Northwest Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards.* The premise of this document is:

“The ACS¹ provides a comprehensive framework for protection and restoration of aquatic and riparian systems. The ACS is composed of four parts: Key Watersheds, Riparian Reserves, Watershed Analysis, and Restoration. Key watersheds serve as the cornerstones of aquatic species recovery and special guidelines apply to federal lands within key watersheds. Watershed Analysis is required in key watersheds and Riparian Reserves prior to determining how proposed land management activities meet ACS objectives. Finally, watershed restoration is integral to recovery of fish and riparian habitat and water quality. Of these elements, Watershed Analysis and Riparian Reserves are fundamental to understanding water quality issues and designing mitigation or treatments necessary to recover water quality to levels that meet state and federal water quality standards and support beneficial uses”
(Sufficiency Analysis for Stream Temperature, 2005 pg4).

Thought Process: Treatment of vegetation within riparian areas evaluated utilizing field verified information and determined that full leave riparian reserves width buffers would best comply with “Sufficiency Analysis for Stream Temperature - Evaluation of the adequacy of the Northwest Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards” (USDA Forest Service and USDI BLM, 2005) process. This document was prepared in collaboration with Oregon Department of Environmental Quality and United States Environmental Protection Agency to provide documentation of Northwest Forest Plan compliance with the Clean Water Act with regard to state water quality standards for stream temperatures. As such, it redeems several of the Forest Service responsibilities identified in “Memorandum of Understanding between USDA Forest Service and Oregon Department of Environmental Quality To Meet State and Federal Water Quality Rules and Regulations” (USDA Forest Service and Oregon DEQ, May 2002). The Sufficiency Analysis provides current scientific guidance for management of riparian vegetation to provide effective stream shade, including appropriate methods of managing young stands for riparian objectives other than shade, such as production of large wood for future recruitment. ASC objectives surrounding water quality, temperature, are therefore met. Under the sufficiency analysis full leave riparian reserve buffers exceed the needs of primary and secondary shade zones thereby protecting water quality.

Riparian Reserves and Management Activities.

In 1993: The Forest Ecosystem Management Assessment Team Report (FEMAT) for the Pacific Northwest and Northern California identified the Aquatic Conservation Strategy (ACS) as a means of addressing concerns surrounding aquatic resources. It was developed to maintain and restore ecological health of the aquatic ecosystem. One of the objectives of the ACS is to “Maintain and restore water quality....”

¹ NWFP consists of the Record of Decision and Standards and Guidelines, the Final SEIS, and the Forest Ecosystem Management Assessment Team report; April, 1994 and July, 1993.

(FEMAT V-30). Components of the strategy are Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration.

In 1994 the Northwest Forest Plan (NWFP), included the ACS as an integral component. The NWFP amends land allocations and S&G's in the Forest LRMP. It establishes Riparian Reserves and Key Watersheds across the landscape and sets forth detailed requirements land managers must meet within those reserves in accordance with the ACS. Within the discussion of these ACSO's aquatic ecosystems distribution, diversity, complexity, connectivity, integrity, quality, and timing, need to be covered at the landscape scale for sediment, flow, channels, wetlands, and species present.

On page 30 the objectives and mitigations for riparian management are discussed. All proposed actions are tied to the watershed analysis for the area (Middle Santiam Watershed Analysis, April 1996).

Thought Process: Middle Santiam Watershed analysis Riparian Reserve Recommendation #E 10 states: "Continue to improve structural diversity in both channels and terrestrial parts of Riparian Reserves..... In order to meet this recommendation and have the riparian reserves obtain objectives, site-specific prescriptions have been developed to leave full leave riparian reserves. In meeting the ACS objectives water quality objectives would also be met.

The State of Oregon DEQ also supported action within riparian reserves:

"Implementation of the NWFP accommodates vegetation treatment necessary or desirable to restore ecological health in Riparian Reserves that have been harvested or affected by fire exclusion or other disturbances. The NWFP also provides for long-term maintenance of water quality. To determine how treatment of Riparian 'reserves can contribute to accomplishing these objectives, when proposing management in Riparian Reserves the following assumptions must apply:

- 1. Vegetation density is high and will benefit from thinning.*
- 2. Vegetation treatment will not result in more than a 50% reduction in canopy closure and will not occur in the primary shade zone."*

Sufficiency Analysis for Stream Temperature (September 9, 2005) USDA Forest Service, BLM; pg 21.

At this time it was determined that the vegetation density criteria (#1), is not met. Spacing and openings are such that stands are naturally obtaining their desired conditions and providing wood for the site.

III. Desired Future Condition

Conditions desirable for Hydrology, Stream Channels, Water Quality and Riparian can best be described in a range of variability. This range has been established through time to represent the natural changes the various elements experience during a wide variety of outside influences. Flood, drought, fire, wind, snow, ice, and land movement all play a natural role in determining the changes to these elements. Add to this natural condition social political drivers and one can see the complexity of stating a Desired Future Condition. The following bullets are an attempt to discuss the Hydrology; Stream Channel, Water Quality and Riparian portion of this condition.

- Range of flow, discharge, which allow for a variety of species within riparian areas.
- Maintenance of wet areas and hyporheic zones, no net loss.
- Maintenance of flows within historic range, no artificial peaks that exceed range.
- Maintenance of channel conditions that represent natural range.
- Reduction of stream energies through channel complexity. (Adding structure into channel, riparian areas.)
- Recovery and maintenance of historic water temperatures found within the system (encourage riparian development and complexity)
- Broad range of diversity associated to the riverine systems
- Accumulation of woody material on the site.

IV. Opportunities:

Opportunities exist in restoring the historic wood loading and stream energy of the streams found within the site. Natural recruitment will accomplish this.

V. Analysis Methods:

The main method of analysis utilized involved field review of the units proposed and surrounding area and streams. Field review includes walking through and around the perimeter of the proposed units. Streams and wet areas encountered are recorded on either a map base or aerial photo. These are then transferred to integration maps for discussion and development of site specific prescriptions. Stability, slope, soil types, vegetation present, aspect, and juxtaposition of the unit are all considered in developing a prescription that will protect and or enhance the hydrology, stream channels, water quality and riparian reserves found within the project.

Stream conditions, slope conditions, vegetation conditions were compared to information provided under the Middle Santiam watershed analysis to determine if changes occurred

since the drafting of the WA. Conditions appeared to be responding typically for Cascade environments and the only discovery made to modify the WA determination was the listing of the Middle Santiam River as temperature impaired for summer rearing. All prescriptions need to insure that waters are protected and enhanced through management activities to help the waters of the state recover.

Aggregate recovery protocol and standard observations of past activities within the watershed to determine response to disturbance were utilized to determine hydrology, stream channel, and water quality responses to proposed actions (regeneration cutting and thinning).

A Region 6 level II stream survey was completed on South Pyramid by Ecosystems Northwest. Information from this report was utilized in the determination of stream conditions downstream of the site.

An interdisciplinary process was then utilized to determine the desired condition of the stands and their response to treatment. All actions were considered in relation to the prescription and risks were evaluated using models, past management track records, and professional judgment.

VI. Existing Conditions and Environmental Consequences:

Actions that could potentially impact the water quality include: 1) increase in stream sedimentation and storage, 2) increase in water temperature, 3) increase in water yield, 4) increase in peak flows and change in timing of peak flows and 5) chemical changes in water quality from slash treatment (mainly burning).

Beneficial users, dependent on aquatic resources, in this planning area are: resident fisheries use; aquatic non-fish species use; riparian dependent species use; water-related recreation; and water-related fire suppression and road maintenance needs.

Average annual precipitation in the project area ranges from 60 to 120 inches occurring mainly between October and May. Elevation ranges from 2000 at the Middle Santiam River to 5618 ft on Middle Pyramid Peak. Units are proposed between the 2800 and 4900 feet elevation band. Precipitation is primarily rain at the lower elevations (<2000 ft.) and snow above 3500 feet. The Transient Snow Zone (TSZ) is defined as areas between 1200 to 4,900 foot elevation that may alternately receive snow or rain. This zone has been modified from 1,500 – 4,000 feet as stated in Christner and Harr, 1982, due to observed site specific events.

Middle Santiam River borders the western boundary of the project area and is on the Oregon Department of Environmental Quality's 2004 303(d) List of Water Quality Limited Water bodies for temperature. River-mile 5.3 (Green Peter Reservoir), to 37.1(headwaters), are listed in the draft 2004 listing for summer temperature, but not on the 2002 303(d) list.

The stands in the project area are natural stands greater than 35 years of age, and are at hydrologic recovery. Therefore, the existing water yield and base flow off the project area is

expected to be within the range of natural variability. Upon utilizing the Aggregate Recovery Percentages (ARP), calculations it was determined that Pyramid Creek planning sub-drainage was 78% recovered. This reduction in recovery is due to the past management activities that have occurred in this subwatershed. Mid-point ARP threshold level, from the Willamette National Forest Land and Resource Management Plan (Appendix E-21), for this planning sub-drainage is 70 percent.

Hydrology: (*“a science dealing with the properties, distribution; and circulation of water on the surface of the land, in the soil and underlying rocks and in the atmosphere”.*) (*Webster’s Ninth New Collegiate Dictionary, 1988.*)

- A. **Existing condition:** A description of the Hydrology and Water Quality within the South Pyramid watershed can be found within the Physical Domain portion of the Middle Santiam Watershed Analysis (pg 19-25). The following discussion relates specifically to the units found within this planning area.

The South Pyramid project area hydrology is similar to other documented watersheds within the Western Cascades. Peak flows occur during rain and rain-on-snow events in the transient snow zone. Intense precipitation is episodic and often generates peak flows which are a major disturbance mechanism for stream channels and associated riparian areas.

The dominant hydrologic mechanism is rain, and rain on snow events. The entire South Pyramid watershed is within the rain on snow or transient snow zone. Surface precipitations drive the flow levels of tributary streams to South Pyramid Creek. Minor, less than 1 acre, wet areas exist which meter some flows to tributary stream. These wet areas are associated to geologic changes that are found within the South Pyramid Creek Watershed (see soils and geology report). Smaller wet areas associated to the broken topography punctuate the landscape and create vegetative diversity.

Water storage in these watersheds is limited to some deeper upland soils, colluvial deposits, flood plains, earthflow perimeters. These areas create small forested wetlands. Colluvial soils, ancient earthflow terraces, and flood plains act like sponges, retaining water and releasing it slowly during periods of low precipitation. General storage is low due to shallow and rocky nature of the soils. Annual precipitation for the area averages from 60 inches in the valley segments to 120 inches on peaks and ridges.

Minimum flows within the South Pyramid are regulated by water storage features which allow flow to persist during drought periods. Much of the summer flow comes from water stored in the broad alluvial floodplains along the main channel of South Pyramid creek and the colluvial and glacial soils found throughout its

tributaries. These storage areas, although limited in number at this site, provide opportunity for hyporheic interactions with the stream (this is the subsurface movement of water through depositional areas). Proposed units within the project area are adjacent to these types of features. Vegetation is the primary user of water within the watershed with main use occurring between April and October. Diurnal fluctuations in stream flow are the result of vegetative transpiration rates associated to diurnal changes in light and climatic conditions.

B. Environmental Consequences: Hydrology

Direct and indirect Effects:

Implementation of Alternative 1, no action alternative, will create a consequence of stands that do not have a sufficient live crown ratio (percent of the tree with limbs) to grow at full potential and are slowed in their growth rates. Existing conditions will change in that the current stands proposed for thinning will reduce growth rates due to competition. Transpiration rates will decrease due to loss of canopy, crown diameters, and a potential for increases in summer flows could exist due to decline in stands ability to utilize available water. Higher likelihood of reduced tree health occurs and the ability of crowns to intercept and hold snow decreases resulting in greater risk for tree damage (breakage) through the accumulation of snow loads. Infiltration rates could be affected by the loss of canopy and the drip that occurs from snow interception. Latent heat would remove the snow and not allow for the water to infiltrate in the same manner or at the same rate that would occur within a healthy canopy. (Reduced canopies are more exposed to latent heat transfer and rapid snow loss. This reduces the contact time the water stored in the snow has with the soil.) (Harr 1981). Units proposed for regeneration are not anticipated to show any hydrologic effect to no action in the near future, (20 years).

Implementation of Alternative 2 would be accomplished using a combination of logging systems, (helicopter, and ground based logging systems). Approximately 189 acres would be thinned to a residual canopy closure of 40 to 60 %. Seventy acres will be thinned to 40 percent, eighty-five acres would be thinned to 50 percent and thirty-four acres will be thinned to 60 percent canopy levels. The effects of implementation, varies depending upon the type of logging system utilized and the residual canopy closure.

Consequences to hydrology will be in the response to reduced competition for light, water, and nutrients, in the thinned stands, and increased snow accumulation on stand thinned to 40 percent. With target canopy closures ranging from 40-60%, snow accumulation will increase until such time that canopy closures reach 70 percent. A short term (5-10 years) increases in discharge during the wet and the dry periods would occur from two mechanisms for the thinned stands. Increased snow accumulation (wet period) would create small (<1year return interval) increases in peak flows (Jones, and Grant; 2001), and reduced canopy (dry periods) would reduce transpiration rates which would account for small increases in

summer flows. It is not anticipated that either of these changes create detrimental effects. (not sure they would be even be measurable). (Pike and Scherer 2003).

Implementation of Alternative 3 would be accomplished using a combination of logging systems, (helicopter, and ground based logging systems). Approximately 68 acres would be thinned to a residual canopy closure of 40 to 50 % and three stands (1, 1b, and 6a) would be regenerated, 43 acres. Thinning and regeneration would be accomplished using a combination of logging systems, (helicopter, and ground based logging systems), approximately 111 acres would be treated (68 thinned, and 43 regenerated). Hydrology of the area is anticipated to experience slight fluctuations resulting from the removal of vegetation during the project. 78 fewer acres will be disturbed under this alternative than with alternative 2, yet, due to the regeneration cutting 43 acres will have a longer recovery time (35 years) as opposed to 5-10 year recovery for the thinned areas. Similar affects would occur as in alternative 2 on those similarly treated areas. With the utilization of Best Management Practices and Contact requirements, there are no anticipated adverse impacts to downstream beneficial users as the result of hydrology.

Implementation of Alternative 4 would be accomplished using a combination of logging systems, (helicopter, and ground based logging systems). Approximately 15 acres would be thinned to a residual canopy closure of 40 to 50 % and four stands (1a, 1b, 2b, and 4a) would be regenerated. Thinning and regeneration would be accomplished on approximately 86 acres. (71 regeneration, 15 thinned). Hydrology of the area is anticipated to experience slight fluctuations resulting from the removal of vegetation during the project. 103 fewer acres will be disturbed under this alternative than with alternative 2, yet, due to the regeneration cutting 71 acres will have a longer recovery time (35 years) as opposed to 5-10 year recovery for the thinned areas. Similar affects would occur as in alternative 2 on those similarly treated areas. These effects are within the range of natural variation for hydrology. With the utilization of Best Management Practices, contact requirements and spatial position of units in the watershed, there are no anticipated hydrologic adverse impacts to downstream beneficial users.

Table 2 compares the alternative and Table 3 depicts the Mechanisms of change by Alternative.

Table 2: Comparison of alternatives:

Comparison Factor	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Acres Commercially Thinned	0	189	68	15
Acres Regenerated	0	0	43	71
Acres of Tractor Logging	0	0	25	0
Acres of Processor Logging	0	61	34	34
Acres of Helicopter Logging	0	128	52	52
Acres of Light Thin (60% canopy left)	0	34	0	0
Acres of Moderate Thin (50% canopy left)	0	85	11	7
Acres of Heavy Thin (40% canopy left)	0	70	57	8

Table 3: Hydrology; Direct and Indirect Mechanism of change by Alternative:

Note: All management activities are 1 standard tree height (150 to 172') away from any stream channel.

<u>Mechanism /Action</u>	<u>Cause</u>	<u>Alternative 1</u>	<u>Alternative 2</u>	<u>Alternative 3</u>	<u>Alternative 4</u>
FIRE	Natural	Historic (100 years) natural fires in the area have not been detrimental to stream channels. Very low risk is associated to detrimental effects of natural fire to hydrology of the area.	Reducing the fuel loading through treatment reduces the risk of hotter, intense burns and subsequent creation of hydrophobic soil conditions.	Reducing the fuel loading through treatment reduces the risk of hotter, intense burns and subsequent creation of hydrophobic conditions within stand outside of the riparian reserve. Potential increase of fuels around the reserves. Regeneration of 43 acres will provide for broadcast burning to treat slash generated from activity. A risk exists from placing fire in areas adjacent to riparian reserves	Regeneration of 71 acres will provide for broadcast burning to treat slash generated from activity. A risk exists from placing fire in areas adjacent to riparian reserves. A reduction of natural fire starts risk associated to those acres treated. A low risk is of changing the hydrology is anticipated.
FELLING	Canopy	N/A	Reduction of canopy is directly associated to the ability of the site to accumulate snow. Sparser canopy equals less interception. This short term 3-5 year reduction will allow for additional snow to accumulation the thinning stands.	Similar to Alternative 2 with increasing the opening size by 43 acres. Openings could collect snow and generate a low risk to the hydrology of the area.	Similar to Alternative 3 with increasing the opening size by 71 acres. Openings could collect snow and generate a low risk of effecting hydrology.
	Solar Radiation	N/A	Increase solar radiation reaches the ground with a reduced canopy. Changes in microclimate and heat transfer will occur. This could change the duration snow stays on the site and the type of flora and fauna occupying the site and their water use. Low risk	Regenerating 43 acres and heavy thinning 57 acres changes the sites microclimate and the ability of the site to transfer heat. This changes the duration snow stays on the site and the type of flora and fauna occupying the site and their water use.	Regenerating 71 acres and heavy thinning 8 acres changes the sites microclimate and the ability of the site to transfer heat. This changes the duration snow stays on the site and the type of flora and fauna occupying the site and their water use.

<u>Mechanism /Action</u>	<u>Cause</u>	<u>Alternative 1</u>	<u>Alternative 2</u>	<u>Alternative 3</u>	<u>Alternative 4</u>
			due to full leave riparian reserve/buffers.	Low risk due to full leave riparian reserve/buffers.	Low risk due to full leave riparian reserve/buffers.
REMOVAL OF TREES	Ground Skidding	N/A	Capture of runoff and compaction could occur on 61 acres. Hydrology could be affected if rerouting of water occurs from the skidding pattern and method. Low risk of capture due to full leave prescription found within the riparian reserve/buffer.	Capture of runoff and compaction could occur on 59 acres. Hydrology could be affected if rerouting of water occurs from the skidding pattern and method. Low risk similar to alternative 2.	Capture of runoff and compaction could occur on 34 acres. Hydrology could be affected if rerouting of water occurs from the skidding pattern and method. Very low risk similar to alternative 2.
	Helicopter yarding	N/A	This is the most protective way of removing trees from a site. 128 acres of thinning removal would not create an increase risk to hydrology.	52 acres of helicopter. No effect similar to alternative 2.	52 acres of helicopter. No effect similar to alternative 2
	Haul	N/A	Maintenance of approximately 22 miles of existing road used for haul, and reconstruction of 5.4 miles of system road, has various positive and potential negative effects on the hydrology. Maintenance and reconstruction will improve road drainage, while reopening and construction can capture water and direct it out of its natural flow path.	Similar to Alternative 2.	Similar to Alternative 2.
CONSTRUCTION OF LANDINGS AND ROADS	Clearing		Clearing reduces the canopy and allows for precipitation to fall directly to the surface. Minor effects would be attributed to the 5.4 miles of road reconstruction.	Similar to Alternative 2.	Similar to Alternative 2.

<u>Mechanism /Action</u>	<u>Cause</u>	<u>Alternative 1</u>	<u>Alternative 2</u>	<u>Alternative 3</u>	<u>Alternative 4</u>
	Grubbing (Digging of root wads and vegetation.)		Grubbing will be associated to the construction of landings. Approximately 1 acre in landings and 5.4 miles of road work, will require some grubbing. Possibility of bringing ground water to the surface with digging. Low risk.	Low risk of intercepting ground water associated to the landings, Similar to alternative 2 for the road reconstruction.	Low risk of intercepting ground water associated to the landings, Similar to alternative 2 for the road reconstruction
	Travel	Status Quo	Travel along existing roads, tends to be restricted to rocked mainline roads. Effects to Hydrology are similar to alternative 1.	Similar to alternative 1.	Similar to alternative 1.
	Closing	Moderate risk of catastrophic road failures from not maintaining drainage structures because of lack of funding from not managing the timber resource. Since there will be no management activities to fund road maintenance, drainage features will not be maintained. So there is moderate risk of increased sediment and catastrophic road failures from failed drainage structures not kept functioning through maintenance	Short-term (3-5 year) moderate risk of capturing flow. Once roads are closed and have recovered then there is a low risk of catastrophic failures due to reconstruction of drainage patterns and maintenance funded by management activities which reduces the risk of capturing flow and routing.	Similar to Alternative 2	Similar to Alternative 2
	Subsoiling	N/A	Sub soiling could possibly occur on the intensely used skid roads 7.3 acres.	Sub soiling could possibly occur on the intensely used skid roads 7.1 acres	Sub soiling could possibly occur on the intensely used skid roads

<u>Mechanism /Action</u>	<u>Cause</u>	<u>Alternative 1</u>	<u>Alternative 2</u>	<u>Alternative 3</u>	<u>Alternative 4</u>
			61 acres are being ground based and no new roads are being built. A positive effect to hydrology occurs in increasing permeability of compacted areas.	Ground based systems will be utilized on 59 acres. Sub-soiling could have a positive effect due to increasing permeability of compacted areas.	(approximately 4.1 acres). Ground based systems will be utilized on 34 acres. Sub-soiling could have a positive effect due to increasing permeability of compacted areas.
SLASH TREATMENT PREP WORK	Piling	N/A	Hydrologic effects associated to piling are dependent on type. No effect occurs with hand piling while minor effects occur with machine piling. By having equipment on the site you increase the risk of intercepting ground water. 61 acres available for piling	Similar to alternative 2 with 59 acres available to pile.	Similar to alternative 2 with 34 acres available to pile.
	Burning	N/A	Burning of hand piles will create small 15x15 foot areas of soils that are at risk of hydrophobic conditions. This spatial distribution of these small sites do not create an impact to the hydrology of the area and is therefore not determined a risk. Machine piles tend to be larger 25 x 25 feet, and spaced at greater distance and are also not considered to pose a risk to the hydrology of the area. The greatest risk of these piles is in their placement associated to the natural flow patterns of the area.	In addition to effects in alternative 2, 43 acres could be broadcast burned. Hydrophobic conditions could be created if prescriptions are not followed. Low risk occurs due to size of units, elevation, the width of the riparian reserve/buffer, and period of time broadcast burning is permitted.	In addition to effects in alternative 2, 71 acres could be broadcast burned. Hydrophobic conditions could be created if prescriptions are not followed. Low risk occurs due to size of units, elevation, the width of the riparian reserve/buffer, and the period of time broadcast burning is permitted.

C. Cumulative Effects: Hydrology

Traditionally, projects involving timber harvest on the Willamette National Forest are analyzed for their cumulative impact on the quantity and timing of peak flows and water yields, using an accounting methodology known as Aggregate Recovery Percentage or ARP. The ARP model compares the amount of an analysis area within the transient snow zone that is recovered against a threshold value (Midpoint) that was calibrated for the area during development of the Forest Plan. The Midpoint values were developed based on the soil, geology, vegetation, climate, and stream channel conditions of each planning sub-drainage, and are intended to represent a minimum safe level of vegetative recovery in the planning sub-drainage to prevent significant alteration of peak flow regimes as a result of management activities. Recovery generally occurs when stand diameters average 8" dbh and crown closures exceed 70%. The transient snow zone is generally considered to include those areas of the forest between the elevations of 1,500 and 4,000 feet respectively (Note: for the South Pyramid thin area the entire area is considered as transient snow zone).

As a result of current vegetative conditions of Pyramid planning sub-drainage, the South Pyramid Thin planning area are well-above desired levels of recovery. Table 3 summarizes the current levels of recovery for the planning sub-drainage affected by the project area, and the Forest Plan Midpoint ARP level. This current level is derived from data in the Forest's VEGIS database, which includes all past harvest activities (1/2006 compilation). The table also includes estimates of past and ongoing harvest activities on private lands.

Thought Process:

Threshold levels, modeled in ARP, become a minor concern when weighed against long-term beneficial affect. The project involves thinning within stands that are currently reducing growth and stands that are declining in their volume due to mortality (proposed regeneration stands). It was determined by the District Silviculturalist that implementing activities would better preserve these stands into the future. Short term impacts from removing the material are low, due to full leave riparian reserve buffers, on hydrology. Silvicultural prescriptions for the area are site specific to allow the stands to become more productive. Cumulative effects tradeoffs were considered for the short-term and the long term. Short-term effects (5-10 years) anticipated include additional accumulation of snow from reduced canopy levels, short-term disturbance from the removal of the material were anticipated. Longer term effects from regenerating 43 acres in alternative 3 and 71 acres in alternative 4 were also anticipated and determined to be low due to the proximity to watercourses. Implementation of specific BMP's also reduces the potential cumulative effect from reconstructing/ reopening roads in the area. The Watershed condition types were type 1 and 2 channels (LRMP; pg. E-10-12). Under types 1 & 2 no recommended ARP is required due to the stability of the channels. Upon reviewing these criteria and the hydrology involved in this project area proposed actions are not anticipated to create adverse cumulative effects to the hydrology of the area.

Table 4: ARP values for Planning Sub-drainage and Changes in ARP by alternative:

(Data was reviewed on 1/31/2006).

Planning Sub-drainage Name	Existing ARP Level	Alternative 2 unit acres in watershed	% change in ARP for Alternative 2	Alternative 3 unit acres in watershed	% change in ARP for Alternative 3	Alternative 4 unit acres in watershed	% change in ARP for Alternative 4
Pyramid Creek 3,868 acres	78 %	189	2.6	111	2.2	86	2.0

Stream (“a body of running water flowing on the earth”) **Channels** (“the bed where a natural stream of water runs”). (*Webster’s Ninth New Collegiate Dictionary, 1988*).

- A. **Existing condition:** A description of the Stream Channels within the South Pyramid watershed can be found within the Physical Domain Chapter of the Middle Santiam Watershed Analysis (pg 20-24). The following discussion relates specifically to the planning area.

Deeply incised parallel streams are found within the project area as evidenced by first to third order stream channels. This pattern of parallel streams is the result of young geologic terraces and earth flow activity shaping the landscape. Soils of glacial and volcanic origin are altered by erosion creating the drainage pattern. These parallel systems join to form a dendritic pattern lower down within the planning sub-drainage. Stream channels are associated with valley walls greater than 65 percent slope and transition into valley bottoms dominated by terraces. A stepped valley profile exists. Channel substrate contains bedrock and boulders in the steeper portions and cobble and gravels in the lower gradient reach. Channels exhibit very little sinuosity in the project area and contain numerous wet areas associated to their margins. Rosgen type Aa+, A, B, and G channels are present within the proposed project area.

Headwater channels have low sediment storage capacity due to channel gradients. Sediment storage capacity increases as streams transition into the valley regions due to addition of structure and lower gradient. Streams within the proposed project could be typified as being transport streams. Portions of South Pyramid Creek do contain depositional reaches associated to earthflow and rock outcrops constricting the channel and causing sediment to fall out upstream. Debris torrents have minimal influence in the development of the first and second order stream channels in this planning area.

The historic morphological characteristics of stream valleys in South Pyramid project area are similar to existing conditions. The basic stream patterns and channel gradients are largely influenced by the underlying geology. The channels have not changed a great deal since the reference time frames, 100 years ago.

B. Environmental Consequences: Stream Channels

Direct and Indirect Effects:

Implementation of alternative 1, no action, would maintain the stream channels in their current conditions. Changes to stream channels occur with the changes in hydrology, vegetation and physical changes. These elements change naturally and artificially through disturbance.

With no action it is anticipated that a low risk of artificial disturbance mechanisms, road crossings, pipe installations, etc., would occur. Indirect affects could occur if riparian stand decline to a point of increasing the wood load into the stream and creating accelerated bank erosion. These channels do utilize the available wood and create small wetlands associated to the channels. A very low risk from increased wood is anticipated.

Implementation of alternative 2 is designed to ground base log 61 acres. During this activity a low risk of capturing water and creating additional channels exists. Units with ground base in this alternative include units: 1a, 2a, 4a, 4b, 6a, and 24. Each of these units has its own complexities and will for the most part be yarded away from stream courses/ channels. With full leave riparian reserve/buffers a low risk to stream channels exist.

Implementation of alternative 3 is designed to ground base 59 acres. During this operation provided the best management practices are met, a low risk of capturing water and creating additional channels exists. Tractor logging will occur on 25 acres of the 59 which tends to create more ground disturbance. Approximately 7 acres of skid trails will be associated to the removal of the timber in these stands. Creating channels from water flowing down these compacted areas could extend the channel net work. Mitigation to reduce this effect is ripping the skid road to restore permeability. As a result of this mitigation a low risk to streams or their network exists.

Implementation of Alternative 4 would be accomplished using a combination of logging systems, (helicopter, and ground based logging systems). Approximately 15 acres would be thinned to a residual canopy closure of 40 to 50 % and four stands (1a, 1b, 2b, and 4a) would be regenerated. Thinning and regeneration would be accomplished on approximately 86 acres. (71 regeneration, 15 thinned). Stream channels of the area are anticipated to experience slight modifications from increased peak flows. Stream channels downstream of the treatment areas will be the main areas affected by this slight fluctuation in flow. Similar affects would occur as in alternative 2 on those similarly treated areas. These effects are within the range of natural variation for the stream channels. With the utilization of Best Management Practices, contact requirements and spatial position of units in the watershed, there are no anticipated adverse impacts to downstream beneficial users as a result of these changes in the channels.

Table 6: Stream Channels: Direct and Indirect Mechanism of change by Alternative

<i>Mechanism/Action</i>	<i>Cause</i>	<i>Alternative 1</i>	<i>Alternative 2</i>	<i>Alternative 3</i>	<i>Alternative 4</i>
FIRE	Natural	Historic (100 years) natural fires in the area have not been detrimental to stream channels. Very low risk is associated to detrimental effects of natural fire to stream channels due to their geology and gradients.	Reducing the fuel loading through thinning reduces the risk of hotter, intense burns and subsequent loss of woody material. A change in the temporal loading of wood in the streams occurs.	Thinning and regeneration cutting reduce material that would be available to a natural fire event. With full leave riparian reserves/buffers effects are similar to alternative #2.	See alternative 3.
FELLING	Directional felling	N/A	Full riparian reserve leave are being left. No effect is anticipated on channels.	Same as Alternative 2	Same as Alternative 2.
REMOVAL OF TREES	Ground Skidding	N/A	Capture of runoff and compaction could occur on 61 acres. Stream channels could be affected if rerouting of water occurs from the skidding and extended drainage network. Low risk of capture, no treatment in the riparian reserves.	Capture of runoff and compaction could occur on 59 acres. Stream channels could be affected if rerouting of water occurs from the skidding pattern and method. A very low risk, if any, occurs due to no treatment in the riparian reserves.	Capture of runoff and compaction could occur on 34 acres. Stream channels could be affected if rerouting of water occurs from the skidding pattern and method. A very low risk, if any, occurs due to no treatment in the riparian reserves.
	Helicopter yarding	N/A	This is the most protective way of removing trees from a site. 128 acres of removal would not create an increase risk to stream channels	52 acres of helicopter yarding. No effect to stream channels	See alternative 3.
	Haul	N/A	Maintenance of 22.32 miles of system road and reconstruction of 5.43 miles of closed roads intersect numerous stream channels. Crossings are designed to withstand 100	See alternative 2	See alternative 2

<i>Mechanism/Action</i>	<i>Cause</i>	<i>Alternative 1</i>	<i>Alternative 2</i>	<i>Alternative 3</i>	<i>Alternative 4</i>
			year flood events. Road template currently in place. Low risk to stream channels.		
CONSTRUCTION	Clearing		Clearing removes vegetation along existing road templates to allow travel. Minor effects would be attributed to the 5.43 miles of road reconstruction.	See alternative 2.	See alternative 2.
	Grubbing (Digging of root wads and vegetation.)		Grubbing will be associated to the construction of landings. Low risk due to full riparian reserves.	See alternative 2.	See alternative 2.
OF LANDINGS	Travel	Status Quo	Travel along existing roads, tends to be restricted to rocky mainline roads. Effects to stream channels will be associated to fines being generated off the 22.32 miles of road maintenance and the 5.43 miles of reconstructed road. This would be short term (duration of sale), due to roads being closed at the end of the sale.	See alternative 2.	See alternative 2.
AND ROADS	Closing	Moderate risk associated to maintaining open roads and not maintaining drainage features.	Reconstruction of drainage patterns and maintenance reduces the risk of capturing flow and routing. Short term (1-2 years) input of sediment into channel from disturbing stream bottom.	See alternative 2.	See alternative 2.
	Subsoiling	N/A	Sub soiling could possibly occur on the intensely used skid roads and	Sub soiling could possibly occur on the intensely used skid roads and landings.	Sub soiling could possibly occur on the intensely used skid roads and

<i>Mechanism/Action</i>	<i>Cause</i>	<i>Alternative 1</i>	<i>Alternative 2</i>	<i>Alternative 3</i>	<i>Alternative 4</i>
			landings. 61 acres are being ground based. Approximately 7.3 acres could be compacted. These areas would be subsoiled. A positive effect to stream channels occurs in increasing permeability of compacted areas and reducing the potential of channel routing.	59 acres are being ground based. Approximately 7 acres could be compacted. These areas would be subsoiled. A positive effect to stream channels occurs in increasing permeability of compacted areas and reducing the potential of channel routing.	landings. 34 acres are being ground based. Approximately 4.6 acres could be compacted. These areas would be subsoiled. A positive effect to stream channels occurs in increasing permeability of compacted areas and reducing the potential of channel routing.
SLASH TREATMENT	Piling	N/A	Due to full leave riparian reserves/buffers it is not anticipated that piles will have an effect on stream channels.	See alternative 2	See alternative 2
PREP WORK	Burning	N/A	Due to full leave riparian reserves/buffers it is not anticipated that piles will have an effect on stream channels.	See alternative 2	See alternative 2

C Cumulative Effects: Steam channels

Effects of a cumulative nature are those effects which independently do not pose a risk to water quality yet, when added together may have some measurable effect on water quality. Looking at the watershed condition types for streams found within the project area, determines what management prescriptions should be followed. (Page E-10 to E-17; LRMP) “This criterion is intended to address the potential for changes in peak flows during rain-on-snow events, and the associate potential change in the stability of the stream banks and streambed.” (LRMP pg. E-6). The Watershed condition types are type 1, and 2 channels (LRMP; pg. E-10-12). Under types 1 & 2 no recommended ARP is required due to the stability of the channels. Upon reviewing these criteria and the streams involved in this project it is not anticipated that adverse cumulative effects will occur to stream channels. See table 4 to review the changes.

Water Quality:

A. Existing Condition: Beneficial uses, dependent on aquatic resources, in this planning area are; resident fisheries use; aquatic non-fish species use; riparian dependent species use; water-related recreation; and water-related fire suppression and road maintenance needs. Water from this site flows into Pyramid Creek a tributary to the Middle Santiam River and then into Green Peter Reservoir.

Water quality parameters critical to beneficial users are temperature, type and timing of sediment input and biological contaminants. Stream segments listed under 303(d) classification with the State of Oregon, due to exceeding the temperature criterion of 18.0 C (64.4 F) for salmonid migration and rearing (December 2003 Temperature criteria adopted by the Environmental Quality Commission and approved by USEPA in March 2004), are found in the Middle Santiam River approximately 1 mile downstream. The Middle Santiam’s river-mile 5.3 (Green Peter Reservoir), to 37.1(headwaters), are listed in the draft 2004 listing for summer temperature, but were not on the 2002 303(d) list when this project was first proposed.

B. Environmental Consequences: Water Quality

Direct and Indirect Effects: Effects to water quality could occur with increases in inputs as the result of the timber sale. These inputs could be as varied as contaminants petroleum products, sediment or solar radiation. All of these could have an adverse effect of the quality of water within the project area. Table 7 evaluates the effect by action for water quality.

Table 7: Water Quality; Direct and Indirect Mechanism of change by Alternative

<u>Mechanism/ Action</u>	<u>Cause</u>	<u>Alternative 1</u>	<u>Alternative 2</u>	<u>Alternative 3</u>	<u>Alternative 4</u>
FIRE	Natural	Historic (100 years) natural fires in the area have influenced water quality by removing vegetation that stabilizes the soils. Moderate risk is associated to detrimental effects of natural fire to water quality.	See alternative #1.	See alternative #1.	See alternative #1.
FELLING	Directional felling	N/A	Full riparian reserve leave are being left. No effect is anticipated on water quality.	See alternative 2.	See alternative 2.
	Bucking/La	N/A	Full riparian reserve leave are being left.	See alternative 2.	See alternative 2.

<u>Mechanism/ Action</u>	<u>Cause</u>	<u>Alternative 1</u>	<u>Alternative 2</u>	<u>Alternative 3</u>	<u>Alternative 4</u>
	mbing		No effect is anticipated on water quality.		
TREES	Ground Skidding	N/A	Capture of runoff and compaction could occur on 61 acres. Water Quality could be affected if rerouting of water occurs from the skidding and extended drainage network allowing sediment to enter the channel. Low risk of capture, due to no treatment in the riparian reserves	Capture of runoff and compaction could occur on 59 acres. Water quality could be affected if rerouting of water occurs from the skidding pattern allowing sediment to enter the stream. A very low risk, if any, occurs due to no treatment in the riparian reserves	Capture of runoff and compaction could occur on 34 acres. Water quality could be affected if rerouting of water occurs from the skidding pattern allowing sediment to enter the stream. A very low risk, if any, occurs due to no treatment in the riparian reserves.
	Helicopter yarding	N/A	This is the most protective way of removing trees from a site. 128 acres of removal are proposed. Water quality risks are associated to service landing locations and potential spills. Low risk.	Only 52 acres of helicopter. Similar to alternative 2.	Only 52 acres of helicopter. Similar to alternative 2.
	Haul	Without a sale in the area money available for road maintenance does not cover adequate maintenance of the road systems. Increase sediment from road surfaces being washed when ditches fill and maintenance of road system does not occur.		Reconstruction of 5.43 miles of system road will intersect numerous stream channels and provide sources of sediment into the channel Loss of current vegetative cover and loss of vegetation increase the potential of sediment input currently in place.	See alternative 2.
	Clearing		Clearing removes vegetation along existing road templates to allow travel. Minor effects would be attributed to the 5.43 miles of road reconstruction/construction.	Additional risks are associated to increasing the road network by 5.43 miles. And removing vegetation that attribute to bank stability at crossings. Increasing	See alternative 3.

<u>Mechanism/ Action</u>	<u>Cause</u>	<u>Alternative 1</u>	<u>Alternative 2</u>	<u>Alternative 3</u>	<u>Alternative 4</u>
CONSTRUCTION OF LANDINGS AND ROADS				sediment and solar inputs.	
	Grubbing (Digging of root wads and vegetation.)		Grubbing will be associated to the construction of landings. Low risk due to full riparian reserves.	Grubbing will be associated to the construction of landings. Low risk due to full riparian reserves	Grubbing will be associated to the construction of landings. Low risk due to full riparian reserves
	Travel	Status Quo	Travel along existing roads, tends to be restricted to rocked mainline roads. Effects to water quality will be associated to fines being generated off the 5.43 mile of reconstructed road and the 22.32 miles of rocked system roads.	See alternative #2.	See alternative #2.
	Closing		5.43 mile of reconstructed road will be closed after drainages are reconnected. Low risk.	See alternative 2.	See alternative 2
	Subsoiling	N/A	Sub soiling could possibly occur on the intensely used skid roads and landings. 61 acres are being ground based. Approximately 7.3 acres could be compacted. These areas would be subsoiled. Potential for petroleum spill is low	Sub soiling could possibly occur on the intensely used skid roads and landings. 59 acres are being ground based. Approximately 7 acres could be compacted. These areas would be subsoiled. Potential for petroleum spill, low.	Sub soiling could possibly occur on the intensely used skid roads and landings. 34 acres are being ground based. Approximately 4.6 acres could be compacted. These areas would be subsoiled. Potential for petroleum spill, low.
SLASH TREATMENT	Piling	N/A	Water Quality effects associated to piling are dependent on type, No effect occurs with hand piling while minor effects occur with machine piling. By having equipment on the site you increase	Similar to alternative 2 with 59 acres available to machine pile.	Similar to alternative 2 with 34 acres available to machine pile

<u>Mechanism/ Action</u>	<u>Cause</u>	<u>Alternative 1</u>	<u>Alternative 2</u>	<u>Alternative 3</u>	<u>Alternative 4</u>
PREP WORK			the size of the piles and the risk of petroleum spills. 61 acres available for machine piling.		
	Burning	N/A	Burning of hand piles will create small 15x15 foot areas of soils that are at risk of hydrophobic conditions. Nutrients from these piles could enter water ways. The spatial distribution of these small sites creates a low impact to water quality and is therefore not determined a risk. Machine pile tend to be larger 25 x 25 feet, and spaced at greater distance and are also not considered to pose a risk.	See alternative 2	Similar to alternative 2

C. Cumulative Effects Water Quality:

Water quality Cumulative affects would be similar to the hydrology and the stream channel discussions. The effect of all the activities that will occur under this proposal is tempered by the timing of the action in relation to the recovery of the stands, and the buffers required. With full leave riparian reserves left as buffers water quality impacts are minimal due to the spatial nature of disturbance to the streams. Provided the Best Management Practices prescribed in this report are met, it is not anticipated that adverse cumulative effects will occur as a result of this project to water quality.

Riparian reserves:

A. Existing Conditions:

Riparian reserves for this planning area are based on the interim widths established in the Northwest Forest Plan. Widths vary depending upon the height of the potential site tree. All units, except unit 24, fall within the pacific silver fir plant association and contain a 150-foot slope distance riparian reserve (one potential site tree height) for class III and IV streams

(300 feet total, including both side of stream) and 300 feet (two site potential tree height) for fish bearing streams (600 feet total, including both side of stream). South Pyramid Creek, below the project area is the only known fish-bearing streams associated to this project. Unit 24 falls within the western hemlock plant association and contains a 172 foot slope distance riparian reserve (one potential site tree height) for class III and IV streams (344 feet total, including both side of stream) and 344 foot slope distance riparian reserve (two site potential tree height) for fish bearing streams (688 feet total, including both side of stream).

Riparian Areas contain a diversity of species and size class. Woody material is being created through the natural succession of the stand and providing the stream with organic material. Reserve areas are progressing towards late successional characteristics and do not need management at this time. Riparian conditions are maintained through the utilization of full leave riparian buffers. These buffers will through time develop the characteristics, structure, openings, down wood naturally. Direct and indirect effect to the riparian reserves are a compilation of the hydrology, stream channel, water quality and terrestrial wildlife components and will not be restated here.

It is anticipated that management of the riparian reserves in this manner will protect and enhance the aquatic and wildlife dependent species present, and the ACS objectives.

VII. Conclusion and Rationale

In looking at the direct and indirect effect for hydrology, stream channel, water quality and riparian reserve, it is not anticipated that any of the effects will be detrimental or create significant downstream effects. Alternative 1 highest risk is the result of fire and the effect if and when a fire occurs. Due to fire management protocols fire starts within this area would be actively pursued and controlled as soon as possible. This reduces the risks associated to alternative 1 to being very low.

Alternative two treats 189 acres with various prescriptions and logging systems. The greatest risk associated to alternative 2 is 61 acres of ground based logging. This risk is reduced due to the maintenance of full width riparian reserves. This risk while real is reduced with the Best management practices prescribed. The action falls well within the Forest Plan standards and guidelines. If all BMP's and standards and guidelines are met it has been shown through past actions that detrimental impacts to beneficial users will not occur. Under this alternative 5.43 miles of road will be reopened and then closed at the completion of the project.

Alternative three treats the 111 acres with various prescriptions. The main difference is regeneration of 43 acres. 6.3 miles of reconstructed roads will be utilized to allow access and these will be closed at the completion of the project. The difference in effect is a longer recovery time on the 43 acres of regeneration cutting.

Alternative four treats the 86 acres with various prescriptions. The main difference is regeneration of 71 acres. 6.3 miles of reconstructed roads will be utilized to allow access and these will be closed at the completion of the project. The difference in effect is a longer recovery time on the 71 acres of regeneration cutting.

The critical elements in the maintenance of hydrology ,stream channels, water quality and riparian reserves in the planning area are the existing riparian areas. Provided these riparian areas are maintained in a healthy state the stream systems would be anticipated to obtain their desired future condition. Future management activities are considered in the long term objectives for riparian areas of perennial and intermittent streams. Long term riparian objectives are considered along with other resource goals and objectives agreed to by the interdisciplinary team. Stream-side management prescriptions are designed to maintain Aquatic Conservation Strategy Objectives (ACSO), as defined in Willamette's LRMP to meet these long term objectives. Under all action alternatives full leave riparian reserves are maintained.

Best Management Practices (BMP's) are utilized in the development of mitigation and compliance to ACSO's. These BMP's can be found in "General Water Quality Best Management Practices" Pacific Northwest Region, November, 1988.

Utilizing BMP's for this project specifically address direction and guidance in the protection of water quality. South Pyramid Thin project objectives and mitigation for water quality are:

Objective:

Continue recovery of downstream riparian, channel and water quality conditions.

Mitigation:

Design units to insure channel bank stability, and provide adequate buffers to reduce sediment inputs and minimize peak flow effects (BMP T-2; T-7; T-8; T-12). Boundaries are placed in such a manner to avoid compromising stability of the channel banks.

Boundaries will be placed on the edge of the riparian reserve (minimum 150 feet from stream course).

Objective:

Maintain or improve the quality of water for domestic and fisheries users.

Mitigation:

Designate riparian management units and specific prescriptions for each individual unit adjacent to stream courses requiring protection (BMP; T-7).

Objective:

Maintain natural filtration of surface, overland flow, through post sale activities.

Mitigation:

Establish appropriate riparian management units and establish fire lines to ensure maintenance of established buffers, filter strips (BMP T-7; T-8; F-2; F-3).

Objective:

Maintain or improve existing temperature regime along perennial streams in relation to water quality.

Mitigation:

Designation of riparian management units to maintain and improve shade canopies over stream channels (BMP T-2; T-7; T-8). Full riparian reserves exceed requirements for primary and secondary shade zones.

Objective:

Maintain or improve channel bank stability.

Mitigation:

Establish riparian management units that include channel bank areas and or establish marking prescriptions that prevent any tree attributing to bank stability from being marked (BMP T-2; T-6; T-7; T-8).

Objective:

Control the amount of sediment leaving the road system.

Mitigation:

Utilize appropriate B and C clauses within the contract to insure that winter haul occurs on roads with adequate surface rock and that erosion control techniques such as mulching of bare soils associated to the road system occur and season of haul permissible for water quality reasons.

Floodplains occur within the areas located in the planning area. No activities will occur on within flood plains due to the maintenance of riparian reserves and buffer restrictions. Wet areas will be dealt with on an individual basis under the stand specific recommendations and wetland areas less than 1/4 acre will be treated as special habitat areas (FW-211).

The action alternatives proposed in the South Pyramid Thin project meet Federal and State water quality objectives. These objectives are met through the implementation of BMP's. Riparian reserves have been established 150 to 172 feet on either side of the intermittent and perennial non fish bearing streams, and 300-344 feet on either side of the fish bearing or domestic water supply streams. These reserves are adequate to maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems and meet the ACS Objectives

VIII. Mitigation:

Due to the requirements of the regulations, Standard, and Guides surrounding this project the mitigations tied to the proposed activity involves the ripping and planting of landings, roads, and closed roads prior to the completion of the project. Approximately 4-7 acres of skid road will need ripping.. This includes but is not limited to the ripping and planting of landings and roads, the under planting of corridors through riparian buffers, the under planting of hardwood stands. This will protect and enhance the hydrology, stream channels, water quality, or riparian values.

IX. Monitoring:

Stand response to treatment will be evaluated in 3 years to insure success of planted trees. At 10-15 years a sticking check will be made to look ate the stands condition. Riparian conditions will also be monitored as to their response to treatment and species composition. This will part of the Best Management practices monitoring.

X. Consistency with Direction and Regulations:

The following list shows the various Directions and regulations that were utilized in the development of the prescriptions for this proposal. In all action alternatives unit layout and design considered and applied the intent of the direction and regulation. All of the units were reviewed on the ground and recommendations and effects considered. All actions within the alternatives are anticipated to be consistent with this direction in regards to water quality, hydrology, stream channels and riparian protection. Thought processes are disclosed under the regulatory framework in section 2 of this report.

Table 10: Consistency with Direction and Regulations for Hydrology, Stream Channels, and Water Quality.

<i>Regulation</i>	<i>Alternative 2</i>	<i>Alternative 3</i>	<i>Alternative 4</i>
Willamette National Forest Land and Resource Management Plan Watershed requirements.	yes	yes	yes
FEMAT	yes	yes	yes
ACSO	yes	yes	yes
NWFP	yes	yes	yes
Clean Water Act	yes	yes	yes
DEQ Sufficiency Analysis for Stream Temperature 303d listing Water Quality Management Plan.	yes	yes	yes
Best Management Practices	yes	yes	yes

XI. Irreversible and Irretrievable Commitments of Resources:

It is not anticipate that any irreversible or irretrievable commitments will occur relating to hydrology, stream channels, water quality, or riparian reserve. The dynamic nature of these elements precludes this from occurring through time.

XII. References Cited:

- Middle Santiam Watershed Analysis ;.Sweet Home Ranger District; Willamette National Forest; April 1996.
- Federal Register, Volume 40, No 230 November 28, 1975
- FEMAT; Forest Ecosystem Management: An Ecological, Economic, and Social Assessment, Report to the Forest Ecosystem Management Assessment Team; July 1993; USDA; USDI; NOAA; EPA.
- General Water Quality Best Management Practices; USDA Forest Service, Pacific Northwest Region, November 1988.
- Harr, Dennis R: Some Characteristics and Consequences of Snowmelt During Rainfall in Western Oregon; Journal of Hydrology, 53; 1981 (pg 277-304).
- Jones, Julia A and Grant, Gordon E; Comment of “Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon: A second opinion” by R.B. Thomas and W.F. Megahan; Water Resources Research, Vol. 37, No 1 (pages 175-178, January 2001.
- Land and Resource Management Plan; Willamette National Forest: 1990; USDA Forest Service, Pacific Northwest Region.
- Northwest Forest Plan; Record of Decision for Admendments to Forest service and Bureau of land Management Planning Documents Within the Range of the Northern Spotted Owl; Standards and Guidelines for management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl; April, 1994 ; USDA Forest Service, USDI Bureau of Land Management.
- Pike, Robin G. and Scherer, Rob; Overview of the potential effects of forest management on low flows in snowmelt-dominated hydrologic regimes. BC Journal of Ecosystem Management, Volume 3, Number 1, 2003.
- Reeves, G.H et al; A Disturbance-Based Ecosystem Approach to maintaining and Restoring Freshwater habitats of Evolutionary Significant Units of Anadromous Salmonids in the Pacific Northwest; American Fisheries Society Symposium 17:334-349, 1995
- Rosgen, Dave; Applied River Morphology; Wildland Hydrology Pagosa Springs, Colorado, 1996.

- Sufficiency Analysis: Northwest Forest Plan Temperature TMDL Implementation Strategies; Evaluation of the Northwest Forest Plan Aquatic Conservation Strategy and Associated Tools to achieve and maintain stream temperature water quality standards; April 15, 2005; USDA Forest Service, USDI Bureau of Land Management.
- Webster's Ninth Collegiate Dictionary; 1988

David Halemeier

/s/

Santiam River Zone Hydrologist

Appendix A: Project File Information for Hydrology;

1. Project Initiation Letter. February 5, 1999
2. Aggregate Recovery report
3. Eco systems West South Pyramid Creek & daily maximum water temperatures.
4. Various IDT notes and tables showing various components of units and alternatives.
5. Field Notes

Note: This information is being kept as part of the specialists project file and not included in this report except by this reference.

Project Review for Heritage Resources
under the terms of the
1995 Programmatic Agreement between ACHP, SHPO,
and USFS R6

FOREST: Willamette RANGER DISTRICT: Sweet Home County: Linn
UNDERTAKING/PROJECT NAME: South Pyramid Timber Sale
USGS Quad(s):
Township(s): 12 S Range(s): 6 E Section(s): 20, 21, 28, 29, 32, 3
Proposed Implementation Date: FY 2004-2005

By signing this document, the Forest Specialist certifies that for this project the Forest complies with Section 106 of the National Historic Preservation Act, under the terms of the Programmatic Agreement (PA). This form shall be kept on file with the project NEPA analysis file and supporting documentation.

PROGRAMMATIC REVIEW (Stipulation III.A) SHPO CONSULTATION NOT REQUIRED:

- The undertaking named above meets the conditions listed in **Appendix A** and will be excluded from case-by-case review.
- The undertaking named above meets the conditions listed in **Appendix B** and will be excluded from case-by-case review. Inspection and/or monitoring documentation is attached.

STANDARD CASE-BY-CASE REVIEW (Stip. III.B) DOCUMENTATION TO SHPO AS NOTED

- NO HISTORIC PROPERTIES** An appropriate inventory has been conducted for this undertaking and no properties potentially eligible for the National Register of Historic Places (NRHP) have been located; therefore, the undertaking meets the criteria given in Stip. III.B.1 of the PA. The undertaking may proceed. A COPY OF THE DOCUMENTATION WILL BE FORWARDED TO SHPO FOR INFORMATION WITHIN 60 DAYS.
- NO EFFECT:** An appropriate inventory has been conducted for this undertaking and property(s) which may be eligible for inclusion in the NRHP have been located. Avoidance measures will be implemented per Stip. III.B.2 (a-d), if necessary; therefore the undertaking meets the criteria given in Stip. III.B.2 of the PA. The undertaking may proceed. A COPY OF THE DOCUMENTATION WILL BE FORWARDED TO SHPO FOR INFORMATION WITHIN 60 DAYS.
- NO ADVERSE EFFECT:** An appropriate inventory has been conducted for this undertaking and property(s) which may be eligible for inclusion in the NRHP have located which may be affected by the undertaking. DOCUMENTATION WILL BE FORWARDED TO SHPO PER STIP. III.B.5(a). The undertaking may proceed in 30 calendar days if SHPO does not object.

Forest Specialist *Carroll Berg* Date 1/26/04

FOR SHPO USE

For NO ADVERSE EFFECT undertakings, please indicate your opinion of our determination by marking the appropriate line below, then sign and return this for to us.

I Concur with NO ADVERSE EFFECT Signed _____

I Do Not Concur, because in my opinion: Date _____

- This undertaking will have an ADVERSE EFFECT
- This undertaking will have NO EFFECT

Past, Present and Reasonably Foreseeable Future Actions

The following summary focuses primarily on present and future actions within the Upper MidSantiam subwatershed (6th field).

In the foreseeable future, the Sweet Home Ranger District is likely to plan pre-commercial and commercial thinning of managed stands in this subwatershed. In contrast, no harvest of natural stands is currently planned over the same period beyond the South Pyramid Timber Sale. However, there is always a potential that windthrown trees from natural and managed stands will be salvaged in the next 10 years. Such salvage will likely be confined to existing road prisms, unless a sizable stand area (over 5 acres) is substantially affected (half of the trees).

Actual future commercial thinning acres are difficult to estimate. The subwatershed has approximately 1120 managed stand acres potentially suitable and available for commercial thinning over the next 10 years. Approximately 520 managed stand acres are currently listed on the District's 5-year action plan for commercial thinning (*Ethyl and Holman*) in this subwatershed. Typically one-third of proposed harvest acres have been dropped as special habitats and Riparian Reserves. Thinning will likely reduce stand densities to an average 40-60% canopy closure depending on site-specific resource concerns. These managed stands are accessible by existing road systems created by past harvest operations; therefore, very little road construction is anticipated to complete thinning activities.

Any road construction connected to future thinnings will create short, temporary spurs to landing sites. Future thinnings could also reopen bermed spurs. Both new and reopened spurs of this nature are closed after harvest operations are complete. By in large, future public harvest will not increase road densities in the Upper MidSantiam subwatershed, though future sales could fund more road closures.

Another 1,200 acres of young managed stands in the subwatershed are prime candidates for pre-commercial thinning (PCT). PCT operations reduce stand densities to approximately 200-250 trees per acre. This work does not require new road construction or reconstruction to complete. Current appropriated budgets have only been able to accomplish 10% of PCT thinning needs. Funding from commercial thinning sales and the PL106-393 Title II funding program could accomplish another 10% of available acres over the next 10 years.

On slightly over 6,000 acres of private land in this subwatershed, some commercial thinning and regeneration harvest will likely occur in the next 10 years. No private acres lie within the South Pyramid project area, though two private parcels of young plantations form part of its boundary. All private land harvest will occur in managed stands. How much private harvest will occur in the next 10 years is difficult to estimate, but given this landowner's even-flow harvest strategy, harvest could affect 12-15% of private lands in this subwatershed in the next decade. Regeneration harvesting will likely be more common than commercial thinning on these private lands. Thinning by this landowner has so far been limited to gentle terrain near roads that can be completed with ground-based equipment. Prescriptions have been conservative by thinning from

below and retaining 60-70% canopy closure. In contrast to public lands, very little PCT thinning will occur on these private lands.

Private land harvest will also rely heavily on the existing road system, requiring very little new road construction. The private landowner in this subwatershed routinely closes (berms or gates) short local spurs when they are not needed for harvest activities.

Commercial harvest operations on both public and private lands can be expected to create fuel reduction activities, such as slash burning. Most slash reduction will occur as pile burning, though broadcast burning could occur on steeper private land after regeneration harvest. Slash piles are created with tractor or manual labor.

In addition to harvest operations described above and its related activities, road and trail maintenance are activities also likely to occur in the foreseeable future in this subwatershed. Road maintenance includes right-of-way brushing, removal of windthrown trees in roadways, and ditch cleaning where necessary. Trail work includes similar work but on a smaller scale and is completed with hand labor. Finally, a limited amount of noxious weed control will occur along roads in this subwatershed. This work will be completed by hand labor, or limited spot chemical application through an existing forest-wide contract.

Extensive timber harvest, mostly regeneration harvesting, has occurred on both public and private lands in this watershed. In order to access harvest areas, an extensive road system was developed. For some resources these past activities are still contributing to cumulative effects and for some resources they are not.

Table 1 below lists possible activities that potentially contribute to cumulative effects in this area. Figure 1 that follows the table shows the timber management and roading activities in the planning area and figure 2 shows the sale names.

Table 1: Activities Potentially Contributing to Cumulative Effects

Past/Present/Future	Activity	Effects																																	
Wildlife																																			
1992-Present	Designation of Critical Habitat Unit	Management activities have changed to be more in line with development and maintenance of late-successional habitat here.																																	
	Surveys of wildlife populations (i.e. spotted owls, etc.)	Have better idea what impacts that management activities have on some species.																																	
Fisheries																																			
2004-2005	Planted spring Chinook salmon above dam	Pre-smolts and fry released above dam																																	
Vegetation																																			
Past 1950'-1980's	<p>The table below shows the harvest by subwatershed and watershed.</p> <table border="1"> <thead> <tr> <th>Decade</th> <th>Headwaters Middle Santiam</th> <th>Middle Santiam</th> </tr> </thead> <tbody> <tr> <td>1941-1950</td> <td>42</td> <td>42</td> </tr> <tr> <td>1951-1960</td> <td>1189</td> <td>1577</td> </tr> <tr> <td>1961-1970</td> <td>612</td> <td>1780</td> </tr> <tr> <td>1971-1980</td> <td>1151</td> <td>2571</td> </tr> <tr> <td>1981-1990</td> <td>1038</td> <td>1505</td> </tr> <tr> <td>1991-2000</td> <td>852</td> <td>1930</td> </tr> <tr> <td>Total Acres Harvested on NF System Lands</td> <td>4884</td> <td>9405</td> </tr> <tr> <td>Total Acres</td> <td>20792</td> <td>66749</td> </tr> <tr> <td>Acres of National Forest System Land</td> <td>14110</td> <td>42639</td> </tr> <tr> <td>Acres of Other Ownership</td> <td>6682</td> <td>24110</td> </tr> </tbody> </table>	Decade	Headwaters Middle Santiam	Middle Santiam	1941-1950	42	42	1951-1960	1189	1577	1961-1970	612	1780	1971-1980	1151	2571	1981-1990	1038	1505	1991-2000	852	1930	Total Acres Harvested on NF System Lands	4884	9405	Total Acres	20792	66749	Acres of National Forest System Land	14110	42639	Acres of Other Ownership	6682	24110	<p>Changed stand structure and seral stage distribution</p> <p>Decreased patch sizes of late-successional habitat</p> <p>Removed snags</p> <p>Increased forage for big game, reduced prey base for spotted owls</p> <p>Loss of interior habitat</p> <p>Increase in edge more likelihood of blowdown</p> <p>Loss of snags and coarse woody material</p> <p>Increase in peak flows</p> <p>Removed suitable spotted owl habitat</p> <p>Creation of a variety of habitat that is good for some species</p> <p>Affected visual quality</p>
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1950's-Present	Yarding Operations	<p>May displace dispersed recreation activities during operations</p> <p>May displace and/or disturb wildlife during operations</p>																																	

		Could disturb heritage sites
1950's-Present	Use of ground-based yarding equipment	Soil compaction Soil displacement Runoff channeled down skid roads
Vegetation		
1950's - Present	Firewood cutting	Reduced snags and down woody material
1950's - Present	Reforestation	Planted trees densely. Early on plantings had less varied species than more current plantings.
1960's - Present	Pre-commercial thinning	Increased tree growth and size on plantations
1950's to present	Harvest of private land in western portion of analysis area	Likely to only ever develop into spotted owl dispersal habitat Hard to manage on landscape level with varied ownership and management philosophies
1994-Present	Timber harvest	Annual volume of timber reduced. Types of harvest changed such as variable density thinning.
1994-Present	Harvest of special forest products	Increased demand for special forest products
1950's to Present	Noxious weeds spread	Travel on roads whether for recreation or commercial purposes has contributed to the spread of noxious weeds Identification and treatment of noxious weed sites has helped curb the introduction and establishment of new noxious weed populations
1960's to present	Thinning	Increase tree sizes Increase light to forest floor - stimulate growth of understorey species - increase forage Increased slash build up - increasing risk of fires, creating habitat, insect
1990's	Harvest of yew bark for taxol	Loss of yew trees in watershed Affected lichens that grow on yew trees
1990 - Present	Protection of sensitive plant species	Maintain species diversity
1990	Retention of snags and down woody material in harvest units	Beginning to improve snag and down wood habitat
Continually	Vegetation growth	Reduction in peak flows Increase in hiding cover for big game

		Reduction in big game forage and forage quality
		Stabilized soil - reduced erosion and sediment to stream
		stabilization of some road sidecast areas
		Increased shade to stream channels - begin to lower stream temperatures
		Hydrologic recovery
		Habitat is growing into spotted owl dispersal habitat
Hydrology/Stream Channels/Water Quality		
1994-Present	Implementation of NW Forest Plan Aquatic Conservation Strategy Objectives (<i>including Riparian Reserves, watershed analysis and standards and guidelines</i>)	Beginning to see improvement in riparian habitat, stream and stream structure.
1964, 1996	Floods	
Soils/Geology		
1980's to Present	End-hauling used in road construction	Reduce potential for slope failures
1990's to Present	Subsoiling	Reduce soil compaction
Fire/Fuels		
Past	Large-scale fires both stand-replacing and underburning	Reduced snags and down wood in watershed
Past 1950's - 1980's	Broadcast burning	Removed coarse woody material
		Depletes soil
		Reduces duff layer
		Loss of snags
Late 1980's - Present	Grapple piling, hand piling, etc.	Better protection of soil resource
1900's - Present	Fire suppression	Changes in natural fire regime, but not outside range of conditions. High fuel loadings so possible elevated risk of severity fire due to the continuity of vertical and horizontal fuels exists across the landscape
		Snags felled - loss of habitat

Transportation and other infrastructure		
1950's to 1980's	Road construction and transportation development using sidecast road-building techniques	Increased sediment affects beneficial uses
		Stream crossings - affect fish habitat
		Increased peak flows
		Extension of drainage network
		Vegetation loss affects habitat
		Reduction in effectiveness of habitat near roads for deer and elk
		Removed suitable spotted owl habitat
		Disturb heritage sites
		Better recreational, administrative and fire suppression access
1980's to Present	End-haul road construction techniques	More stable roads
		Less erosion
1950's to present	Road use - traffic	Introduction of exotic species
		Direct mortality of animals
		Increased noise and disturbance to wildlife
		Snags near roads felled to protect public safety - loss of habitat
1950's to present	Road surfacing	Rock use irretrievable
		Spread of noxious weeds
		Minimize erosion
1950's to present	Road maintenance activities	Sediment
1990's to Present	Road decommissioning, obliteration, and closures	Reduced road maintenance costs
		Storm-proof and/or store roads
		Less access for recreation, commercial and administrative activities
		Less traffic on roads
		helps direct flow to natural drainage pattern
		Reduced wildlife disturbance

1990's to Present	Lack of road maintenance due to funding and no timber sales	Some roads beginning to brush in and close on own
		Less access for recreation, commercial and administrative activities
1994- Present	Culvert replacement	Improve ability of road to handle large amounts of water during flood events
1960's	Construction of Green Peter and Foster Dams	Blocked upstream migration of fish including spring Chinook salmon and winter steelhead in many areas

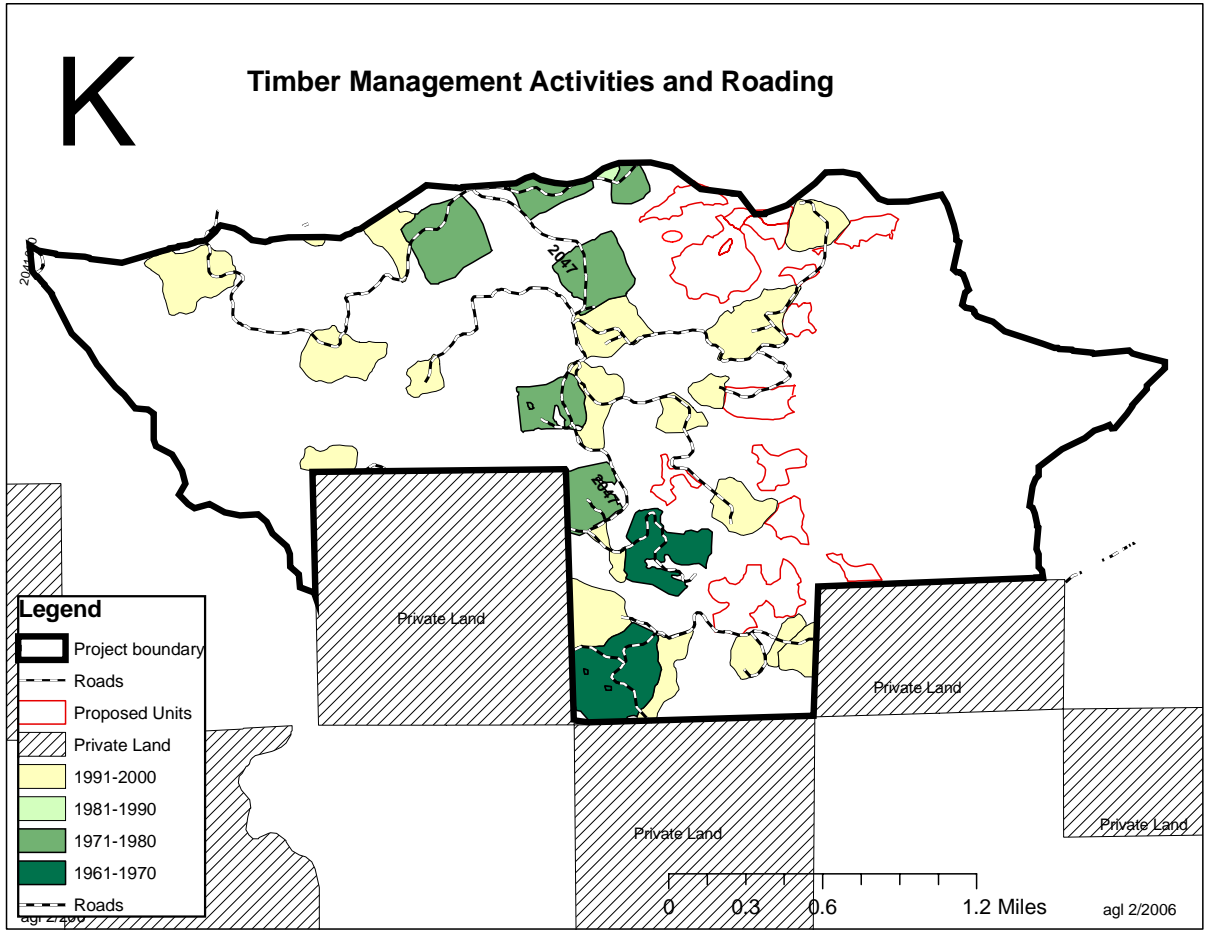


figure 1 – timber management activities and rooding.

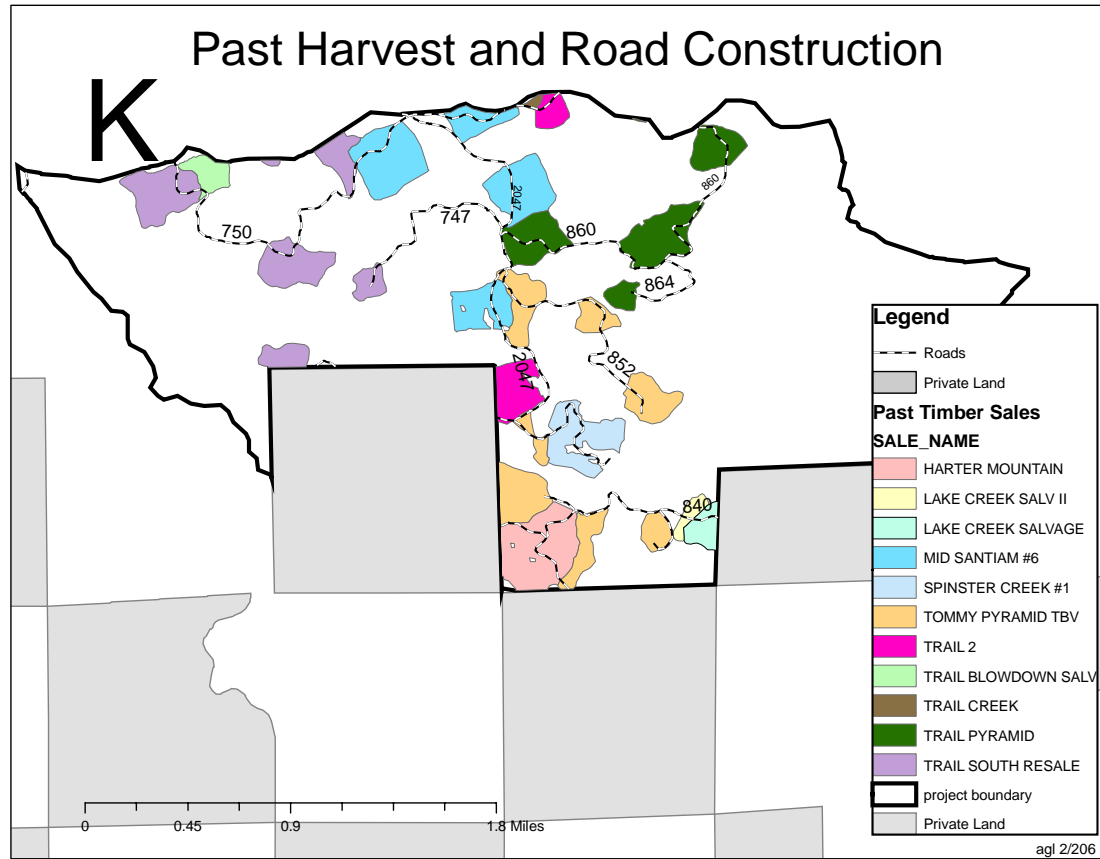
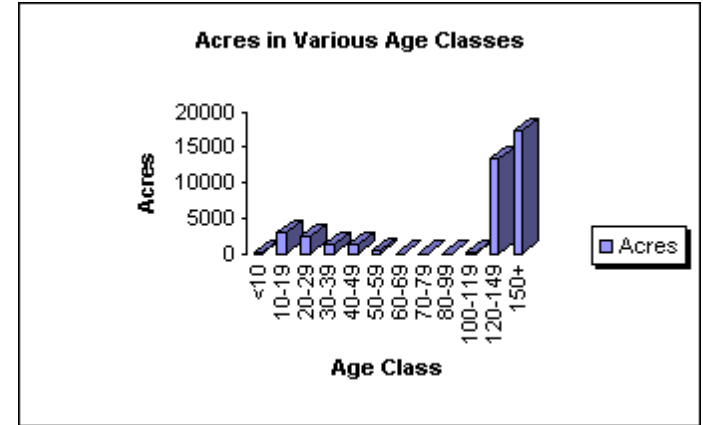
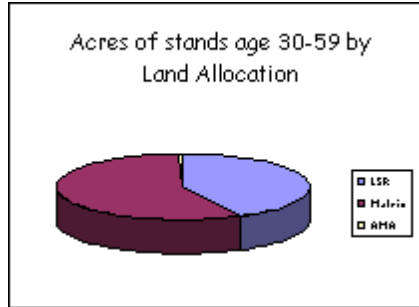


figure 2 – timber sales in the planning area

Middle Santiam

HUC4	HUC5	LMP	Total Acres	Acres 30-59	PAG	<10	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-99	100-119	120-149	150+
06	01	LSR	7474	178	ABAM	63	728	341	178							2489	3675
					ABGR												
					PSME												
			8480	248	TSHE	30	858	459	248							2500	4385
			739	4	TSME	7	76	34	4							200	418
					ND												
LSR Subtotals			16693	430	Totals	100	1662	834	430	0	0	0	0	0	0	5189	8478
		Matrix	10223	1129	ABAM	37	442	873	269	541	319					3716	4026
					ABGR												
			13		PSME		11	2									
			12002	1370	TSHE	10	786	702	432	782	156				45	4363	4726
			54	14	TSME		20	20	7	6	1						
Matrix Subtotals			22292	2513	Totals	47	1259	1597	708	1329	476	0	0	0	45	8079	8752
		AMA	156	59	ABAM		13	23	30	29					61		
					ABGR												
					PSME												
			5	2	TSHE			1	1	1					2		
			84	36	TSME		13	2	18	18					33		
					ND												
AMA Subtotals			245	97	Totals	0	26	26	49	48	0	0	0	0	96	0	0
Watershed Totals			39230	3040		147	2947	2457	1187	1377	476	0	0	0	141	13268	17230

LMP	Total Acres	Acres 30-59
LSR	16693	430
Matrix	22292	2513
AMA	245	97
Total	39230	3040



Note: Figures in yellow are estimates because there is no year of origin data for these stands.

Age Class	<10	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-99	100-119	120-149	150+
Acres	147	2947	2457	1187	1377	476	0	0	0	141	13268	17230

Regulatory Framework, Management Direction, Regulations, and Guidance

Botany

- A biological evaluation for sensitive botanical species was conducted for South Pyramid Timber Sale EA in compliance with Forest Service Manual (FSM) 2670 direction. FSM 2670 states that no Forest Service action should contribute to the federal listing of a species, and that species viability should be maintained. This report documents the results of field surveys and provides the basis for a Conclusion of Effects for sensitive species within the proposed project area. The complete Botanical Resources Biological Evaluation for South Pyramid Timber Sale can be found in Appendix D.
- In 1994, the *NW Forest Plan* established survey and manage guidelines that provided an adaptive-management process for acquiring information and managing rare and uncommon, and poorly understood old-growth forest related species.
- In January 2001, the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDA, USDI Survey and Manage ROD, 2001) adopted new standards and guidelines for survey and manage and protection buffer species, and other mitigating measures.

Fire and Fuels

- Willamette Forest Plan

The Willamette Forest Plan includes Fire management direction to ensure that fire use programs are cost-effective, compatible with the role of fire in the forest ecosystems, and responsive to resource management directions.

The goals for fire management are to: 1) initiate initial management action that provides for the most reasonable probability of minimizing fire suppression costs and resource damage, consistent with probable fire behavior, resource impacts, safety, smoke management; and 2) identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection program consistent with management direction (Forest Plan IV-84).

The following Forest wide direction is provided for fire management: 1) Utilize prescribed fire to meet land management objectives, 2) manage residue profiles at a level that will minimize the potential of high intensity wildfire and provide for other resources (Forest Plan IV-85). Air Quality standards require that air quality impacts be minimized, especially to Class I Airsheds and smoke sensitive areas, mitigation measures are used when appropriate, and burning is conducted in accordance with the State Smoke Management Plan (Forest Plan IV-14).

In 1995, the Federal Wildland Fire Policy and Program Review was initiated (USDA/USDI et al., 1995). Some of the principles of the review include: 1) firefighter and public safety are the first priority; 2) wildland fire is an essential ecological process and natural change agent; and 3) fire management plans must be based on the best available science. This policy contains direction to allow Wildland Fire Use and

prescribed fire to restore fire’s natural role in appropriate areas where approved plans are in place.

The fuels management portion states that the appropriate type and amount of fuel treatment is tiered to the Forest Plan Management Area specific Standards and Guidelines. Levels and methods of fuel treatment will be guided by the protection and resource objectives of each management area. Emphasis will be on ecological restoration treatments. Where appropriate, fuel treatments may allow for the utilization of wood residues using a market strategy.

Maximum Acceptable Fuel Loadings Table 2 (Willamette National Forest Plan)

Diameter ¹	Tons/Acre	Pieces/Acre	Length
0 – 3”	7-11	NA	NA
3”- 9”	8-12	NA	NA

¹Diameter = small end

- Clean Air Act

The Clean Air Act establishes certain minimum requirements that must be met nationwide, but states may be able to establish additional requirements. Users of prescribed fire must comply with all applicable federal, state and local air quality regulations. The Clean Air Act establishes major air quality goals, and provides means and measures to attain those goals by addressing existing and potential air pollution problems. The major air quality goals include attaining National Ambient Air Quality Standards (NAAQS), preventing significant deterioration of air quality in areas cleaner than the NAAQS.

Each state (including Oregon) has a State Implementation Plan (SIP) that provides the means by which these goals are to be attained. The SIP may contain measures such as emission standards for air pollution sources, air quality, and permit programs, and regulations controlling specific air pollutant sources such as mobile sources, wood-burning stoves and slash burning. Any burning in Oregon needs to comply with the State of Oregon Smoke Management Implementation Plan. Forest Service policy is to integrate air resource objectives into all Forest Service planning and management activities. The Forest Service and Oregon Department of Environmental Quality entered into a Memorandum of Understanding (MOU) concerning air quality. All alternatives would follow the agreements within the MOU. Because of this impacts from any activity are minimized. FASTRACS is the program that is used to meet requirements to report prescribed fire smoke management to the State of Oregon. Registering, planning and reporting accomplishment of prescribed fire activities will be utilized using this program.

- National Fire Plan

The National Fire Plan provides national direction for hazardous fuels reduction, restoration, rehabilitation, monitoring, applied research and technology transfer. The

USDA Forest Service and the Department of Interior (DOI) are developing a common strategy for reducing fuels and restoring land health in fire-prone areas. The DOI and the USDA Forest Service have prepared two documents that outline the strategies that will protect people and the environment by restoring and sustaining land health; *Protecting People and Sustaining Resources in Fire-adapted Ecosystems*. The purpose of the strategy is to:

Establish national priorities for fuel treatment; ensuring funding is targeted to higher risk communities and ecosystems

Evaluate tradeoffs between programs that emphasize wildland urban interface and those emphasizing ecosystem restoration and maintenance.

Measure the effectiveness of strategic program options at different funding levels.

Recommend a strategic program to best achieve national fuel objectives for community protection and ecosystem restoration and maintenance.

Emphasize landscape-scale, cross-boundary treatments that reduce hazards while providing benefits to other ecosystem values.

The strategy will emphasize improved working relationships between federal land managers, as well as with multiple key disciplines inside the various land management and regulatory agencies and bureaus across geographic scales. Applicable National Fire Plan goals and objectives include:

- a) Reduce the number of small fires that become large
- b) Restore natural ecological systems to minimize uncharacteristically intense fires.
- c) Create new jobs both in the private and public sectors
- d) Reduce threats to life and property from catastrophic wildfires

- Fuel Models

The majority of this project planning area is best represented by 2 Fire Behavior em fuel models (FM). Fuel Model 10 constitutes 75% of the acres. This profile can be found in stands that were or were not previously harvested. Fire spread is generally slow with low flame lengths. Heavy fuel concentrations (jackpots) can flare up. Only under severe weather conditions involving high temperatures, low humidity's, and high winds do the fuels pose fire hazards. About 25% of the acres are a Fuel Model 11 represented by the mixed conifer stand with a heavy concentration of down and standing woody component. Ground fire behavior is higher in intensity than Fuel Model 8 or 9 because of the heavier fuel loading. Torching trees (fires in the crowns of trees) occurs more frequently.

Soils and Geology

- Laws and Regulations -- 36 C.F.R. 219.14(a) directs the Forest Service to classify lands under their jurisdiction as not suited for timber production if they fall into any of four categories: 1) Non-forest, 2) Irreversible soil or watershed damage (from NFMA 6(g)(3)(E)(i)), 3) No assurance of reforestation within five years, and 4) Legislatively or administratively withdrawn. This report considers the first three categories of land. On

the Willamette National Forest these areas are defined by land type, which will be explained later in this report.

- Regional Guidelines -- Forest Service Manual R-6 Supplement No. 2500.98-1 (Title 2520 – Watershed Protection and Management) clarifies direction for planning and implementing activities in areas where soil quality standards are exceeded from prior activities; redefines soil displacement; provides guidance for managing soil organic matter and moisture regimes. In addition, the USDA FS Pacific Northwest Region handbook on General Water Quality Best Management Practices (November, 1988) provides a guide about practices which are applicable in conducting land management activities to achieve water quality standards to ensure compliance with the Clean Water Act, as amended, and Oregon Administrative Rules.
- Forest Plan Direction – Chapter IV of the Willamette Forest Plan states the Forest-wide Standards and Guidelines for a variety of resources and activities. Soil and Water Quality protection are addressed in the section from FW-079 to FW-114. Based on direction in the Forest Wide Standards and Guides, FW-079 and FW-080 and BMP T-1, T-2 and T-3, the following activities were performed as part of the planning process: A. verifying the present SRI land type boundaries; B) determining the location of unsuited and unmanageable land types; C) prescribing slash treatment and suspension objectives for the possible units; and D) evaluating potential watershed impacts from management of the timber resource.

Hydrology

- The South Pyramid Thin Project Initiation Letter's Proposed Action to: “Commercially thin up to 400 acres of forest stands to improve tree growth, to increase development of late seral conditions in wildlife corridors, and to reduce fuel levels on the landscape are supported and directed by the Forest plan objectives to:
 - *Manage the area consistent with the desired future condition for the various management allocations and in a way that reflects the range of historic conditions described in Middle Santiam Watershed Analysis(April 1996).*
 - *Meet objectives outlined in the Aquatic Conservation Strategy (specifically Aquatic Conservation Strategy Objectives - ACSO #'s 1, 2, 4, 8 and 9).*
 - *Manage forested stands at the landscape level, while considering habitat diversity, the size and shape of contiguous habitat blocks, and habitat function.*
- Willamette National Forest Land and Resource Management Plan: The 1990 Land and Resource Management Plan (LRMP) for the Willamette National Forest identified water quality as a significant issue to guide its development, it described the desired future condition of water quality in 10 and 50 years; and it designed standards and guidelines creating operational requirements to meet water quality objectives.

“This Forest Plan responds to the high level of concern for water and riparian resources by requiring strict application of Best Management Practices, including: retaining live trees along wetlands and Class IV streams where needed; scheduling no harvest in

riparian areas along Class I, II, and III streams and adjacent lakes; accounting for the potential for adverse cumulative effects in scheduling of timber harvest; proposing watershed improvement projects to stabilize existing high risk conditions; and by implementing a comprehensive program to monitor water quality and related habitat.” (LRMP III-3-4)

- Memorandum of Understanding, Oregon Department Environmental Quality: The Pacific Northwest Region entered into an agreement with the State of Oregon adopting “General Water Quality Best Management Practices” in November 1988. Best Management Practices are practices or combinations of practices determined by the State after problem assessment, examination of alternative practices and appropriate public participation, to be the most effective, practicable means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals. (Federal Register, Volume 40, No.230 dated 11/28/75) These practices are cited in this hydrology report on page30.
- Specific Forest Management Direction Includes:
 - Strategic goal:*Maintain the integrated ecological functions of rivers, streams, wetlands, lakes, and the associated riparian areas Forest -wide. (LRMP IV-3).
 - Resource management goal:*Maintain water quality through acceptable levels of water temperature, suspended sediment, chemicals, and bacteria. (LRMP IV-4)
 - Standards and Guides (S&G’s):* S&G’s help the manager stay within the constraints prescribed by law as well as provide environmental safeguards for management activities.
 - Forest-Wide: 28 separate S&G’s including Federal and state statute and regional guidelines address road construction and maintenance, streamside protection, and management of mass movement. There is also a forest-wide S&G to address watershed enhancement.
 - Management Areas:*Eight S&G’s address water quality in Management areas (MA’s) other than riparian; 41 for MA 15/riparian; and 8 specific to water quality.
- Additional Directional Documents:
 - 1.) FEMAT: In 1993: The Forest Ecosystem Management Assessment Team Report (FEMAT) for the Pacific Northwest and Northern California identified the Aquatic Conservation Strategy (ACS) “aimed at maintaining and restoring the ecological health of aquatic ecosystems.” One of the objectives of the ACS is to “Maintain and restore water quality....” (FEMAT V-30). Components of the strategy are Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration.
 - 2.) NWFP: In 1994 the Northwest Forest Plan (NWFP) included the ACS as an integral component. The NWFP amends land allocations and S&G’s in the Forest LRMP, however, the most restrictive S&G’s of the two would be maintained. It establishes Riparian Reserves and Key Watersheds across the landscape and sets forth detailed requirements land managers must meet within those reserves in accordance with the ACS.

3.) ACSO: In October of 2003 a Final Supplemental Environmental Impact Statement was released entitled: “ Clarification of Language in the 1994 Record of Decision for the Northwest Forest Plan National Forest and Bureau of Land Management districts Within the Range of the Northern Spotted Owl Proposal to amend Wording about the Aquatic Conservation Strategy”. Within this supplement clarification language was provided to consider actions effects upon the aquatic system. While this language clarifies it does not change the original intent of FEMAT or the direction found within the NWFP in the management of ACSO’s.

A key feature of the NWFP is that Watershed Analysis be performed as a systematic way to characterize aquatic, riparian and terrestrial features in a watershed. Watershed Analysis “consists of technically rigorous and defensible procedures designed to identify processes that are active within a watershed, how those processes are distributed in time, and space, the current upland and riparian conditions of the watershed, and how all of these factors influence riparian habitat and other beneficial uses.” (NWFP S&G B-21) The Middle Santiam Watershed Analysis was completed in April 1996 by the USFS.

Information found in these analyses is used by managers to refine interim riparian reserves widths assigned in the NWFP, while prescribing land management activities including watershed restoration and developing monitoring programs. Information from watershed analysis is used in project specific National Environmental Policy Act (NEPA) planning.

- Municipal Watershed and Management Activities Effects on Water Users. Forestry related activities and related water quality center around the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P1 92-500). This act revises and reenacts previous Federal Water Pollution Control Acts of 1970, 1965, 1956, and 1948 to restore and maintain the chemical, physical, and biological integrity of the nation’s waters by eliminating pollutant discharges into the waters of the United States and providing surface waters suitable for uses. Section 208 of this law deals with non-point pollution of which forestry type activities are included. A previous revision (1970) requires Federal agency compliance with water quality standards.

As part of the Clean Water Act, the states were required to develop a state-wide Water Quality Management Plan and to set standards for water quality. In December of 1978, the Region -6 of the Forest Service and the Oregon Department of Environmental Quality (DEQ), signed an MOU delineating the responsibilities of each pursuant to the implementation of the Statewide Water Quality Management Plan. This agreement was where both parties, FS and DEQ, laid out the terms of the Best Management Practices and the State determined if Forest Service practices meet or exceed state BMP’s. These reviews occur periodically and the state determines if the BMP’s will meet the revised state standards. The current BMP’s are determined to meet or exceed state standards set for waters of the state. These were last published in November of 1988 for the Pacific Northwest Region.

Currently (September 9, 2005) the USDA Forest Service and the Bureau of Land Management have created a Sufficiency Analysis for Stream Temperature Evaluation of the adequacy of the Northwest Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards. The premise of this document is:

“The ACS¹ provides a comprehensive framework for protection and restoration of aquatic and riparian systems. The ACS is composed of four parts: Key Watersheds, Riparian Reserves, Watershed Analysis, and Restoration. Key watersheds serve as the cornerstones of aquatic species recovery and special guidelines apply to federal lands within key watersheds. Watershed Analysis is required in key watersheds and Riparian Reserves prior to determining how proposed land management activities meet ACS objectives. Finally, watershed restoration is integral to recovery of fish and riparian habitat and water quality. Of these elements, Watershed Analysis and Riparian Reserves are fundamental to understanding water quality issues and designing mitigation or treatments necessary to recover water quality to levels that meet state and federal water quality standards and support beneficial uses” (Sufficiency Analysis for Stream Temperature, 2005 pg4).

- Riparian Reserves and Management Activities: In 1993: The Forest Ecosystem Management Assessment Team Report (FEMAT) for the Pacific Northwest and Northern California identified the Aquatic Conservation Strategy (ACS) as a means of addressing concerns surrounding aquatic resources. It was developed to maintain and restore ecological health of the aquatic ecosystem. One of the objectives of the ACS is to “Maintain and restore water quality....” (FEMAT V-30). Components of the strategy are Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration.

In 1994 the Northwest Forest Plan (NWFP), included the ACS as an integral component. The NWFP amends land allocations and S&G’s in the Forest LRMP. It establishes Riparian Reserves and Key Watersheds across the landscape and sets forth detailed requirements land managers must meet within those reserves in accordance with the ACS. Within the discussion of these ACSO’s aquatic ecosystems distribution, diversity, complexity, connectivity, integrity, quality, and timing, need to be covered at the landscape scale for sediment, flow, channels, wetlands, and species present.

On page 30 the objectives and mitigations for riparian management are discussed. All proposed actions are tied to the watershed analysis for the area (Middle Santiam Watershed Analysis, April 1996).

- The State of Oregon DEQ also supported action within riparian reserves:
“Implementation of the NWFP accommodates vegetation treatment necessary or desirable to restore ecological health in Riparian Reserves that have been harvested or affected by fire exclusion or other disturbances. The NWFP also provides for long-term

¹ NWFP consists of the Record of Decision and Standards and Guidelines, the Final SEIS, and the Forest Ecosystem Management Assessment Team report; April, 1994 and July, 1993.

maintenance of water quality. To determine how treatment of Riparian 'reserves can contribute to accomplishing these objectives, when proposing management in Riparian Reserves the following assumptions must apply:

Vegetation density is high and will benefit from thinning.

Vegetation treatment will not result in more than a 50% reduction in canopy closure and will not occur in the primary shade zone."

- *Sufficiency Analysis for Stream Temperature (September 9, 2005) USDA Forest Service, BLM; pg 21.*

At this time it was determined that the vegetation density criteria (#1), is not met. Spacing and openings are such that stands are naturally obtaining their desired conditions and providing wood for the site.

Fisheries

- The Willamette Forest Plan (USDA, 1990) as amended, by the NW Forest Plan (USDA 1994) provides direction to protect and manage resources such as fisheries. The following are some of the pertinent direction for fisheries:
 - a) Riparian Areas: All riparian areas will be managed to protect or enhance their value for water quality, fish habitat and wildlife.
 - b) Water: Manage soil and water resources to maintain or enhance the long-term productivity of the Forest. Integrate mitigation into management activities. Examples of mitigation for soil and water protection include water barring skid trails, seeding disturbed soil along riparian areas and size and distribution of harvest units.
 - c) Forest-wide (FW) and Management Area Standards and Guidelines provide further guidance for water quality and fisheries (FW-079 through FW-120). See Management Area standards and guidelines for Management Area 15 for rivers, streams, wetlands, lakes, and adjacent riparian areas.
 - d) Threatened, Endangered and Sensitive Species: Meet all legal and biological requirements for the conservation of threatened and endangered plants and animals. Assess all proposed projects that involve habitat changes or disturbance having potential to alter habitat of threatened, endangered or sensitive plant and animal species (FW154). When threatened or endangered species or habitat are present, follow the required biological assessment process, according to the requirements of the Endangered Species Act (Public Law 93-205). Meet all consultation requirements with the USDI Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and state agencies (FW-157).
- Section 303 (d) of the Clean Water Act calls on each state to list its polluted water bodies and to set priorities for their clean up.

- Executive Order 12962: Recreational Fisheries: Signed on June 7, 1995, this order mandates that Federal agencies improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities. In addition, this order establishes a National Recreational Fisheries Coordination Council which oversees the various Federal agencies' actions and programs to ensure that they accomplish the goals set forth in this order.
- Executive Order 11988 requires government agencies to take actions that reduce the risk of loss due to floods, to minimize the impact of floods on human health and welfare, and to restore and preserve the natural and beneficial values served by floodplains. Floodplains occur within the planning area. No activities will occur within floodplains as all streams have full-leave, no-harvest Riparian Reserves. Wet areas will be protected on an individual basis under the stand-specific recommendations and wetland areas less than 1/4 acre will be treated as special habitat areas (FW-211).
- Executive Order 11990 requires government agencies to take actions that minimize the destruction, loss, or degradation of wetlands. Streamside Riparian Reserves, seeps, and other wet habitats exist in the South Pyramid Project Area. These areas will be either avoided or managed according to Riparian Reserve Management Guidelines in Chapter 2 to comply with amended Willamette Forest Plan Standards and Guidelines. Riparian Reserves will also be protected with Mitigation Measures also detailed in Chapter 2. As a result, proposed harvest treatments will be consistent with Executive Orders 11988 and 11990.
- Magnuson-Stevens Fishery Conservation and Management Act, 1976 (MSA): The only MSA species in the subbasin is UWC. There is no essential fish habitat within the analysis area.

Wildlife

- *Mid-Willamette LSR Assessment* (August 24, 1998)
- *Biological Opinion for 2005-2006 Habitat Modification Activities within the Willamette Province* (March 27, 2005)
- *Northwest Forest Plan* (April, 1994)
- *Willamette Forest Plan* (1990)
- *Biological Opinion for Fiscal Year 1999 Disturbance Only projects in the Willamette Province* (1999)

Sensitive and Survey and Manage

- A biological evaluation for sensitive botanical species was conducted for South Pyramid Timber Sale EA in compliance with Forest Service Manual (FSM) 2670 direction. FSM 2670 states that no Forest Service action should contribute to the federal listing of a species, and that species viability should be maintained. This report documents the results of field surveys and provides the basis for a Conclusion of Effects for sensitive species

within the proposed project area. The complete Botanical Resources Biological Evaluation for South Pyramid Timber Sale can be found in Appendix D.

- In 1994, the *NW Forest Plan* established survey and manage guidelines that provided an adaptive-management process for acquiring information and managing rare and uncommon, and poorly understood old-growth forest related species.
- In January 2001, the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDA, USDI Survey and Manage ROD, 2001) adopted new standards and guidelines for survey and manage and protection buffer species, and other mitigating measures.

Invasive Plants

- The Willamette National Forest *Integrated Weed Management Plan* (IWMP 1999) for managing invasive weeds states that each infestation of weeds will be managed according to its classification; new invaders will be eradicated using all control methods available and will have highest priority. Established infestations will be kept in check through biological and manual control methods. The last category, potential invaders, will be treated as new invaders if they are discovered on national forest lands. The following documents guide the treatment of competing and unwanted vegetation in the Pacific Northwest:
- Final EIS for Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants (USDA Forest Service PNW Region, May, 2005)
- Willamette National Forest Integrated Weed Management Environmental Assessment (1999)
- Guide to Noxious Weed Prevention Practices (2001)
- Executive Order 13112 (February 3, 1999)
- Noxious Weed Control and Eradication Act (2004)

Recreation

- *Willamette National Forest Plan*: This plan directs the management of recreational and visual resources here. It establishes management allocations and standards and guidelines for management of the resources within these management allocations.
- *Trails*: The Forest Plan directs managers to maintain trail corridors of 100 to 300 feet wide (each side) to meet recreation resource objectives (FW-045, page IV-52). Timber sale project teams are also directed to minimize road crossings and road related impacts on trails (FW-049, page IV-53).
- *Forest Service Manuals provide direction for recreation management.*

Roads

- *Willamette Forest Plan*: provides direction for resource management activities and establishes standards and guidelines for management of various resources including roads.
- *Middle Santiam Watershed Analysis* recommends reducing disturbance effects to wildlife by reclaiming/decommissioning unnecessary roads to reduce road densities in the watershed and where roads cannot be decommissioned, the recommendation is to close and storm proof unnecessary roads.
- *Forest Service Manual 7700* provides further direction for road management activities such as having an interdisciplinary, science-based roads analysis on which to base road management decisions.
- *Willamette National Forest Road Analysis Report, 2003* provides information to help manage the forest transportation system to ensure that it: (1) is environmentally sound, (2) provides safe access and meets the needs of communities and forest users, (3) can be maintained within current and projected financial abilities and (4) facilitates the implementation of the approved Forest Plan direction (*page 5*)

Heritage

- **Regulatory Framework:** The principal Federal law addressing protection of cultural resources is the National Historic Preservation Act (NHPA) of 1966 as amended in 1976, 1980 and 1992 (16 U.S.C. 470 et seq.). Section 106 of this act requires Federal agencies to take into account the effects of their undertakings on historic properties and affords the Council on Historic Preservation a reasonable opportunity to comment on such undertakings. The following is a list of principal Section 106 implementing rules published in the Federal Register that Federal agencies must follow:
- 36 CFR 63 (*Determination of Eligibility to the National Register of Historic Places*)
- 36 CFR 296 (*Protection of Archaeological Resources*)
- 36 CFR 800 (*Protection of Historic Properties*) establishes procedures for Federal agencies to meet their Section 106 responsibilities.

**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number 1a

I. Abiotic Data

Acres	Aspect	Elevation	Slope
13	SW	3800	30%

Planning direction

General forest – Matrix and riparian reserve

II. Biotic Data

Average dbh	Basal Area	Trees per Acre	Stand Density Index
9.1	280	600	530

Current condition

This stand originated from a fire about 1895 and was naturally regenerated. The stocking is too high, and the stand is experiencing suppression mortality.

Desired condition

The stand should be in a condition to continue growth and provide a forested habitat. The reduction of stocking will allow for greater individual tree growth and a vigorous stand condition.

Treatment Alternatives

The alternatives are to regenerate the stand or to thin the stand. Thinning will allow the continuation of the forested habitat and maintenance of a variety of tree species.

Treatment Objectives

The objective is to reduce stand stocking while maintaining the variety of tree species present, particularly focusing on western red cedar. There is an objective of maintaining a canopy closure of 40% immediately after harvest. The fuels will be treated by topping and limbing the trees in the unit, and hand piling for a width of 66 feet near the LSR boundary.

Expected treatment sequence

The stand will be commercially thinned about 2008. There will be some fuel reduction treatment after the harvest. The stand will be in a condition to be left growing for about 20 years, at which time it will need to be reevaluated for further treatment. It is expected that the stand would again be thinned to continue to provide a forested habitat and to potentially provide large structure.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

The access will be native surface roads, which will restrict operations to dry weather only. There will be no haul on weekends from July 4 to Labor day. Skidding will not be allowed during the major sap flow, about April 30 to June 30, and operations will be prohibited during the elk rifle season in mid October.

Marking guides

The stand will be harvested using a DxD spacing of 16 feet, which means that any tree within 16 feet of the largest tree will be felled. All western red cedar and incense cedar greater than 10 inches dbh will be left, unless it is competing with a larger cedar. No sugar pine or western white pine of any size will be cut, and no trees with a stump diameter of over 30 inches will be cut. There will be no harvest in the riparian reserve in the SE corner of the unit, with a 150 foot reserve depth. There are also 150 foot no harvest buffers around populations of *Nephroma occultum* and *Pseudocyphallria rainierensis*.

Harvest will be by ground based equipment, using pre-designated skid trails that do not exceed 15 feet in width. Use an old landing in a plantation on the NE side of the unit. About 326 MBF will be removed.

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Certified Silviculturist

**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number ____2a____

I. Abiotic Data

Acres	Aspect	Elevation	Slope
8	SE	4000	15

Planning direction
General forest – Matrix

II. Biotic Data

Average DBH	Basal Area	Trees per Acre	Stand Density Index
9.3	350	745	660

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 40% immediately after thinning. Tops and limbs will be left in the unit, and there will be hand piling of slash along the LSR boundary.

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that

point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31.

Marking guides

Leave trees will be determined by using a DxD spacing of 16 feet. Western red cedar and incense cedar greater than 10 inches dbh will be left unless it is competing with a larger cedar. If the dry rock garden with *Orobanche pinorum* is greater than ½ acre, leave a no cut buffer of 200 feet. Leave a 150 foot no harvest buffer around the *Nephroma occultum* population.

Harvest will be by ground based equipment on pre-designated skid trails. About 212 MBF will be removed.

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**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number ____2b____

I. Abiotic Data

Acres	Aspect	Elevation	Slope
49	SE-W	3800	45%

Planning direction
General Forest – Matrix

II. Biotic Data

Average DBH	Basal Area	Trees per Acre	Stand Density Index
9.3	350	744	660

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 40% immediately after thinning. Tops and limbs will be left in the unit, and there will be hand piling of slash along the LSR boundary.

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that

point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31.

Marking guides

The leave trees will be determined using a DXD spacing of 16 feet. All western red cedar and incense cedar greater than 10 inches dbh will be left unless competing with a larger cedar.

Yarding will be by helicopter. Yard tops of trees by leaving tops attached to the last log.

An estimated 1404 MBF will be removed.

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**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number 4a

I. Abiotic Data

Acres	Aspect	Elevation	Slope
4	SW	3800	25%

Planning direction
Genral Forest - Matrix

II. Biotic Data

Average DBH	Basal Area	Trees per Acre	Stand Density Index
8.5	328	833	640

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 50% immediately after thinning.

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that

point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31.

Marking guides

The leave trees will be determined by using a DXD spacing of 14 feet. All cedar will be left. There is a rock outcrop in the top of the unit, around which a 200 foot no harvest buffer will be left. The harvest will remove about 100 MBF.

Yarding will be with ground based equipment.

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**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number 4b

I. Abiotic Data

Acres	Aspect	Elevation	Slope
8	S	3600	20%

Planning direction
General Forest – Matrix

II. Biotic Data

Average DBH	Basal Area	Trees per Acre	Stand Density Index
8.5	328	833	640

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 50% immediately after thinning.

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31. If the northern spotted owl is nesting, operations will be prohibited March 1 to July 15.

Marking guides

Leave trees will be identified by using a DXD spacing of 14 feet. All cedar will be left. Fuels will be hand piled for a distance of 66 feet into the unit along road 860.

Yarding will be by ground based equipment. About 219 MBF will be removed.

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**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number ___4c_____

I. Abiotic Data

Acres	Aspect	Elevation	Slope
11	S-SW	4000	15%

Planning direction
General Forest – Matrix

II. Biotic Data

III.

Average DBH	Basal Area	Trees per Acre	Stand Density Index
8.5	328	833	640

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 50% immediately after thinning. .

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31. If the northern spotted owl is nesting, operations will be prohibited March 1 to July 15.

Marking guides

Leave trees will be identified by using a DXD spacing of 16 feet. All cedar will be left. Fuels will be hand piled for a distance of 66 feet into the unit along road 860.

Yarding will be by helicopter. Tops will be yarded by leaving the tops attached to the last log. About 270 MBF will be removed.

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**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number ___ 6a _____

I. Abiotic Data

Acres	Aspect	Elevation	Slope
21	SW-W	3400	15%

Planning direction

General Forest – Matrix

About 18 acres are in an unroaded block, and about 1.8 acres are in a CHU for NSO.,

II. Biotic Data

Average DBH	Basal Area	Trees per Acre	Stand Density Index
12.3	406	492	686

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 60% immediately after thinning.

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31. If the northern spotted owl is nesting, operations will be prohibited March 1 to July 15.

No harvest buffers of 150 feet will be left around populations of *Albatrellus ellisii* and *Polyozellus mupltiplex*.

Fuels will be hand piled within 66 feet of road 864

Marking guides

Leave trees will be identified by using a DXD spacing of 14 feet. All cedar will be left.

Yarding will be by ground based equipment. About 487 MBF will be removed.

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**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number ___ 6a _____

I. Abiotic Data

Acres	Aspect	Elevation	Slope
21	SW-W	3400	15%

Planning direction

General Forest – Matrix

About 18 acres are in an unroaded block, and about 1.8 acres are in a CHU for NSO.,

II. Biotic Data

Average DBH	Basal Area	Trees per Acre	Stand Density Index
12.3	406	492	686

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 60% immediately after thinning.

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31. If the northern spotted owl is nesting, operations will be prohibited March 1 to July 15.

No harvest buffers of 150 feet will be left around populations of *Albatrellus ellisii* and *Polyozellus mupltiplex*.

Fuels will be hand piled within 66 feet of road 864

Marking guides

Leave trees will be identified by using a DXD spacing of 14 feet. All cedar will be left.

Yarding will be by ground based equipment. About 487 MBF will be removed.

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**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number 8b

I. Abiotic Data

Acres	Aspect	Elevation	Slope
6	NW	3900	30%

Planning direction

General Forest – Matrix

About 6 acres are in an unroaded block, 6 acres in CHU for NSO

II. Biotic Data

Average DBH	Basal Area	Trees per Acre	Stand Density Index
12.3	404	492	680

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 50% immediately after thinning. .

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that

point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31. If the northern spotted owl is nesting, operations will be prohibited March 1 to July 15. Operations will be prohibited April 1 to July 30 for the Goshawk nest.

A no harvest buffer of 150 feet will be left around the wet area, and a 300 foot buffer will be left around the meadow.

Marking guides

Leave trees will be identified by using a DXD spacing of 16 feet. All cedar will be left. Fuels will be hand piled for a distance of 66 feet into the unit along road 2047-840, and along the private land boundary.

Yarding will be by helicopter. Tops will be yarded by leaving the tops attached to the last log. About 190 MBF will be removed.

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**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number 9

I. Abiotic Data

Acres	Aspect	Elevation	Slope
38	SW	3900	50%

Planning direction

General Forest – Matrix

About 38 acres are in an unroaded block, 0.4 acres in CHU for NSO

II. Biotic Data

Average DBH	Basal Area	Trees per Acre	Stand Density Index
12.3	404	492	680

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 50% immediately after thinning. .

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that

point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31.

Marking guides

Leave trees will be identified by using a DXD spacing of 16 feet. All cedar will be left, cut competing trees of cedars greater than 10 inches.

Yarding will be by helicopter. Tops will be yarded within 66 feet of road 840 by leaving the tops attached to the last log. About 1158 MBF will be removed.

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**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number 24

I. Abiotic Data

Acres	Aspect	Elevation	Slope
7	SW	3300	20%

Planning direction
General Forest – Matrix

II. Biotic Data

Average DBH	Basal Area	Trees per Acre	Stand Density Index
Est 11	Est 400	Est 450	Est 600

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 50% immediately after thinning.

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31. If the northern spotted owl is nesting, operations will be prohibited March 1 to July 15. No haul will be permitted on weekends from July 4 to Labor Day. The spur will be a native surface road, so haul will only be permitted during dry weather.

Marking guides

Leave trees will be identified by using a DXD spacing of 14 feet. All cedar over 12 inches will be left, unless there is a larger cedar to be left.

Yarding will be by ground based equipment on pre-designated skid roads. Fuels will be hand piled within 66 feet of spur 852. About 82 MBF will be removed.

Prepared by: _____

Norm Michaels
Certified Silviculturist

**Silvicultural Prescription
Sweet Home Ranger District
Willamette National Forest**

Planning Project: South Pyramid

Stand number 27

I. Abiotic Data

Acres	Aspect	Elevation	Slope
11	NW	3800	40%

Planning direction

General Forest – Matrix

About 11 acres are in an unroaded block, 2 acres in CHU for NSO

II. Biotic Data

Average DBH	Basal Area	Trees per Acre	Stand Density Index
12.3	404	492	680

Current condition

This stand originated from a fire about 1895, and naturally regenerated. There have not been any management activities within the unit. The stand is overstocked, and is experiencing suppression mortality.

Desired condition

The stand should be left in a thrifty condition where individual trees are free to grow and stocking levels preclude suppression mortality.

Treatment Alternatives

Alternatives for this stand include commercial thinning and regeneration harvest.

Treatment Objectives

The stand will be thinned to maintain a forested cover, to release the remaining trees, and to maintain a variety of tree species on the site. The stand will be thinned to leave a canopy closure of 50% immediately after thinning. .

Expected treatment sequence

The stand will be thinned about 2008, followed by appropriate fuels treatment. The stand will then be left to grow, and evaluated for further treatments in about 20 years. At that

point the stand could be treated with a regeneration harvest, or it could be thinned again to provide large structure in the future.

Expected Results

The stand will be more open, with stocking levels that allow individual trees to grow rapidly.

Monitoring

The harvest operation will be monitored by the designated sale administrator.

Management requirements

Operations will be prohibited during the sap flow, which is about April 30 to June 30, and during the mid October elk rifle season. If a peregrine falcon is found during operations, operations will be prohibited January 15 to July 31. If the northern spotted owl is nesting, operations will be prohibited March 1 to July 15. Harvest will be prohibited April 1 to July 30 for the goshawk. Haul is prohibited on weekends July 4 through Labor Day.

Marking guides

Leave trees will be identified by using a DXD spacing of 16 feet, do not harvest any tree larger than a 34 inch stump diameter. All cedar and western white pine will be left. There is a wet area with devil's club which will have a 50 foot buffer around it. There are no harvest riparian reserves adjacent to the stand.

Yarding will be by helicopter. Tops will be yarded by leaving the tops attached to the last log. About 216 MBF will be removed.

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