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Environmental Assessment

Gordon Three Thin

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



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<http://www.fs.fed.us/r6/willamette/manage/nepa/index.html>

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Summary

The Sweet Home Ranger District of the Willamette National Forest in Oregon proposes to commercially thin over 400 acres of 40 year old managed stands. The project is located in the Gordon and Three Creeks areas within the South Santiam Watershed.

Twelve of the thirteen proposed thinning units are in the South Santiam-RO215 Late-Successional Reserve and the other one is located in the Central Cascade Adaptive Management Area. The Northwest Forest Plan identifies thinning of young managed stands within LSR's as a useful tool for accelerating the development of late-successional habitat features (NWFP, ROD B-6). The Northwest Forest Plan makes references to the importance of managing young stands in Adaptive Management Areas (AMA) to maintain vigor and growth through timber management. Also within the LSR is the Three Creeks Old-Growth Grove which contains three 40 year old units. A non-significant forest plan amendment is required to thin these units in conjunction with the Three Creeks Old-Growth Grove Implementation Plan contained in the appendix.

This action is needed because the existing plantations are overstocked. Thinning will increase stand vigor and diversity and will accelerate the rate of development of late-successional habitat. The existing managed stands range from 200 to 350 trees per acre (TPA). These stands will be variable thinned to 70, 90 and 110 TPA. The proposed action may have short term effects to the forest floor and canopy, potential sediment delivery to streams, and spread invasive weeds. Mitigation measures common to all alternatives are prescribed to minimize these effects.

Three alternatives were evaluated and compared in the Gordon Three Thin Environmental Analysis including the No Action Alternative 1. Alternative 2 – the proposed action - thins 491 acres using a combination of helicopter, skyline and ground-based logging systems; 650 feet of native surface operator spur is built. Alternative 3 – proposes to thin 437 acres using a combination of skyline and ground-based logging systems; 1,550 feet of native surface operator spur is built.

For both action alternatives there will be 6 new road closures, maintenance of 23 miles of existing roads, and reconstruction of 0.25 miles of road. Designated system roads will be closed by creating either earthen berms across them, installing one gate or ripping and planting; these roads may be storm proofed with water bars as appropriate. At the completion of harvest activities, heavily used tractor skid roads (existing or created temporary logging spurs) that are not part of the dedicated transportation system, 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; these spur roads will also be revegetated with native seed.

The Decision Notice identifies the preferred alternative.

Chapter 1: Purpose and Need

Introduction

The Willamette National Forest, Sweet Home Ranger District, is proposing the Gordon Three Thin Timber Sale for sale in fiscal years 2004 or 2005 in one or more contract offerings.

The proposed thinning timber sale areas are located in the Canyon Creek, Trout Creek, Sevenmile Creek, and Sheep Creek Subwatersheds in Linn County, Oregon. The project areas are on the west end of the District and south of Highway 20 (see Figures 1 and 2). The projects areas are two groups of units in two separate locations, but are relatively close, named for their association with the Three Creeks and Gordon Meadows areas.

The District proposes to thin 190 acres in the Gordon area and 456 acres in the Three area. The four subwatersheds comprise 55,184 acres, including 8,928 acres of private land. These subwatersheds are within the South Santiam Watershed that contains 101,752 acres, including 22,627 acres of private land. The principal land management direction is Late-Successional Reserve (LSR).

Currently, the Sweet Home Ranger District has over 17,000 acres of managed stands over 30 years old. An estimated 1,000 acres per year are growing into this category for the next 20 years. These acres will require stocking level reduction to maintain the stand vitality and achieve LSR objectives. The Gordon and Three Creeks planning areas are within some of the subwatersheds with managed stands that could benefit from commercial thinning.

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 five parts: Chapter 1: Purpose and Need; Chapter 2: Comparison of Alternatives; Chapter 3: Environmental Consequences; Chapter 4: Agencies and Persons Consulted (including Literature Citations) and Appendices.

This chapter includes the purpose of and need for the project, management direction, 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 issues raised by the public and the Sweet Home Ranger District interdisciplinary team. Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning files located at the Sweet Home Ranger District Office.

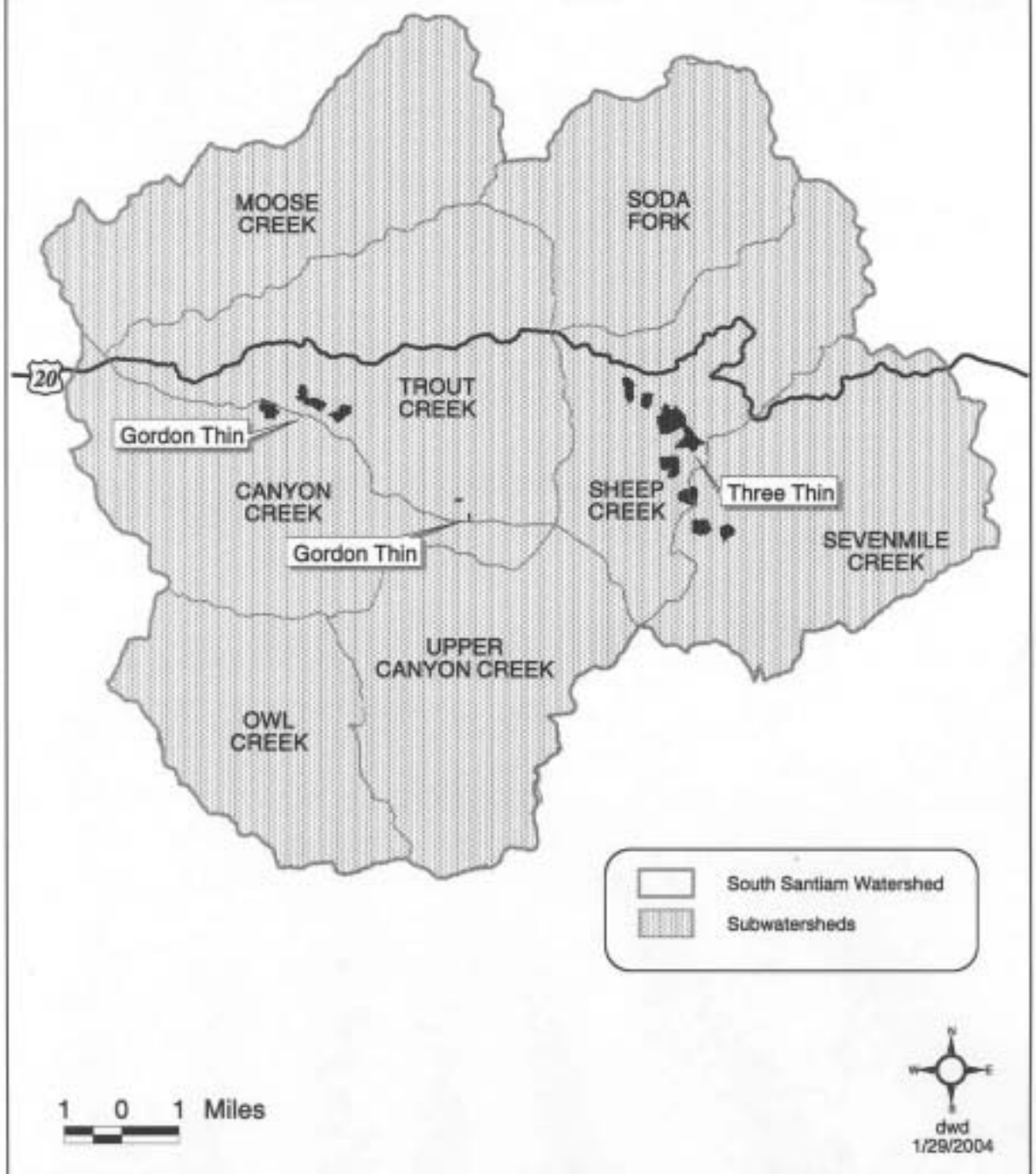
Vicinity Map

Gordon Three Thin - Figure 1



South Santiam Watershed and Subwatersheds

Gordon Three Thin - Figure 2



Purpose and Need for Action

The purpose of this project is to increase stand vigor, structural complexity, and diversity by reducing stocking levels of managed stands with commercial thinning. These managed stands were previously regeneration harvested between 1950 and 1969. Since initial reforestation, additional conifer and hardwood seedlings have entered these stands through natural seeding.

Existing stocking levels in these thirteen (13) plantations range from 200 to 350 trees per acre, and should to be lowered to optimize tree growth and stand development. If these stands remain at their current stocking levels for the next 10-20 years, tree growth will continue to diminish, crown ratios will shrink, understory development will be suppressed, and natural mortality will increase. Increased mortality will subsequently elevate fuel loading on the ground and the risk of significant damage from fire events.

Thinning will accelerate the rate of development of late-successional habitat (Carey, 2003). By maintaining and favoring a mixture of tree species, thinning will retain stand diversity, wildlife diversity and resistance to single species insect attack and disease. Through reduced crowding and competition between trees, stand vigor will improve and provide bigger, taller trees and begin the development towards a multistory stand. Improving diversity and increasing vertical and horizontal stand structure will also provide superior wildlife habitat quality.

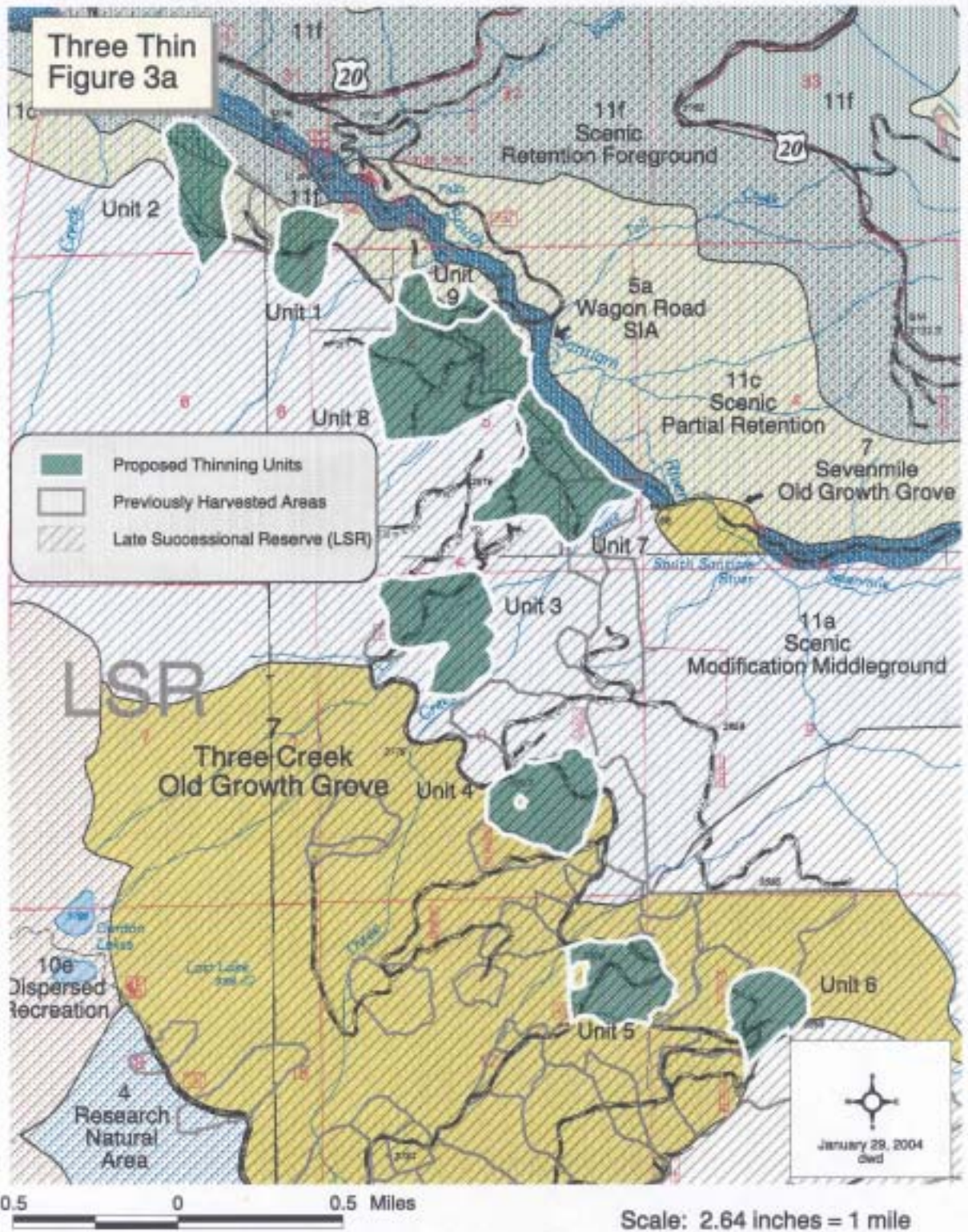
Objectives

The existing conditions vary from the desired conditions. Project objectives follow:

- Develop thinning prescriptions from land management direction towards late-successional structure, there by enhancing stand vigor and growth while maintaining or increasing managed stands diversity.
- Design an economically feasible commercial thinning sale and promote local employment by minimizing logging cost.
- Design transportation management to minimize and reduce road density while providing forest management and recreational access.
- Design thinning treatments to reduce vegetation density in riparian areas to promote diameter growth for future large wood recruitment and improve riparian condition while maintaining riparian integrity.
- Maintain or enhance ground cover and coarse woody debris for wildlife habitat, soil protection and fertility while providing for fire hazard protection.
- Restrict the spread of existing noxious weed populations and avoid introducing any additional noxious weeds.

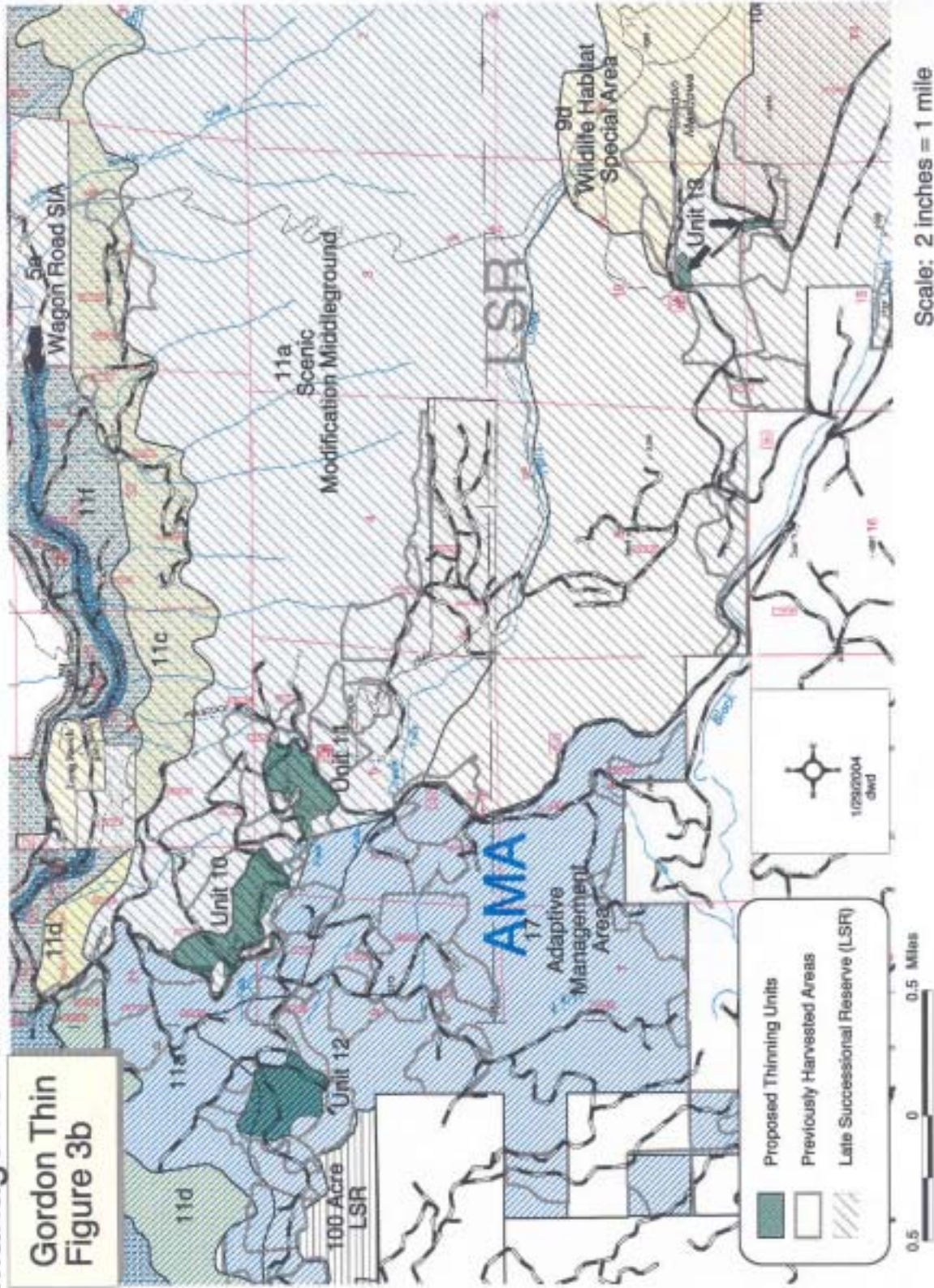
Proposed thinning units in the Gordon area and Three Creeks area are displayed in Figures 3a and 3b. These maps also illustrate the associated management allocations discussed in the next section on Management Direction.

Management Allocations

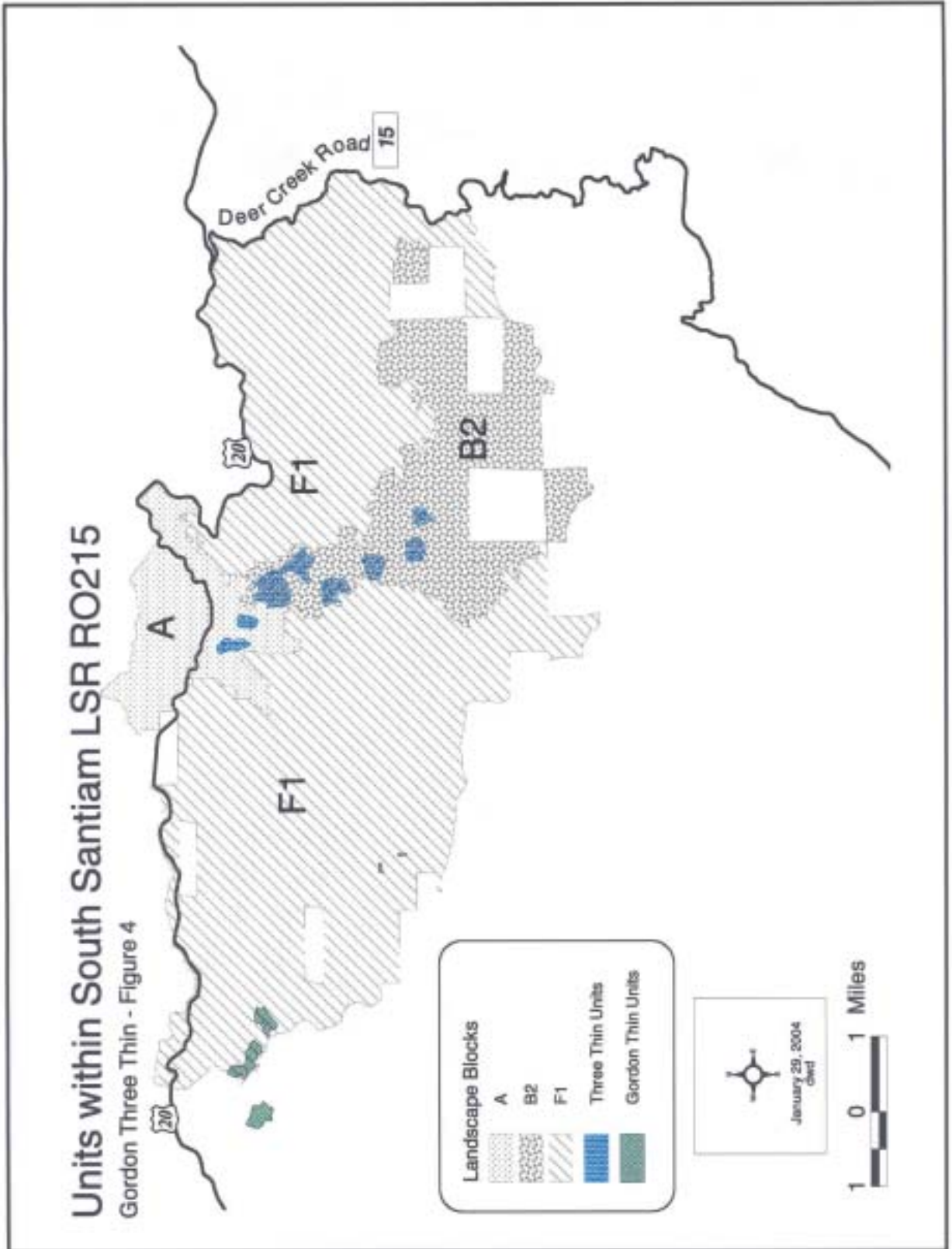


Management Allocations

Gordon Thin
Figure 3b



Scale: 2 inches = 1 mile



Management Direction

The Willamette National Forest Land and Resource Management Plan (LRMP, 1990) as amended by the *Record of Decision (ROD) and Standards and Guidelines on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (April 1994), after this referred to as either the Forest Plan, NWFP or ROD, designates most of the Gordon and Three Creek Subwatersheds as “Late-Successional Reserve (LSR).” The ROD identifies thinning of young managed stands within LSR’s as a useful tool for accelerating the development of late-successional habitat features (ROD B-6). Such features include large trees, rich species composition in the over- and understory, shade tolerant tree species, large standing snags and coarse woody debris. Most of these features contribute a multi-layered composition of structure and habitat for old-growth species.

The Willamette National Forest Plan, as amended, makes numerous references to the importance of managing young stands in Adaptive Management Areas (AMA) to maintain vigor and growth through timber management (LRMP IV-227-230; Forest Plan ROD Standards and Guidelines C-22, C-39 and D-8). Stand management in Late-Successional Reserves (LSR) “...can accelerate the development of young stands into multi-layered stands with large trees and diverse plant species, and structures that may in turn, maintain or enhance species diversity.” (ROD, B-6) The South Santiam Watershed Analysis (1995) recommends the continuance of growth enhancement of young stands to meet objectives of the different land allocations (C2, p. 60).

As directed from Forest Plan, the Mid-Willamette Late-Successional Reserve Assessment (1998) was developed for 11 designated LSRs. The objective of forest management in LSRs is to protect and enhance conditions of late-successional forest ecosystems for the benefit of associated species (IV, 111). This assessment is to be used to establish criteria and guidelines in reaching prudent site-specific decisions.

Of the 646 acres of 40 year old managed stands proposed for thinning about 598 acres are in South Santiam-RO215 LSR (see Figure 4 – previous page). The Mid-Willamette Late-Successional Reserve Assessment has Treatment Criteria and Needs identified at the landscape level, LSR network, individual LSR and at the condition-specific or stand level (Chapter IV). There are also individual LSR Summary Sheets with Treatment Recommendations for different Landscape Blocks within the South Santiam LSR (VI, 168-170) for commercial thinning in stands less than 80 years old (early-mid to mid seral stands).

The proposed units in the Gordon and Three thinning areas fall within the Landscape Blocks A, B2 and F1. Landscape Block A recommends “Treat range of seral states in plantations in as short a time as possible.” Landscape Block B2 recommends “Focus on treating early high density stands by precommercial thinning. Multiple entries may be necessary as these stands grow.” Landscape Block F1 recommends, “Prioritize treatments in early seral stands.”

The following Table 1 lists all the allocations for the thinning areas.

Table 1: Forest Plan Allocations

Thinning Areas	Acres	Location	Forest Plan Allocations within Subwatersheds	Subwatersheds
Gordon	190	T14S, R3E, S1; T13S, R4E, S31; T14S, R4E, S5, 10,15	LSR, AMA, RR, Scenic-11a, Wildlife Habitat-9d	Canyon Creek, Trout Creek
Three	456	T13S, R5E, S31; T14S, R5E, S5, 6, 8, 16, 17	LSR, RR, Old-Growth Groves-7, Wagon Road SIA-5a, Scenic-11a, 11c, 11f	Sevenmile Creek, Sheep Creek
<i>Total</i>	646			

Thinning within Late-Successional Reserve must also be consistent with underlying standards and guidelines or allocations. The following discussions address these allocations.

Riparian Reserve (RR) direction under timber management states “Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.”(Forest Plan ROD, TM-1c, C-32) One aspect of the Aquatic Conservation Strategy objectives for management is that it improves conditions in the long term (Forest Plan ROD, B-10).

The South Santiam Watershed Analysis (1995) recommends for Riparian Reserve treatment:

“Management activities to enhance species diversity, diameter growth for future large wood recruitment to streams, and/or development of late-successional structure is appropriate in areas that currently lack complex structure and/or plant species diversity (C12, p. 63).”

The desired future conditions of the MA 5a Santiam Wagon Road Special Interest Area is to continue to provide an example of a unique cultural feature on the Forest. The Willamette Forest Plan directs the preparation of an Implementation Guide for each SIA describing the site-specific management objectives, enhancement programs, and other acceptable uses and activities for these areas (LRMP, p.138-140). A draft Implementation Guide and a draft Historic Properties Management Plan have been prepared. The Santiam Wagon Road will be protected through avoidance. All units will be outside of the special interest area.

The desired future condition of MA 9d Wildlife Habitat is a well-distributed network of high quality habitat throughout the forest landscape. Proposed thinning for Unit 13 in the 9d management allocation will only occur to meet wildlife objectives.

The desired future condition for MA 11a- Scenic Modification Middleground is described, as “*Management activities will be conducted at such a scale that their visual characteristics are compatible with the natural surroundings*” (WNF, IV-201). The thinning prescriptions in this analysis will blend in with the natural surroundings as seen from Highway 20.

The desired future condition for MA 11c -Scenic Partial Retention Middleground, is described, as “*Resource treatments will be conducted in such away that they are visually subordinate to the characteristic landscape*” (WNF, IV-213). Only thinning prescriptions will be analyzed in this analysis.

The desired future condition for MA 11f- Scenic Retention Foreground is described, as “*Important individual landscape elements will be retained to meet forest user expectations. These elements include: large trees, distinctive bark, spring and fall color, shrubs and ground cover, a variety of tree species having age class diversity*”(WNF, IV-213). This project will produce large trees over a shorter time frame in areas treated.

Further detail can be found in the above referenced documents.

Non-Significant Forest Plan Amendment

Within the Three Creeks Old-Growth Grove are three managed stand units proposed for thinning. The size of the old-growth grove management area is 1,963 acres and 796 acres are managed stands generally younger than 40 years old. A non-significant amendment to the Willamette Forest Plan (1990) is required to thin Units 4, 5 and 6 in the old-growth grove where management direction excludes programmed timber harvest.

The Willamette Forest Plan directs the Districts to prepare an Implementation Guide for all designated Old-Growth Groves, in order to establish site-specific management objectives, enhancement programs, and other acceptable uses and activities for these areas (LRMP, p.158-160). These guides augment the existing amended Forest Plan Standards and Guidelines (1994) for all Old-Growth Groves (MA-7).

“The desired future condition for management area (MA) 7 Old-Growth Groves is a network of outstanding, highly accessible examples of old-growth timber types of the Western Cascades.” (LRMP, IV p. 158)

An old-growth implementation guide is prepared in conjunction with this environmental analysis. One site-specific management objective for the Three Creeks Old-Growth Grove is to enhance structural and species diversity in the existing managed stands to facilitate development of old-growth forests. Refer to the appendix for the entire guide.

To implement the proposed action and be in compliance with the Forest Plan a site-specific Forest Plan amendment will be employed. The Forest Plan amendment is considered non-significant because the action will meet the goals and objectives of the old-growth grove by accelerating the growth of young stands, by thinning, towards old-growth and by not

affecting the existing old-growth timber types. Refer to Chapter 3: Stand Late-Successional Structure, Vigor and Diversity.

The purpose of this non-significant amendment is to allow for short-term management activities that are not consistent with current Forest Plan direction to lead to long-term resource benefits. The timing of the change is less likely to result in a significant plan amendment if the change is likely to take place after the plan period (the first decade). The proposed changes are taking place after the first decade of the current 1990 plan; but will be enacted before the next scheduled revision. The Willamette National Forest will begin its revision in 2008. Therefore, the timing of the one change in this amendment is not significant because of how late the change is occurring under the current Forest Plan.

Another factor in non-significance is size and location. The size of the three proposed thinning units total 113 acres of the total 1,963 acres for the Three Creeks Old-Growth Grove equating to 17%; even if all the managed stands were thinned over time in this grove that would be about 41% of the total acres (796/1,963) and would increase the rate that these young stands would move towards the desired old-growth structure. The location of Units 4, 5, and 6 in their relation to existing old-growth/late-successional stands has been taken into consideration and 100 foot no thin buffers provided (see Appendix A: Unit Prescriptions).

There are 29 Old-Growth Groves (OGG) forest-wide. This amendment does not affect any of them. This amendment would only affect the stands identified in the Three Creeks OGG and would not change the management prescription nor the goals and objectives for this OGG or any others on the Forest.

Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to commercially thin approximately 491 acres of 40 to 45 year old managed stands in the Gordon and Three planning areas (see Figures 3a and 3b). The proposed action also includes sale area enhancements such as: riparian plantings; logs and boulder placement in Falls and Three Creeks; Noble Fir enhancement; dispersed site recreation development; the Gordon Lakes trailhead reconstruction; and firewood (see KV Appendix.).

Decision Framework

The Willamette Forest Supervisor, based on the information and analysis presented in this Environmental Assessment must decide whether or not to commercially thin all or part of the 491 acres as proposed. Specific components that will be factors in making this decision include:

1. Might this proposed action have significant impacts requiring analysis using Environmental Impact Statement procedures?
2. Should the area be managed for stated objectives?
3. What other resource needs for action within the sale area boundary could be funded through K-V funds generated by this sale and what are their priorities?
4. What changes to the road system should be made, specifically what roads to close and how?
5. Is the propose thinning of the 40-year-old managed stands in the Three Creeks Old-Growth Grove non-significant action?

Public Involvement

The Sweet Home Ranger District prepared a Project Initiation Letter dated December 9, 2002 detailing the proposed actions and issues and mailed it to over 90 people, agencies and organizations who either have expressed an interest in the area or project, or who might be interested. Recipients included Santiam Wilderness Committee, Oregon Natural Resource Committee, Oregon Department of Fish and Wildlife, and the City Manager of Sweet Home. In response we received correspondence from Oregon Natural Resource Committee and Frontier Technology, Inc.

Jeremy Hall from Oregon Natural Resources Council out of Eugene, Oregon wrote “... *ONRC supports thinning of young managed stands.*” They also support variable density thinning and logging in the Three Creeks Old-Growth Grove but limited to young managed stands. Other issues mentioned were controlling weeds and reducing fine fuel loads.

Gary Marcus of Frontier Technology, Inc. is concerned with the protection of the Falls Creek infrastructure and specifically that “... *the penstock be protected during any logging operation.*”

The Willamette National Forest quarterly mailer, “Forest Focus” is mailed to over 100 individuals, groups and/or industry representatives and is available on the Forest web site. The proposed Gordon Three Thin was included in all issues from August 2002 to summer of 2003.

All correspondence and full text of the letters are available at the Sweet Home District Office.

Issues

Scoping with the public and internally, and with the other agency contacts, helped the Forest Service identify issues associated with this project. To help focus planning efforts, the interdisciplinary analysis team used public scoping results and field reconnaissance to identify issues. Significant issues are used to develop more than one action alternative.

Other issues, some of specific concern from the public, many of them associated with Forest Plan standards and guidelines, legal requirements, and localized resource concerns, are mainly addressed by mitigation measures which are typically common to all action alternatives. Other issues, which are important to discuss but will not have a significant effect on the human environment but are required to be addressed will either not be analyzed beyond this chapter or addressed in the Environment Consequences chapter.

Significant Issues

Significant issues were used as the driving force in alternative development.

1. Economics

Timber sale viability, the need to develop an economically attractive proposal, is essential. A hard look at sale design and ease of thinning prescription implementation must be taken into account. A below cost (deficit) sale or a package which generates no bidder interest is not desirable and needs to be avoided. A sale that does not sell does not accomplish the silvicultural objectives, and provides no wood or work for the community.

The minimum thinning of 5 to 10 MBF per acre is considered economically feasible. Conventional harvest systems, such as a small skyline machine (Kohler, for example) and ground-based, processor/forwarder, cut-to-length operations are efficient, environmentally sensitive, and cost effective. Helicopter involves less ground disturbance, but has higher costs, and helicopter availability is often limited. In general, road systems already have been developed to access the proposed managed stand units with conventional harvest methods. However, proposing a temporary low standard road would be more economical than a helicopter logging system where there are no existing roads.

Indicators that can be used to measure economic feasibility are as follows.

- Measured by acres by logging system
- Logging cost by MBF (thousand board feet)
- Total volume of wood produced

2. Noxious and Invasive Weeds

Noxious weeds, such as false brome, are a threat to the native wildland ecosystem because they out-compete and displace native vegetation. Soil disturbance and canopy openings created by thinning near existing weed populations will provide seedbeds for the germination of noxious and invasive weeds. Indicators that can be used to measure the potential weed infestation are as follows.

- Acres for potential establishment of noxious weeds on disturbed soil near existing weed populations.

3. Riparian Management

Riparian reserve areas comprise more than half the acreage in these stands. A major objective is the development of riparian reserve thinning recommendations that meet the needs of the aquatic conservation strategy (ACS) objectives and achieves desired ecological, economic, and social objectives.

Direction from the May 19, 2003 Final Draft “*Sufficiency Analysis for Stream Temperature*” page 13 states:

“The ACS objectives were not intended to preclude management in Riparian Reserves. In fact, vegetation treatment may be necessary to restore ecological health in Riparian Reserves that have been harvested previously or have been affected by lack of disturbance such as fire exclusion. Many Riparian Reserves are overstocked or lack the species composition and age class to restore aquatic and riparian condition. Treatments to reduce vegetation density in riparian areas could have the benefit of reducing the risk of wildfire and disease; or restoring species composition, structural diversity, biological habitat, large wood recruitment potential, soil productivity, and riparian condition.”

The Indicator that can be used to measure the riparian maintenance and enhancement are Riparian Reserve thinning density reduction within full riparian reserves and no-thin stream buffer percentages. These are measured as follows.

- Percent of riparian area treated
- Amount of no-thin buffers

Other Issues

Wild and Scenic Rivers

The South Santiam River has been recognized in the Forest Plan as a potential candidate for Wild and Scenic River (WSR) designation. It was determined eligible for a “Recreation” designation in the segment from the junction of Sevenmile and Latiwi Creeks downstream to

the Forest boundary. Outstandingly Remarkable Values (ORV's) that support WSR eligibility include recreation, fisheries, prehistoric and historic resources. Proposed thinning is allowed within the river corridor, but should not compromise the river's "free-flowing" nature or degrade the Outstandingly Remarkable Values that helped determine its eligibility.

The following reasons state why this issue is not significant.

- This action will not include new road construction within the river corridor that could degrade Outstandingly Remarkable Values.
- This action will not adversely affect the Santiam Wagon Road, or destroy any prehistoric sites.

Skid trails within the river corridor will be ripped and seeded where needed and closed to motorized use after the thinning is complete.

- Thinning prescriptions in all action alternatives are designed to maintain visual quality consistent with the corridors.

Heritage Resources

Known Heritage properties such as the Santiam Wagon Road will be avoided, buffered or otherwise subject to appropriate mitigation from harmful effects (see Chapter 2 - Mitigation Measures). The effects on heritage resources from any action alternative will remain constant for all alternatives being considered. Any further or unforeseen mitigation efforts will be considered in consultation with the State Historic Preservation Office (SHPO).

Units 7, 8, and 9 have been located on the ground and are outside of the Santiam Wagon Road Special Interest Area (SIA). The SIA is designated to be 330 feet on each side of the Santiam Wagon Road, which generally parallels the South Santiam River.

The following reason states why this issue is not significant.

- This action will not adversely affect the Santiam Wagon Road, or affect (no effect) any prehistoric sites.

Bat Species

Sites commonly used by bats for roost sites and hibernacula include caves, mines, snags and decadent trees, wooden bridges and old buildings. The relatively young, thin barked, 40 year old trees of the managed stands proposed for thinning generally do not provide habitat for bats. However, provisions for retention of large snags and decadent trees if they occur in the stand and directly adjacent to the stands are included in the standard and guideline for green tree patches in the Matrix and Late-Successional Reserves. Caves and abandoned mines, wooden bridges and buildings require additional protection measures to ensure their value as habitat is maintained. There are no known caves, abandoned mines, wooden bridges or buildings within the project area. This issue will not be analyzed further.

Special Habitats

Special habitats are non-forested areas including seeps, rock outcrops and gardens, caves,

and meadows. These sites are important reservoirs of biodiversity, providing habitat for a variety of plants, fungi, and animals not often found in forested areas. In addition, many sensitive species are found in special habitats.

Multiple special habitats were found in and adjacent to the proposed units. Most of these sites were impacted by the initial harvest of the stand. No buffers were left around the sites so they presumably experienced great change in solar radiation, humidity, and other microsite factors. The consequence of that disturbance is difficult to assess. These special habitats will be evaluated and protected from disturbance where necessary in all alternatives of this project. See Special Habitats in Chapter 2 Mitigation Common to All Alternatives. This issue will not be analyzed further.

Chapter 2: Alternatives, including the Proposed Action

The purpose of the alternatives chapter is to display “...*the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among the options by the decision maker and the public.*” FSH 1909.15,22.3(5.).

This chapter contains the no action alternative, description of action alternatives, alternatives not considered in detail, project objective analysis, mitigation measures common to all alternatives, maps and tables comparing action alternatives.

Alternatives

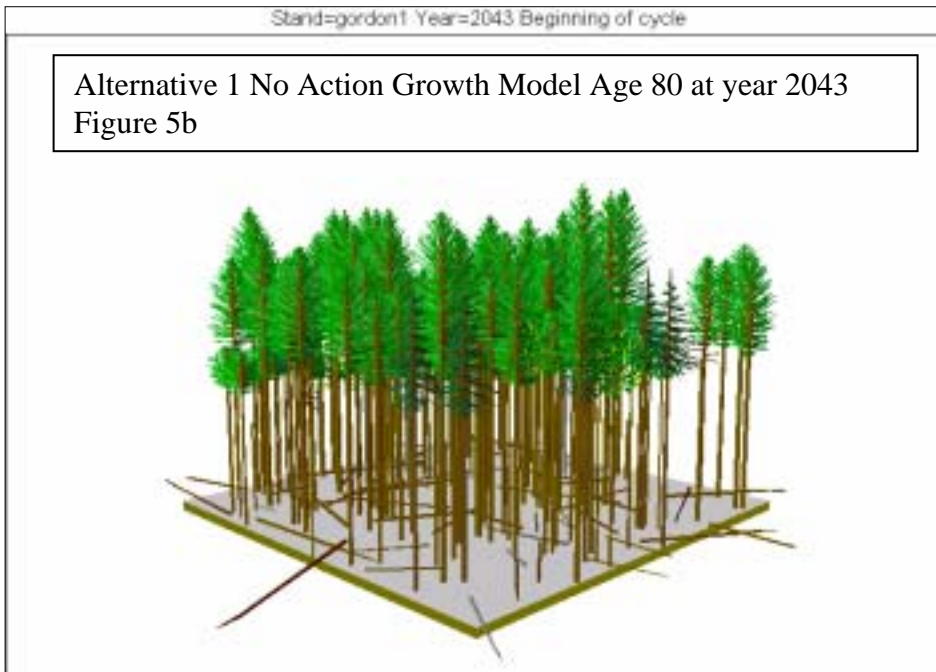
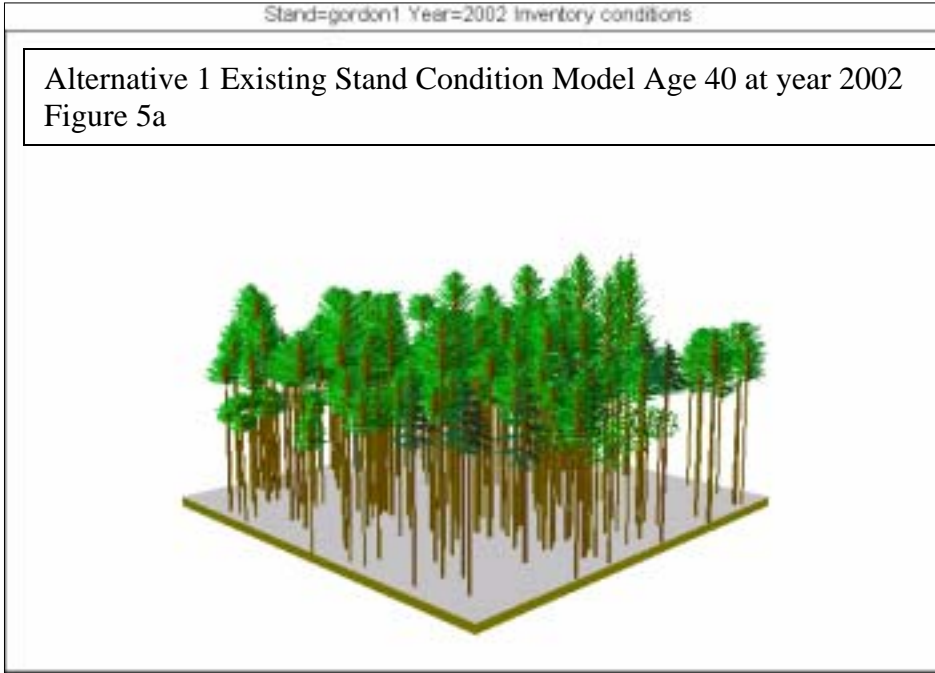
Alternative 1- No Action

The No Action alternative is required by the Council of Environmental Quality regulations (40 CFR 1502.14(d)). This alternative provides the bases for comparison of information for understanding the changes associated with the action alternatives and meeting the project objectives. A great deal of the baseline information is presented in an analytical manner in the discussions of the Affected Environment located in the first part of the effects descriptions in Chapter 3: Environmental Consequences of this EA. Other information can also be found in the needs for action and the issues in Chapters 1.

Under the No Action alternative, current management plans would continue to guide management of the project area. Selecting this alternative would result in the following conditions:

- No thinning of over stocked managed stands, no acceleration of stands towards late-successional characteristics and no closure of roads would be implemented to accomplish project objectives at this time.
- No sale enhancements from Knutson-Vandenberg (KV) collections would be made for: riparian plantings; logs and boulder placement in Falls and Three Creeks; Noble Fir enhancement; dispersed site recreation development; the Gordon Lakes trailhead reconstruction; and firewood (see KV Appendix.).

Because the existing environment is not static, environmental consequences from selecting this alternative are expected. Depending on the kind and frequency of disturbance and the gradual change in vegetation, these lands would slowly move towards old-growth conditions. However, at age 80 (in forty years) the stand would still exhibit inter-tree competition mortality and no understory growth resulting from overstocked stand conditions. Figure 5a displays a model of representative existing stand conditions and Figure 5b models this stand’s predicted growth at age 80 if no action or no thinning occurs.



Stand Visualization Simulation Model (SVS) 2001
Robert J. McGaughy, USDA Forest Service, PNW Research Station

Alternative 2 - The Proposed Action

Alternative 2 was designed to thin as many acres as possible using a combination of helicopter, skyline and ground-based logging systems (see Table 2 and Figure 6).

Approximately 491 acres of commercial thinning will be accomplished with this alternative and volume produced from this alternative is 5.146 million board feet (MMBF). Yarding systems for this entry will consist of skyline for 222 acres, ground-based for 170 acres and helicopter for 99 acres. There will be a native surface operator's spur of 650' in Unit 7.

Economic:

- Alternative 2 thins 491 acres or 80% of the young stand acres.
- Total logging cost for Alternative 2 is \$664,840.
- Spur road building for Alternative 2 is \$1,847 and includes helicopter yarding.

Noxious Weeds:

- Alternative 2 proposes a 100-foot containment buffer along the main roads in Units 10 and 11 to maintain a dense canopy next to the roads and limit spread of noxious weeds. Unit 12 will have weed containment no thin buffer only around existing populations. About two acres of potentially disturbed soil near existing weed populations is anticipated.

Riparian Management and Thinning Prescriptions:

- Alternative 2 thins 74% of the acres (143/192) within riparian reserves. In Alternative 2, for Units 1 and 2, the no-thin riparian buffer for permanently flowing non-fish-bearing streams are 50 foot and increased canopy closure retention is 60% outside that 50 foot buffer in the rest of the Riparian Reserve. Fish-bearing Falls Creek, Three Creek and the West Fork of Three Creek have a 100-foot no-thin buffer in both alternatives (see Appendix A for full thinning prescription).

Other Actions:

Thin Prescriptions: Retention areas (RA) and dominant tree release (DTR) areas will cover 10% of the area within Units 1, 2, 3, 7 and 8. Units 4 and 5 have 20% RA and DTR. Units 6, 9 and 13 will not have any areas RA/DTR areas; only thinning to reduced TPA retention. Units 10 and 11 will have 10% of the area in DTR only and Unit 12 will have 10% in RA only. Target Canopy Closure averages RA, DTR and TPA retention thinning and is the final result after Coarse Woody Debris (CWD) and snags are provided, see Table 2.

- 10% - four ¼ acre areas will be left per ten acres of unit for DTR, may group RA.
- 20% - eight ¼ acre areas will be left per ten acres of unit for DTR, may group RA.
- This will leave 10 or 20% of the area in retention and 10 or 20% in openings surrounding a dominant tree. Retention areas will also be grouped to provide greater maintenance of microclimates.
- Between RA/DTR there is thinning to 70, 90, 110 TPA for an overall variable thin.

Fire Hazard Protection Methods: Treetops will be yarded in skyline and helicopter yarding areas. The ground-based systems will crush and use the slash in the skid roads. Hand piling will be collected for along the major forest roads: 2032, 2044 and 2044230.

Protection Buffers: No-thin protection buffers will be provided for Survey and Manage/Sensitive Species, riparian areas and next to existing late-successional habitat along boundaries of thinning units.

Down wood: Ten TPA in addition to existing coarse woody debris and snags will be left on site to be felled after timber sale.

Road Work and Closures: Six new roads will be closed and one road will have an improved gate closure as a result of implementing alternative totaling over seven miles of road closure. Road maintenance is proposed for approximately 23 miles consisting of spot rocking, brush cutback, road blading and ditch cleaning on gravel roads. A six-inch lift of rock will be added for about 1.6 miles on road 2032 adjacent to the South Santiam River. Road reconstruction is proposed for approximately 0.25 miles consisting of resurfacing the roadbed and adding about a four-inch lift of rock; 0.15 mile for the 365 spur road into Unit 13 and 0.1 mile of spur road into Unit 4 (see Appendix C: Economic Analysis).

KV Projects: KV projects will be funded in the following priority and are described in Appendix B.

- 1) Noxious Weeds
- 2) Snag and Down Wood Creation
- 3) Precommercial Thinning of Other Managed Stands
- 4) Planting *
- 5) Forage Seeding and Sub-soiling of Skid Roads
- 6) Trailhead Reconstruction
- 7) Berm Road
- 8) Dispersed Campsite Development
- 9) Stream and Wetland Structures and Riparian Planting
- 10) Noble Fir Maintenance and Enhancement
- 11) *Leptogium cyanescans* Monitoring
- 12) Fertilize Commercial Thin Stands
- 13) Firewood
- 14) Fertilization of Other Managed Stands
- 15) Pruning of Managed Stands

**Planting is not required reforestation of the stand as all stands will remain adequately stocked following prescribed treatments. Planting is silviculturally prescribed in the openings around Dominant Tree Release to speed the second cohort development, provide superior trees and a diversity of tree species (see KV Appendix).*

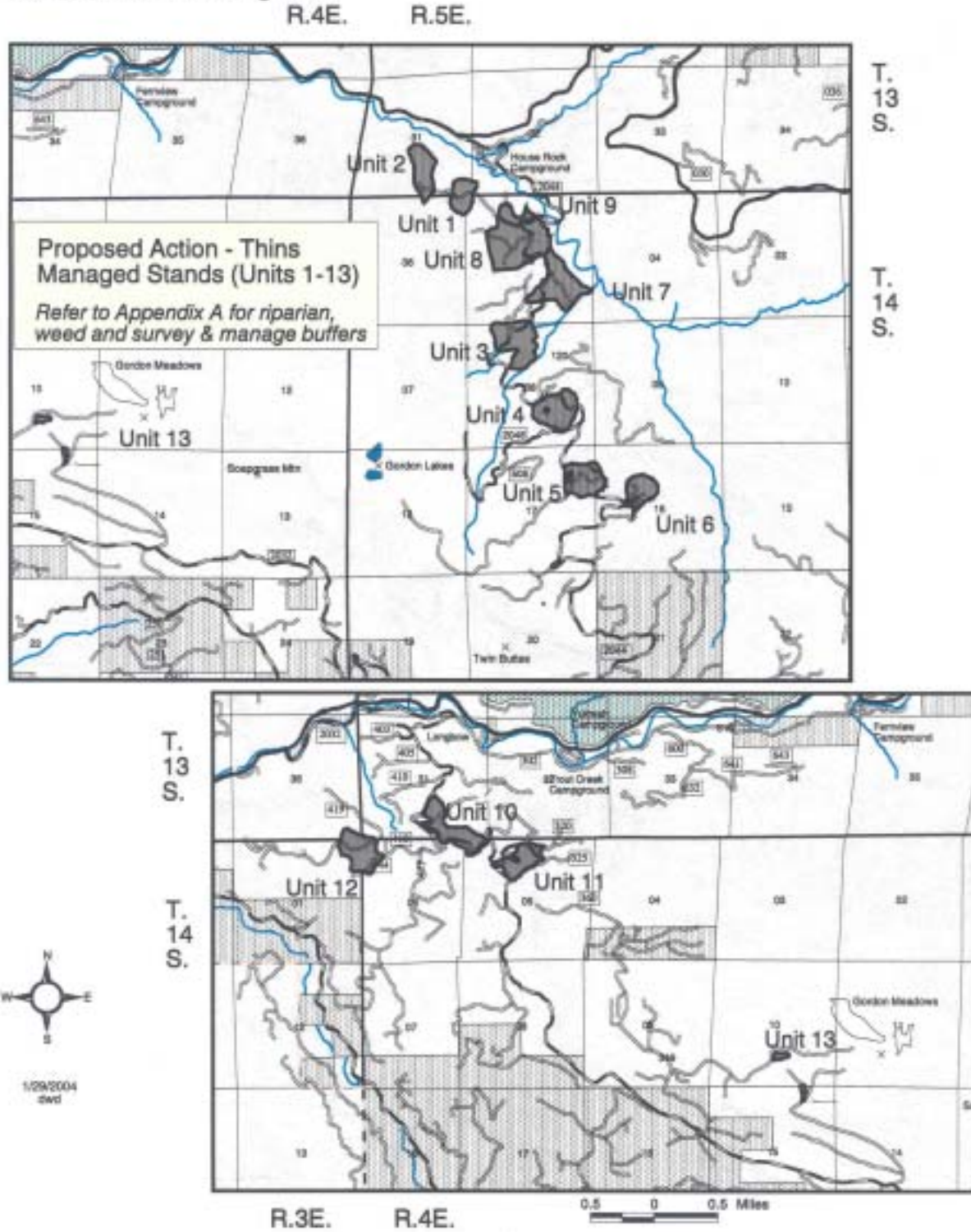
Table 2: Alternative 2

Units	Tot. Ac.	Buffer Ac: RR, S&M LS, SH, Weeds	Thin Ac.	TPA Reten.	Target% Canopy Closure	RA/DTR Areas in % of Unit	SkI. Ac.	Grd Ac.	Hel. Ac.	Addl. CWD& Snags	Est MBF /Ac	Est.Total Remove MBF
1	27	RR; TORR; ALRU/LYAM -Total 3ac	24	70&110	40% 18ac & 60% 6 ac	10%ea RA/DTR	10	9	5	10	12 Avg.	288
2	38	RR; Rock BAWR; -Total 6ac	32	70&110	40% 23ac & 60% 9ac	10%ea RA/DTR	9	0	23	10	11 Avg.	352
3	60	RR; LS; PSRA -Total 13ac	47	70&110	40% 26ac & 60% 21ac	10%ea RA/DTR	21	0	26	10	8 Avg.	376
4	51	RR; ALRU/LYAM; Rock/LS; Rock pit; -Total 3ac	48	90	50%	20%ea RA/DTR	12	18	18	10	10 Avg.	480
5	44	RR+ALRU/ LYAM; LS; BAWR -Total 7ac	37	70	40%	20%ea RA/DTR	18	19	0	10	10 Avg.	370
6	30	ALRU/LYAM; LS; Trees too small -Total 2ac	28	90	50%	None	18	10	0	10	8 Avg.	224
7	92	RR; LS; ALRU/LYAM; LECY -Total 16ac	76	90	50%	10%ea RA/DTR	55	16	5	10	12 Avg.	912
8	97	RR; LS; Rock LECY; ALRU/LYAM -Total 16ac	81	90	50%	10%ea RA/DTR	53	6	22	10	12 Avg.	972
9	17	LS; RR ALRU/LYAM -Total 1ac	16	90	50%	None	9	7	0	10	12 Avg.	192
10	55	RR; BRSY; LECY; -Total 23ac	32	90	50%	10% DTR only	6	26	0	10	13 Avg.	416
11	37	RR; LS; BRSY -Total 16ac	21	90	50%	10% DTR only	11	10	0	10	11 Avg.	231
12	48	RR; BRSY -Total 7ac	41	110	60%	10% RA only	0	41	0	10	5 Avg.	205
13	50	BRNO -Total 42ac	8	70	40%	None	0	8	0	10	16 Avg.	128
Total	646		491				222	170	99		11 Avg.	5146

All acres are estimates. RR –Riparian areas w/in Riparian Reserves that have no thinning; ALRU/LYAM – red alder/skunk cabbage; S&M – /Sensitive; LS – Late-Successional; SH – Special Habitats; Grd., SkI., & Hel.= Ground, Skyline and Helicopter based logging systems; LECY-Leptoguim cyanescens; BRSY=false brome; BAWR = Oregon Slender Salamander; TORR=Torrent Salamander; BRNO= Bridgeoporus nobilissimus; PSRA=Pseudocypbellaria rainierensis; DTR=Dominant Tree Release; RA= Retention Areas

Alternative 2

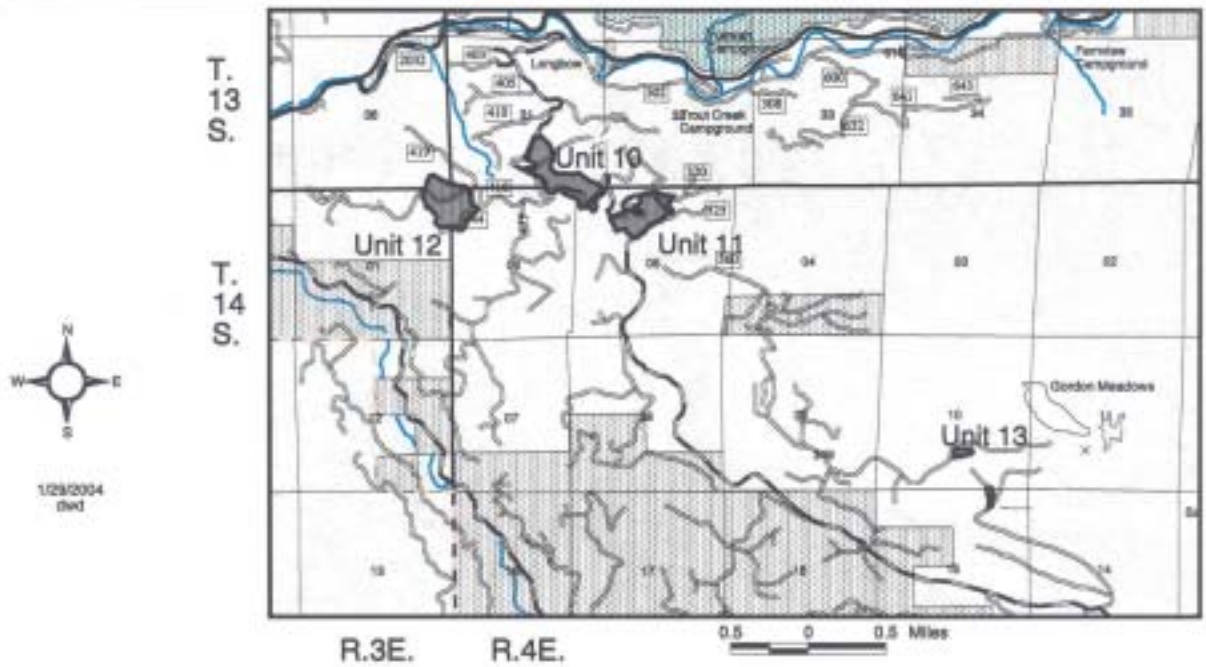
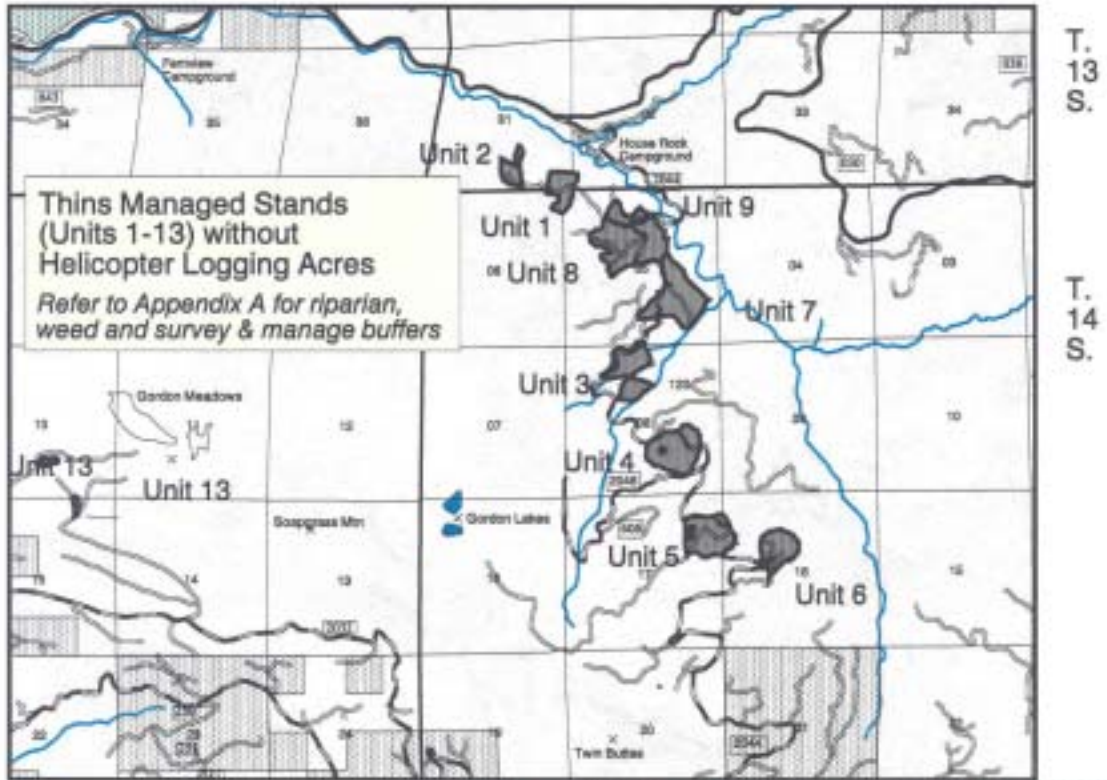
Gordon Three Thin - Figure 6



Alternative 3

Gordon Three Thin - Figure 7

R.4E. R.5E.



Alternative 3

Alternative 3 was designed to economically thin as many acres as possible using only skyline and ground-based logging systems and excluding acres that would require helicopter logging (see Table 3 and Figure 7). Some thinning acres were retained by downhill yarding for short distances and proposing an additional spur road. Approximately 437 acres of commercial thinning will be done with this alternative and volume produced from this alternative is 4.589 million board feet (MMBF). Yarding systems for this entry will consist of skyline for 255 acres, and ground-based for 182 acres.

Economic:

- Alternative 3 thins approximately 437 acres and produces 4.589 MMBF.
- Total logging cost for Alternative 3 is \$514,040.
- Spur road building for Alternative 3 is \$4,403. There will be a native surface operator's spur of 650' in Unit 7 and an additional 900' spur in Unit 4. (see Appendix for full economic analysis).

Noxious Weeds:

- Alternative 3 provides a 100-foot containment buffer on specific weed populations for Units 10, 11, and 12 (not along entire road). Approximately 16 acres of potentially disturbed soil that is near existing weed populations is anticipated.

Riparian Management and Thinning Prescriptions:

- Alternative 3 thins 70% of the acres (129/184) within riparian reserves. In Alternative 3, Units 1 and 2, the no-thin riparian buffer for permanently flowing non-fish-bearing stream are 100 foot width and canopy closure retention decreased to 40%. Only for Alternative 3 skyline corridors 15' wide go through riparian areas in Units 2 and 3. Fish-bearing Falls Creek, Three Creek and the West Fork of Three Creek have a 100-foot no-thin buffers in both alternatives (see Appendix A for full thinning prescription).

Other Actions:

Thin Prescriptions: Retention areas (RA) and dominant tree release (DTR) areas will cover 10% of the area within Units 1, 2, 3, 7 and 8. Units 4 and 5 have 20% RA and DTR. Units 6, 9 and 13 will not have any RA/DTR areas; only thinning to reduced TPA retention. Units 10 and 11 will have 10% of the area in DTR only and Unit 12 will have 10% in RA only. Target Canopy Closure averages RA, DTR and TPA retention thinning and is the final result after Coarse Woody Debris (CWD) and snags are provided, see Table 3.

- 10% - four ¼ acre areas will be left per ten acres of unit for DTR, may group RA.
- 20% - eight ¼ acre areas will be left per ten acres of unit for DTR, may group RA.
- This will leave 10 or 20% of the area in retention and 10 or 20% in openings surrounding a dominant tree. Retention areas will also be grouped to provide greater maintenance of microclimates.
- Between RA/DTR there is thinning to 70, 90, 110 TPA for an overall variable thin.

Fire Hazard Protection Methods: Treetops will be yarded in skyline yarding areas. The ground-based systems will crush and use the slash in the skid roads. Hand piling will be collected for along the major forest roads: 2032, 2044 and 2044230.

Protection Buffers: No-thin protection buffers will be provided for /Sensitive Species, riparian areas and next to existing late-successional habitat along boundaries of thinning units.

Down wood: Ten TPA in addition to existing coarse woody debris and snags will be left on site to be felled after timber sale.

Road Work and Closures: Six new roads will be closed and one road will have an improved gate closure as a result of either action alternatives totaling over seven miles of road closure. Road maintenance is proposed for approximately 23 miles consisting of spot rocking, brush cutback, road blading and ditch cleaning on gravel roads. A six inch lift of rock will be added for about 1.6 miles on road 2032 adjacent to the South Santiam River. Road reconstruction is proposed for approximately 0.25 miles consisting of resurfacing the roadbed and adding about four inch lift of rock; 0.15 mile for the 365 spur road into Unit 13 and 0.1 mile of spur road into Unit 4 (see Appendix C: Economic Analysis).

KV Projects: KV projects will be funded by priority and are described in Appendix B and are the same as Alternative 2.

Table 3: Alternative 3

Units	Tot. Ac.	Buffer Ac: RR, S&M LS, SH, Weeds	Thin Ac.	TPA Reten.	Target% Canopy Closure	RA/DTR Areas in % of Unit	Skl. Ac.	Grd Ac.	Hel. Ac.	Addl. CWD& Snags	Est MBF /Ac	Est.Total Remove MBF
1	27	RR; TORR; ALRU/LYAM -Total 6ac	17	70	40%	10%ea RA/DTR	7	10	0	10	12 Avg.	204
2	38	RR; Rock BAWR; -Total 10ac	15	70	40%	10%ea RA/DTR	14	1	0	10	11 Avg.	165
3	60	RR; LS; PSRA -Total 13ac	29	110	60%	10%ea RA/DTR	29	0	0	10	8 Avg.	232
4	51	RR; ALRU/LYAM; Rock/LS; Rock pit; -Total 3ac	48	90	50%	20%ea RA/DTR	30	18	0	10	10 Avg.	480
5	44	RR+ALRU/ LYAM; LS; BAWR -Total 7ac	37	70	40%	20%ea RA/DTR	18	19	0	10	10 Avg.	370
6	30	ALRU/LYAM; LS; Trees too small -Total 2ac	28	90	50%	None	18	10	0	10	8 Avg.	224
7	92	RR; LS; ALRU/LYAM; LECY -Total 16ac	76	90	50%	10%ea RA/DTR	60	16	0	10	12 Avg.	912
8	97	RR; LS; Rock; LECY; ALRULYAM -Total 14ac	59	90	50%	10%ea RA/DTR	53	6	0	10	12 Avg.	708
9	17	LS; RR ALRU/LYAM -Total 1ac	16	90	50%	None	9	7	0	10	12 Avg.	192
10	55	RR; BRSY; LECY; -Total 17ac	38	90	50%	10% DTR only	6	32	0	10	13 Avg.	494
11	37	RR; LS; BRSY -Total 12ac	25	90	50%	10% DTR only	11	14	0	10	11 Avg.	275
12	48	RR; BRSY; -Total 7ac	41	110	60%	10% RA only	0	41	0	10	5 Avg.	205
13	50	BRNO -Total 42ac	8	70	40%	None	0	8	0	10	16 Avg.	128
Total	646		437				255	182	0		11 Avg.	4589

All acres are estimates. RR –Riparian areas w/in Riparian Reserves that have no thinning; ALRU/LYAM – red alder/skunk cabbage; S&M – Survey and Manage/Sensitive; LS – Late-Successional; SH – Special Habitats; Grd., Skl., & Hel.= Ground, Skyline and Helicopter based logging systems; LECY-Leptogium cyanescens; BRSY=false brome; BAWR = Oregon Slender Salamander; TORR=Torrent Salamander; BRNO= Bridgeoporus nobilissimus; PSRA=Pseudocypbellaria rainierensis; DTR=Dominant Tree Release; RA= Retention Areas.

Mitigation Common to All Alternatives

The following mitigation measures address Forest Plan standards and guidelines as well as the adverse effects on resources identified in Chapter 3. These mitigation activities apply to all action alternatives unless another mitigation measure is specifically identified in a particular unit prescription in Appendix A: Unit Prescriptions. Also listed are common mitigations that apply to a specific unit regardless of alternative. Only requirements listed in this section is mitigation.

Big Game

- Roads opened for access will be closed following timber harvest operations.
- Gaps created in Unit 10 will be located away from road 2032 to the extent possible.
- Operators will not be allowed in Unit 12 from December 1 – April 30 to minimize disturbance to big game.

Fisheries

- No in-stream activities should take place in fish-bearing streams or other perennial streams near their confluence with fish-bearing streams outside of the in-water work window (July 15 to August 30th).
- Riparian Buffers ranging from 25 each side of streams to 100 feet each side of stream are set up to minimize sediment delivery to streams and reduce the potential for temperature increases (**see Appendix A: Unit Prescriptions**).
 - Fish-bearing streams with 100 foot no-thin: South Santiam River, Falls Creek, Three Creeks and west fork of Three Creeks - Units 3, 7, 10 and 11; also Unit 8 (below road) it is not fish-bearing but it's close to S. Santiam River.
 - Streams in units that directly drain into South Santiam River and below roads 50 foot no-thin – Units 1, 2, 7 and 9.
 - All other creeks have a 25 foot no-thin buffer – Units 1, 2, 4, 5, 7, 8, 10, 11 and 12.
- Dust abatement, and fresh rock will be used on roads paralleling the South Santiam River and Canyon Creek to minimize sediment delivery to streams with ESA listed species. Dry weather haul will be required on native surface roads.

- To minimize impact from skyline corridors across streams and riparian areas, the trees felled will be left on site.

Fuels/Air Quality

- Treetops will be yarded in skyline and helicopter yarding areas. The ground-based systems will crush and use the slash in the skid roads. Hand piling will be collected for along the major forest roads: 2032, 2044 and 2044230.

Heritage Resources

- Protect eligible sites. In the event that Heritage Resources are encountered during project implementation project activity will cease until a qualified archeologist can make a determination of effect on the heritage resource.

Noxious Weeds

- Noxious weeds will be surveyed for and removed where possible in harvest units, and along adjacent road systems.
- Existing weed sites of false brome and non-native blackberries will be buffered from thinning activities to maintain a dense overstory and to prevent weed seed from being transported throughout the harvested area.
- Minimize areas of disturbance during road reconstruction.
- Berm or gate any new roads to reduce disturbance and incoming weed seed due to vehicular traffic.
- All road construction and logging equipment will be pressure washed prior to working in the area.
- KV dollars will be collected for surveying and controlling noxious weeds on all harvest units and roads in the planning area.
- Obtain gravel for road reconstruction from a weed free rock source.
- Seed all disturbed areas with native species including landings and subsoiled skid roads, to reduce weed establishment.

Recreation

- Avoid logging or hauling operations during weekends from July 4th to August 31st. A weekend is defined as starting at 5pm on Friday and ending at 7pm on Sunday.
- Berm all forwarder roads in Unit 9 where they connect with road 2044 to minimize

risk of off-highway vehicle traffic on Santiam Wagon Road access spur . Whenever possible, wildlife trees felled in this unit for downed wood should be directed across forwarder roads.

- Berms placed on local roads (ex. road 365) after logging operations should be placed far enough away from main roads to create dispersed recreation sites, whenever possible.
- Install plastic culvert and dig out catch basin on recreation segment of Santiam Wagon Road in Unit 9 to prevent further overflow erosion on wagon road.
- Reconstruct or replace any existing dispersed recreation sites impacted by logging operations or road closures.

Residual Tree Protection

- No thinning during sap flow March 15 to June 30 to protect remaining trees from damage due to logging equipment, unless approved by District Silviculturist.

Snag and Down Wood Habitat

- Retention areas will be concentrated at accumulations of down wood wherever possible.
- Snags required to be felled for safety will remain as down wood.
- Snag and down wood habitat will be retained from the existing stand at 10 trees per acre (TPA). Five TPA above the thinning prescription for standing snags and five TPA for down wood creation. Trees in the large diameter class should be selected whenever possible for snag and down wood trees.

Soils

- At the completion of harvest activities, tractor skid roads shall be ripped or subsoiled to return the site to near original productivity.
- Erosion control measures will be implemented as soon as possible after soils have been disturbed. All ripped and subsoiled areas will be seeded with native seed mix.

Special Use Protection of Falls Creek Hydro Penstock

- Avoid heavy equipment use on Road 325 just east of Unit 11, where the Falls Creek Hydro Penstock runs north and south. If heavy equipment is needed to access unit a metal plate bridge must be placed on road to protect the pipe underneath from collapsing. Penstock pipe is most vulnerable to collapsing when empty at the end of summer.

Special Habitats

Special habitats, including seeps, rock outcrops and gardens, caves, and meadows will be protected in accordance with the Forest Plan and the Special Habitat Management Guide. See **Appendix A: Unit Prescriptions** for specific information regarding protective measures for special habitats known to occur in or adjacent to proposed units.

Protective measures and no-harvest buffer widths for special habitat are as follows:

- Directional falling away from the special habitat
- Avoiding placement of skyline corridors through special habitat areas.
- Seeps/springs: 172 feet if greater than 1/4 acre; and
exclude from harvest unit if less than ¼ acre and if contain riparian
vegetation such as skunk cabbage. Unit 11 and 12 wet area 50 feet
no-thin buffer – see Appendix A.
- 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

Smaller seeps, rock gardens and outcrops will be buffered commensurate with their size and the adjacent harvest prescription. There should be no direct disturbance to the habitat or its ecotone.

Small rock outcrops are abundant in the planning area and therefore do not require buffering in the thinning units, provided that direct disturbance is avoided. Additional special habitats encountered during project layout will be protected in consultation with resource specialists.

Survey and Manage/Sensitive Species

Survey and manage/sensitive species are afforded protection to some degree in all action alternatives. Buffers are wider for species considered locally rare.

Table 4: Protective Measures For Survey and Manage/Sensitive Species

Unit #	Plant Survey and Manage/Sensitive Species Located	Number of Sites	Buffer Width
1	No survey and manage/sensitive species found		
2	No survey and manage/sensitive species found		
3	<i>Pseudocyphellaria rainierensis</i>	4	100'
4	<i>Pseudocyphellaria rainierensis</i>	1, riparian	100'
5	No survey and manage/sensitive species found		
6	No survey and manage/sensitive species found		
7	<i>Leptogium cyanescans</i> <i>Pseudocyphellaria rainierensis</i>	1 3	172' 100'
8	<i>Leptogium cyanescans</i>	2	172'
9	No survey and manage/sensitive species found		
10	<i>Leptogium cyanescans</i>	1	172'
11	No survey and manage/sensitive species found		
12	No survey and manage/sensitive species found		
13	<i>Bridgeoporus nobilissimus</i> <i>Racomitrium aquaticum</i> <i>Rhizomnium nudum</i>	4 historical record 2, out of unit	Dropped from unit Not located none

* Retention areas are small (1/4 acre) patches where no thinning will occur. Where survey and manage/sensitive species are found adjacent to but outside of the stand, retention areas will be left in the stand.

Wildlife Proposed (P), Endangered (E), Threatened (T) and Sensitive (S) species (PETS)

Sensitive Wildlife Species

- Oregon slender and Cascade torrent salamander locations in Units 1, 2, and 5 will have a minimum 75-foot no-harvest buffer.

Spotted Owl

- Standards outlined for spotted owls in the Biological Opinion (USDI 2/27/03) will be adhered to.
- Operators will not be allowed in Units 1, 2, 7, 8 and 9 to minimize disturbance to protect nesting spotted owls from March 1 to September 30.
- Operators will not be allowed in Unit 12 will to minimize disturbance to protect nesting spotted owls from March 1 to July 15.

The following guidelines apply to the use of all motorized equipment:

- For verified owl pair locations, operating restrictions shall apply until non-nesting has been verified. If non-nesting is verified, restrictions may be waived. (FW-173, LRMP pg. IV-73).

Osprey

- Operators will not be allowed Units 1 and 9 to minimize disturbance to protect nesting osprey from March 1 to July 31.

Great Gray Owl

- Operators will not be allowed Unit 13 to minimize disturbance to nesting great gray owls from March 1 to July 31.

Peregrine Falcon

- Aircraft will remain a minimum of 2 miles from known peregrine nest site January 15 – July 31.
- Surveys of high potential nesting habitat will be completed prior to timber harvest operations January 15 – July 31 in Units 1-9.

Alternatives Not Considered in Detail _____

An alternative that thinned the entire managed stands as they were originally created was not considered due to changes in management objectives in the current Forest Plan. Many of the original unit boundaries extended into the entire riparian areas. The units totaled 646 acres when originally sold in the early 1960's, regeneration harvested (clear-cut) and planted. The interdisciplinary team, at this time-2004, only considered thinning up to approximately 500 acres in any action alternative; thinning of other acres would not meet the purpose and need for action, objectives and management requirements. Some of the acres were not of a suitable size timber for commercial thinning and would be uneconomical to harvest. Also the size of no-thin buffers required to meet environmental protection listed in the Alternatives tables (Tables 2 and 3) reduced the acres available for thinning.

An alternative that was purely without roads was not pursued because the proposed low specification road(s) will be temporary operators spur/native surfaced and closed after use; this spur(s) will also make the sale more economical. One of the primary project objectives is to design an economically feasible commercial thinning sale and promote local employment by minimizing logging cost. Skyline and cut-to-length logging systems accessed by roads are less expensive to operate than bringing in a helicopter logging show.

Thinning these stands without roads and ground-based logging would either result in an uneconomical sale offering or would thin a small percentage of the densely stocked stands. Neither result is consistent with the Purpose and Need for this project.

Single-entry treatment or heavy thinning of managed stands was not pursued. A one-time entry would generally require thinning the stands down to 30 to 50 trees per acre to achieve the desired long-term stand conditions. Associated activities such as stand underplanting and road closures would be implemented. Stands would then be allowed to develop old-growth conditions on their own. However, a landscape populated by stands with minimum numbers of trees leaves little room for mortality from natural events such as strong winds or insect infestation.

A major objective of this project is to develop thinning prescriptions to enhance stand vigor and growth and after evaluating stand data for these 40-year-old stands thinning to below 25% Relative Density the remaining stand would not fully occupy the site. Relative Density (RD) is a percentage of what a stand can carry or a percentage of the maximum Stand Density Index (SDI). When a stand reaches 55% RD this indicates the stands are overcrowded and are at the zone of immanent mortality. All the stands are close to 55% RD and thinning to 25% to 35% RD is preferred so the stands will be in the optimum growth zone. Stand exam data and modeling is in Appendix I: FVS Model Thinning Analysis. To thin these stands to 40 trees per acre (TPA) was modeled for Unit 10 and would put the stand to 14.3 RD of trees greater than 7 inches and is problematic when the stand is not fully occupying the site; however, thinning to a low density could be done considering smaller trees less than 7 inches are present to provide some future stocking and there is another resource benefit. In addition, the location of these stands next to main roads and relatively closer to population centers makes a second entry viable.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in Table 5 is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 5. Comparison of Alternatives by Main Issues, Objectives and Outputs

	Alternative 1	Alternative 2	Alternative 3
Thin Acres by Logging System & Total acres	none	Skl – 222 Grd – 170 Hel – 99 Total - 491	Skl -255 Grd – 182 Hel - 0 Total - 437
Volume Total;& Average mbf/ac	“	5,146 mbf; 11 mbf/ac.	4,589 mbf; 11 mbf/ac.
Logging Cost; & Spur Rd Cost;& Total Cost/mbf	“	\$129.19/mbf; \$0.36/mbf for 650 feet; Total \$129.55/mbf	\$112.02/mbf; \$0.96/mbf for 1,550 feet; Total \$112.98/mbf
Weed Risk	“	2 acres	16 acres
Treated Riparian Reserves	“	Treat 73% of RR	Treat 67% of RR
Riparian Management Differences	“	Units 1& 2 -50’ no-thin buffer; all other units have same buffers	Units 1& 2 -100’ no-thin buffer; Skl Corridor through Riparian areas for Units 2&3
Thin Prescription Differences	“	Units 1,2,& 3 Leave 70&110 TPA	Units 1& 2 Leave 70 TPA; Unit 3 leave 110
Coarse Woody Debris Development	“	Leave 10 TPA	Leave 10 TPA
Fire Hazard Reduction		Hand pile & Yard Tops by Skyline and Helicopter Logging Systems	Hand pile & Yard Tops by Skyline Logging System
Road Closures	“	5 New Closures: 5.38 miles	5 New Closures: 5.38 miles
KV Projects	“	Yes - \$377,479 See Appendix B	Yes - \$358,211 See Appendix B

Chapter 3: Existing Conditions and Environmental Consequences

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented at the end of Chapter 2, Table 5. The beginning of each section describes the current conditions followed by the effects expected from implementation of each alternative.

Cumulative effects are defined as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions. Where specific effects are not described for a particular resource, cumulative effects are not expected to be measurably different from those under existing conditions.

Significant Issue Effects

1. Economics

In *“The Practice of Silviculture: Applied Forest Ecology”* it states: *“The harvesting of timber crops is usually the most expensive operation conducted in the forest. Therefore, it is important to arrange stands so that costs, per unit of volume harvested, will be kept at the lowest level consistent with other objectives. Transportation is the component of logging costs most affected by the arrangement of stands. If the merchantable age classes or species are scattered rather than concentrated in a contiguous unit, the gross area that must be covered to harvest a given volume of timber in a single operation is correspondingly increased. This is especially true if terrain is difficult, if roads must be built or improved for each operation, or if the cost of shifting heavy equipment from one operation to another is high. If the heterogeneity of the stands dictates handling a broader range of sizes, qualities, and species of trees than is possible with a single set of machinery or a single procedure, there is the additional cost of having a wider variety of equipment or of trying to handle material with equipment not suited to the purpose. The cost of supervision also tends to increase the more scattered and complicated the operation.”* (Smith et al. 1997)

Since this proposed thinning of second growth builds on the investment made in the 1950's and beyond for the road infrastructure, there is relatively little additional cost associated with access to the managed stands. However, type of harvest system can increase the cost of logging; ground-based is \$100 per thousand board feet (MBF), skyline is \$120/MBF, and helicopter logging is \$200/MBF.

Alternative 1 – No Action

Under Alternative 1 opportunities for timber-related employment would not occur. In the short term, the wood fiber proposed for harvest will be available in another sale. In the longer term,

much of this wood fiber will be lost through mortality and restricted growth. Opportunities to alter stand dynamics both for the improvement of diversity and the generation of wood biomass will be gone. As smaller trees are shaded and out competed for nutrients and light they will die. The economic loss will continue as stand mortality increases and the value of down wood is lost to decay.

Alternative 2 and 3

Average volume pre acre is above the desired five to ten thousand board feet (MBF) required to have a feasible timber sale and does not change appreciatively between alternatives. Indicators used to measure economic feasibility are displayed in Table 6.

Table 6: Economic Indicators Analysis

	Alternative 2	Alternative 3
Average MBF Volume pre Acre	11 MBF	11 MBF
Harvest System Acres	Skyline = 222 Ground = 170 Helicopter = 99 Total Acres = 491	Skyline = 255 Ground = 182 Helicopter = 0 Total Acres = 437
Temporary Low Standard Road	Unit 7: 650'	Unit 7: 650' Unit 4: 900'

Alternative 3 does not thin 54 acres of portions of units when dropping the helicopter yarding method. Not all of 99 acres of helicopter logging for Alternative 2 were lost as displayed in the alternatives tables in Chapter 2. For example, Alternative 3 a temporary spur is proposed for Unit 4. This 900' spur will access previous Alternative 2 helicopter acres, by skyline logging. Logging cost for Alternative 2 is higher than Alternative 3 (see Economic Analysis Appendix). For Alternative 3, Units 1, 2, 3, and 7 increase acres by skyline down hill yarding for short distances next to roads to save expenses (see unit prescriptions in Appendix A). Volume is also recovered by thinning more volume per acre for Units 1, 2, and 8.

The estimated cost of the proposed thinning is displayed in Table 7. After logging cost the next highest cost is KV Collections. These collections will provide for sale area improvements listed in the appendix; these improvements are prioritized and in the event the sale does not generate sufficient funds low priority projects will drop off.

Table 7: Total Associated Costs

	Alternative 2	Alternative 3
Logging Costs	\$664,840	\$514,040
Road Costs	\$108,337	\$110,893
Fuels Treatment Costs	\$52,480	\$68,060
Total KV Opportunities	\$542,455	\$530,816
<i>Total Costs</i>	\$1,368,112	\$1,223,809

See Appendix B: KV Collections & Appendix C: Economic Analysis for more details.

All proposed action alternatives show a positive return to the treasury, as displayed in Table 8. All acreage and costs used are estimates. 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.

Table 8: Economic Analysis for Resulting Timber Sales

	Alternative 2	Alternative 3
Gross Value (\$500/MBF)	5146 MBF * \$500 = \$2,573,000	4589 MBF * \$500 = \$2,294,500
Associated Costs	\$1,368,112	\$1,223,809
Cost/Benefit Ratio	1:2	1:2
Present Value	\$1,204,888	\$1,070,691

**See Appendix C: Economic Analysis for associated values and Appendix B: for total KV Collections by Alternative Table*

Cumulative Effects of Management Activities

The cumulative effects of making this thinning sale economical will be the ability to improve forest stand conditions. Thinning managed stands will speed the development of late-successional forest characteristics across approximately 500 acres. These changes will accelerate development of large trees, multistory canopies, a greater shrub and understory layer and increase the diversity of vegetation and wildlife species (see Stand Late-Successional Structure, Vigor and Diversity).

2. Noxious and Invasive Weeds

The following documents guide the treatment of competing and unwanted vegetation in the Pacific Northwest:

- Final EIS for Managing Competing and Unwanted Vegetation (USDA Forest Service PNW Region, November 1988) specified a broad spectrum of appropriate vegetation management techniques for use in the region.
- The Mediated Agreement is a settlement approved in the US District Court in May 1989, between plaintiffs and USDA Forest Service regarding how the Forest Service implements the Final EIS. Specifically, it addresses adequate analysis and evaluation of preventative techniques, how well treatments meet goals and objectives, impacts and long term site productivity, and environmental and human risk.
- Willamette National Forest Integrated Weed Management Environmental Assessment (1999)
- Executive Order 13112 (February 3, 1999)

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.

The most serious weed infestations in the Gordon Three Thin sale area are false brome (*Brachypodium sylvaticum*), Himalaya blackberry (*Rubus discolor*), evergreen blackberry (*Rubus laciniatus*) and Reed canarygrass (*Phalaris arundinacea*). False brome is a highly invasive grass that has the capability to dominate the forest floor to the exclusion of native species. It has broad ecological amplitude that allows it to succeed in heavy shade or in openings, such as meadows and roadsides. It does not appear to have forage value for big game and so receives little or no grazing pressure. Possible mitigation measures include deleting infested areas from unit, leaving a no harvest strip along roadsides, pretreating the sites with herbicides or hot foam. False brome is found in Units 10, 11, and 12.

Himalaya and evergreen blackberries prefer open areas and roadsides but also persist and spread under the forest canopy. Both species are spread by birds and other animals that eat the berries and both species spread vegetatively by root tipping. These species are found along the road for Units 10 and 12.

Reed canarygrass (*Phalaris arundinacea*) is found at scattered locations on Roads 2032 and 2044-230, and at the lower Gordon Lake. This is a tall, perennial rhizomatous grass with a deep root system. It is especially well suited to invade aquatic ecosystems, particularly wet meadows, riparian areas, and lakeside habitat.

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.

Alternative 1 – No Action

The No Action Alternative has the least risk of spreading weeds. Few weed species can survive the deep dark that will result from foregoing thinning in these stands. Although opportunities for KV funds will not be generated, there is less risk that weeds will spread into the closed canopy stands, not only due to light limitations but also because there will be no equipment in the stands that could potentially spread weed seeds.

Alternative 2

Of the action alternatives, Alternative 2 provides the most prevention strategy to limit the spread of invasive weeds. In this alternative, a 100-foot containment buffer will be left along the main roads in Units 10, and 11 to maintain a dense canopy adjacent to the road. The roadsides in these units contain populations of false brome, a highly invasive grass, and Himalaya blackberry. The buffer will prevent these species from spreading by maintaining a dense canopy and limiting mechanical disturbance that could spread the existing weed seed bank into the stand. Although care has been taken to treat existing sites prior to thinning, there remains a seed bank in the soil of unknown longevity. Alternative 2 will contain the spread of the soil seed bank.

Alternative 3

Alternative 3 mitigates the risk of weed invasion, in particular, false brome and Himalaya blackberry, by providing 100-foot buffers on specific weed populations, rather than along the entire road. However, there is a risk of spreading weed populations that were undetected, either by moving weed seed through the units or by improving weed habitat through thinning. Increased light in the understory along the roads enhances weed habitat. Roads are well documented as vectors of weeds and new populations could easily establish outside of the 100-foot buffers. Conifer seedling will be planted along the road corridor to shade out potential weed establishment.

Cumulative Effects of Management Activities

Both action alternatives provide mitigation measures that will reduce the long-term likelihood of expanded weed populations. These include buffers around known weed sites, logging equipment washing, survey and control funding through KV, and pretreatment of existing weed sites. The canopy in the treated stands is expected to close in 10 to 20 years, and this will further reduce habitat for some weed species. False brome, a species that can flourish in the understory even in closed canopy stands, has the highest likelihood of expanding despite mitigation measures. Diligence will be required to keep this highly invasive species from overtaking the understory over the long-term. These efforts will be required whether the stands are thinned or not because the species is so tolerant of low light conditions.

3. Riparian Management

On March 22, 2004 the Northwest Forest Plan was amended to change the documentation requirements with regard to the Aquatic Conservation Strategy. This analysis was prepared to comply with the requirements in effect prior to that date. Under Chapter 1 Purpose and Need for Action one project objective to meet desired future condition is “*Design thinning treatments to reduce vegetation density in riparian areas to promote diameter growth for future large wood recruitment and improve riparian condition while maintaining riparian integrity.*” The existing condition, short and long term trade offs are discussed in the following paragraphs. The intent of the new direction is to insure that the project will maintain or restore the fifth-field watershed over the long term. Analysis at a fifth-field level is specifically discussed in Appendix K: Aquatic Conservation Strategy Objectives; Stand Late-Successional Structure, Vigor and Diversity; and references under Management Direction (EA page 8) for the South Santiam Watershed Analysis for the development of late-successional structure, as well as other locations.

Water Quality

Beneficial uses dependent on aquatic resources in this planning area are: domestic water use; resident and anadromous fisheries use; aquatic non-fish species use; riparian dependent species use; water-related recreation; hydroelectric power generation; and water-related fire suppression and road maintenance needs.

Water off this project area flows into the South Santiam River which serves as a domestic water supply for several downstream municipalities, including Cascadia, Foster, Sweet Home, and

Albany. Water quality parameters critical to beneficial users are temperature, and type, and timing of sediment input. Another potential critical parameter is biological contaminants.

The South Santiam River, and Canyon Creek are identified as “Streams of Potential Concern” under the 303d listing criteria. The parameter of concern is temperature. At the time of this report there are no “303d listed” within the project area. Streams of Potential Concern are those streams that need additional data collection.

Hydrology

The Gordon Three project area’s 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 that is estimated to occur between 450 to 1200 meters (1,500 feet and 4,000 feet) elevation (Christner and Harr, 1982). Due to the orientation of these tributary watersheds to the dominant winter storm patterns, the elevation of this transient snow zone changes to approximately 365 meters to 1500 meters (1200 to 4900 feet) for the Gordon Three project area.

Water storage in these watersheds is limited to some deeper upland soils, terraces, flood plains and small forested wetlands. Glacial soil remnants, terraces, and flood plains act like sponges, retaining water and releasing it slowly during periods of low precipitation. Annual precipitation for the area averages from 54 inches at Foster Dam to 130 inches on peaks and ridges. Intense precipitation is episodic in nature, and it often generates peak flows that are a major disturbance mechanism for stream channels and associated riparian areas.

Stream Channels

Deeply incised parallel streams are found within the project area as evidenced by first to third order stream channels. This pattern of parallel and dendritic streams is the result of high gradient channels draining glacial and volcanic formed slopes that have been altered by erosion. The high gradient stream channels are associated with valley walls greater than 65 percent slope and contain channel bottom materials that are dominated by bedrock and boulders. These high-energy stream channels exhibit very little sinuosity. Rosgen type Aa+, A, B, C, G and E channels are present within the proposed project area.

Headwater channels have low sediment storage capacity due to the lack of channel structure such as logs and boulders. Sediment storage capacity decreases as streams transition into the valley wall regions.

Debris torrents have at times played an important role in the development of the first and second order stream channels in this planning area. Material from debris torrents builds terraces in third and fourth order stream channels, which are shaped and reshaped by peak, flow events.

Type B channels are present in higher order channels such as Canyon, Trout, Sevenmile, and Sheep Creek. These B type channels contain a high percentage of exposed bedrock and large boulders. In addition, debris torrent activity in headwaters streams feed these creeks with structure. Most of the fine sediments are transported out of the system and into the South Santiam River.

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

Riparian Reserves

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. Units 5, 6, and 13 fall within the Pacific silver fir series. The width of the riparian reserve is 150 feet on each side of non-fish-bearing perennial flowing or intermittently flowing streams and 300 feet for fish-bearing streams. The other ten units are within the Western hemlock series and contain a 172-foot reserve for fish-bearing streams and 344 feet for fish-bearing streams. Falls Creek, Three Creek, West fork of Three Creeks and the South Santiam are known fish-bearing streams associated with this project.

Riparian conditions are very site specific. Past management activities have compacted soils in skid trails and directed overland flow, which creates scoured stream channels and small wetlands. These areas exhibit a stocking of alder, and have small wetlands (25'x50') associated with them. The species mix contains an alder component for approximately 25-50 feet from the channel and then transfers into a more upland species character. Along areas of less than 30 percent slope, riparian vegetation and character are maintained for approximately 50-100 feet. In areas less than 10 percent in slope, mapable wetlands occur. Approximately 200 acres of riparian reserves are associated with the proposed units.

Approximately 73 percent of the reserves do not contain the vertical diversity or the complexity that signifies a healthy riparian reserve. Characteristics of these areas include dense overstocked stands with a closed canopy, an increase in fuel loadings associated with the mortality of suppressed trees, and the lack of large down wood. They contain a similar characteristic to adjacent upslope, upland areas.

Alternative 1 – No Action

Existing conditions will change in that the current stands proposed for thinning will have continued slow growth with some trees no growth that will lead to mortality and increased fuel loading.

Riparian reserves would eventually convert to conifer and could potentially decrease in vigor as a result of no action. Stream channels, hydrology and water quality would remain unchanged during the short term through there is a potential affect from the risk created by higher fuel loadings.

Conditions could be created as result of this alternative that could increase the potential for a stand replacement fire. If this occurred hydrology, stream channels and water quality would be negatively impacted. Increased discharge resulting from lack of vegetation and increased snow loading would generate increased peak flows. Depending upon the size of the fires increased peak flows could generate downstream effects to the stream channel, and hence water quality.

Alternative 2

Under both alternatives short-term disturbance to the forest floor and canopy will occur. With the utilization of Best Management Practices and contact requirements, there are no anticipated adverse impacts to downstream beneficial users.

Under Alternative 2 thinning would be maximized using a combination of logging systems, (helicopter, skyline, and ground-based logging systems). Approximately 491 acres would be treated. The effects of implementation vary depending upon the type of logging system utilized.

Water Quality: Due to the laws and regulations surrounding water, this project is required to not have a detrimental affect on water resources. Through the implementation of Best Management Practice, it is anticipated that the waters associated with the project area will be protected. The quality of water flowing off the project area is anticipated to be similar to the existing quality. Temperature aspects will be protected through maintenance of 70 percent canopy closures within the portions of the riparian reserve that provide shade for perennial streams.

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. Specific BMPs associated with this project can be found within the project file.

Hydrology: Hydrology of the area is anticipated to experience slight fluctuations resulting from the removal of vegetation during the project. Any fluctuation would be short term due to the remaining vegetation utilizing the available water once the stand responds to the thinning. A seasonal increase in groundwater would result in wet areas increasing in size or duration. Stream flow could also be affected by an increased amount and duration of flow. These affects would be short lived until such time that trees remaining on the site utilize the available water.

Unit 13 is above the rain-on-snow influence and could have some indirect effects upon Gordon Meadow's hydrology. Increased ground water could effect down slope areas creating a longer duration of soil moisture. It is not anticipated that this effect will be noticed due to the storage capacity of the meadow and the area being thinned.

All other units are within the rain on snow-dominated zone. With target canopy closures ranging from 40-60% snow accumulation will increase until such time that canopy closures reach 70 percent. On Units 1, 2, 3, 4, 7, 8, 9, 10, 11, and 12 it is expected that this closure to 70% would take approximately 10 years. With Units 5 and 6, the expectation would be approximately 15 years and with Unit 13, 15 years plus. This is largely due to site conditions such as: soils, nutrients, growing season, and aspect. The higher in elevation the slower the growth rate and hence the longer time period to close canopy and reduce snow accumulation. The channels located within and adjacent to these units have been created to withstand even higher flow than those that will be created as a result of thinning.

Stream Channels: Channels found within the project area will be unchanged with the exception of designated crossings. These crossings will be designed to allow the natural flow of waters

down the stream channels. Channel bank stability will be retained through the marking prescription. The channels without detrimental affects will handle increased amounts of water generated from the area associated with thinning of the stands. Channels are Rosgen types A, B, C, and G channels which are resistant high-energy type channels. The change in hydrology will result in minor changes in intensity and duration of stream flow. The channels associated with the units will easily handle these flows with only minor effects, which include minor mining of channel banks, and mobilization of channel deposits.

Riparian Reserves: Table 9 displays the breakdown of the acres found within Alternative 2 and the riparian areas associated with each unit (see Tables 2 and 3 for detailed unit prescriptions). Within the riparian reserve acres (as defined by the Northwest Forest Plan) there is a zone that contains shade-producing vegetation for the stream. As further defined in the May 19, 2003 Final Draft “*Sufficiency Analysis for Stream Temperature*” this zone (stream shade zone) has a target canopy closure of 65-70%. Other non-shade-producing areas of the reserve will be managed to the unit’s prescription. Within the stream shade zone, both action alternatives propose to thin. The amount of the stream shade zone to be thinned varies depending on the prescribed no-harvest buffer. The average canopy density after thinning for the stream shade zone will be at least the 65-70% target canopy closure. This will provide adequate canopy to prevent temperature changes.

Table 9: Unit and Riparian Acres under Alternative 2

Unit #	Unit Acres	Treated Riparian Reserve Acres	Total Riparian Reserve (RR) Acres	% Unit in Riparian Reserve
1	27	8	11	41
2	38	17	23	61
3	60	24	31	52
4	51	8	11	22
5	44	1	3	7
6	30	0	0	0
7	92	20	33	36
8	97	17	26	27
9	17	2	4	23
10	55	24	28	51
11	37	8	9	24
12	48	11	13	27
13	50	0	0	0
Total	646	140	192	
RR % Treatment		73%		

Alternative 3

Under this alternative, excluding acres that need to utilize a helicopter logging system would reduce thinning acres. Acres in this alternative will be thinned using a combination of skyline, and ground-based logging systems. Approximately 437 acres would be treated. The effects of implementation vary depending upon the type of logging system utilized.

Under this action alternative similar short-term disturbance to the forest floor and canopy will occur as in Alternative 2. With the utilization of Best Management Practices and Contract requirements, there are no anticipated adverse impacts to downstream beneficial users.

Water Quality: See discussion for Alternative 2.

Hydrology: Hydrology of the area is anticipated to experience slight fluctuations resulting from the removal of vegetation during the project. Sixty-four fewer acres will be disturbed under this alternative than with Alternative 2. Similar affects would occur with minor tempering due to fewer acres than Alternative 2. Ground-based yarding operations could impact the hydrology through compaction and directing of surface flow to low areas. Under Alternative 2 acres changed from helicopter to skyline (33 acres), or ground-based systems (2 acres). Greater canopy disturbance occurs with the skyline acres and greater ground disturbance occurs with the ground-based systems. Additional snow accumulation occurs along cable roadways and water tends to flow down ground-based skid roads. It is not anticipated that either of these will exceed Forest Plan standards or guides.

Stream Channels: Channels found within the project area under this alternative will experience similar affects as in Alternative 2. The major differences would be the potential to expand the drainage network with poorly drained skid roads. An additional 2 acres will be ground-based logged. It is not anticipated that this will occur due to the implementation of Best Management Practice and Willamette Forest Plan Standards and Guides.

Riparian Reserves: Table 10 shows the breakdown of the units and the riparian reserves (see Tables 2 and 3 for detailed unit prescriptions). Definitions for this table are consistent with Table 9.

Table 10: Unit and Riparian Acres under Alternative 3

<i>Unit #</i>	Unit Acres	Treated Riparian Reserve Acres	Total Riparian Reserve (RR) Acres	% Unit in Riparian Reserve
1	27	5	11	41
2	38	9	19	61
3	60	22	31	52
4	51	8	11	22
5	44	1	3	7
6	30	0	0	0
7	92	20	33	36
8	97	15	23	27
9	17	1	4	23
10	55	24	28	51
11	37	8	9	24
12	48	11	13	27
13	50	0	0	0
Total	646	124	184	
RR % Treatment		67%		

Cumulative Effects and Management Activities

This project involves thinning within stands that are currently unraveling due to stand density. Threshold levels established by the Forest Plan for the Willamette National Forest were reviewed and consideration was given to the beneficial users within the area. Short-term impacts resulting from management activities were weighed against long-term effects. It was determined that implementing activities would better preserve the stand into the future and off-set any short term impact from removing the material. Silvicultural prescriptions for the area are site specific and site-specific hydrology prescriptions protected unstable areas, hence, cumulative effects tradeoffs were considered for the short-term and the long-term.

Short-term effects anticipated include additional accumulation of snow from reduced canopy levels. Implementation of specific BMP's also reduces the potential cumulative effect from additional temporary road building in the area. The watershed condition types are type 1, 2, 3, and 4 channels (LRMP; pg. E-10-12). Under types 1 and 2, no recommended Aggregate Recovery Percentage (ARP) is required due to the stability of the channels. Under types 3 and 4 ARP levels can be within 5 points +/-, of the threshold. Upon reviewing these criteria and the streams involved in this project, it is not anticipated that adverse cumulative effects will occur.

The alternatives proposed in the Gordon Three project meet Federal and State water quality objectives. These objectives are met through the implementation of BMP's. Riparian reserves have been established and average between 150 and 172 feet on either side of the intermittent and perennial non-fish-bearing streams, and will average between 300 and 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,

(DTWA; pgV-23 to V-28; and V-31), and meet the ACS Objectives. A discussion of how this project meets the ACS objectives can be found in Appendix F.

No floodplains occur within the units. 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).

Other Effects

Big Game

Big game species within the planning area include Roosevelt elk, black-tailed deer, cougar, and black bear. These four species are year round residents with seasonal movement due to snow or availability of forage or prey.

The Forest and the Oregon Department of Fish and Wildlife have defined the subwatersheds where the units are located as either “high or moderate emphasis” elk management areas. *Habitat conditions shall provide good quality cover and forage distributed within the area emphasis boundaries* (FW-150, LRMP IV-69). A Model to Evaluate Elk Habitat in Western Oregon (Wisdom, et al. 1986) is used to evaluate elk habitat quality and effects on this quality from projects like timber sales. Habitat effectiveness (HE) values are calculated in the model for forage quality, cover quality, open road density, and spacing of forage and cover areas. A mathematical equation is then used to integrate the four habitat variables to obtain one overall index (HEI) of habitat effectiveness.

Each of the habitat variables should be within the range of > 0.5 to 1.0 for high emphasis and > 0.4 to 1.0 for moderate emphasis areas. The HEI value should be > 0.6 for high emphasis and > 0.5 for moderate emphasis areas. Table 11 summarizes the current HEI values. See Big Game/Snag Emphasis Area map (Figure 8).

Table 11: Big Game Emphasis Areas

	Boulder	Latiwi	Upper South Santiam
<i>Current Habitat Conditions</i>			
HE overall	0.48	0.46	0.49
HE forage	0.34	0.34	0.32
HE cover	0.50	0.50	0.57
HE roads	0.41	0.36	0.41
HE size & spacing	0.78	0.72	0.76

Most of the habitat within the subwatersheds is classified as winter range. Winter range in general is defined as habitat below 2400 feet on the north and east aspects and below 3500 feet on the south and west aspects.

Forage and cover habitat and their distribution in time and space are the primary factors that limit deer and elk populations (Brown 1985). Both species utilize edge, where food and cover habitat come together. The majority of elk use of forage areas occurs within 300 feet of edge and the majority of elk use of cover occurs within 900 feet of edge (Wisdom, et al. 1986). Use patterns may change during periods of severe weather or when intensively hunted.

Roads open to vehicle traffic can impact both deer and elk populations. Road traffic can reduce deer and elk use of available habitat through disturbance, where animals are forced out of an area, and can 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 increase the opportunity for poaching to occur. Roads closed to vehicles do not disturb deer and elk and are often used as travel lanes and forage sites.

Habitat within the 13 units proposed for treatment is classified as thermal cover due to the amount of canopy closure and tree height. Big game use within the units varies but is quite high where hardwood or wetland openings occur or where they are adjacent to forage areas. Current habitat model indices are shown in Table 11. This project will use changes in these indices as criteria for comparing alternative effects on big game habitat effectiveness.

Table 12: Current Road Conditions

	Boulder	Latiwi	Upper South Santiam
Miles of open road	59.1	33.56	64.03
Miles of closed road	11.33	1.88	10.13
Open road density miles/square mile	2.75	3.36	2.83

Alternative 1 – No Action

There are no direct effects under alternative 1. Overstory canopies in the proposed units will continue to close, retarding understory development for several years or decades until gaps begin to form as the stands self-thin. The understory will then develop further from increased sunlight to the forest floor. The available forage within regeneration plantations throughout the analysis areas will continue to diminish over the next few years as overstory canopies close. Open road density in each emphasis area is not expected to change.

Habitat values within the two high emphasis areas (Boulder and Upper South Santiam) and the moderate area (Latiwi) are below Forest objectives, except for the HE cover and HE size and spacing values. There will be no immediate change to these values under this alternative.

Alternatives 2 and 3

These two alternatives will increase the development of big game thermal habitat while improving the quality of big game forage habitat. Reducing tree density will allow more structural diversity to develop in the stands and increased sunlight to the forest floor will

encourage increased development of the understory. The areas of dominant tree release will also create small (<1/4 acre) gaps to provide additional areas of well-distributed, native forage habitat for the short term. Thermal cover is most valuable to big game when the overstory canopy can intercept and hold a substantial amount of snow yet has small dispersed openings for foraging.

An additional 4.84 miles of roads will be closed with berms or gates in these two alternatives. Open road density will decrease in all three analysis areas (see Tables 12 and 13). Habitat values will improve slightly for both HE roads and HE overall but will remain the same for the other habitat variables.

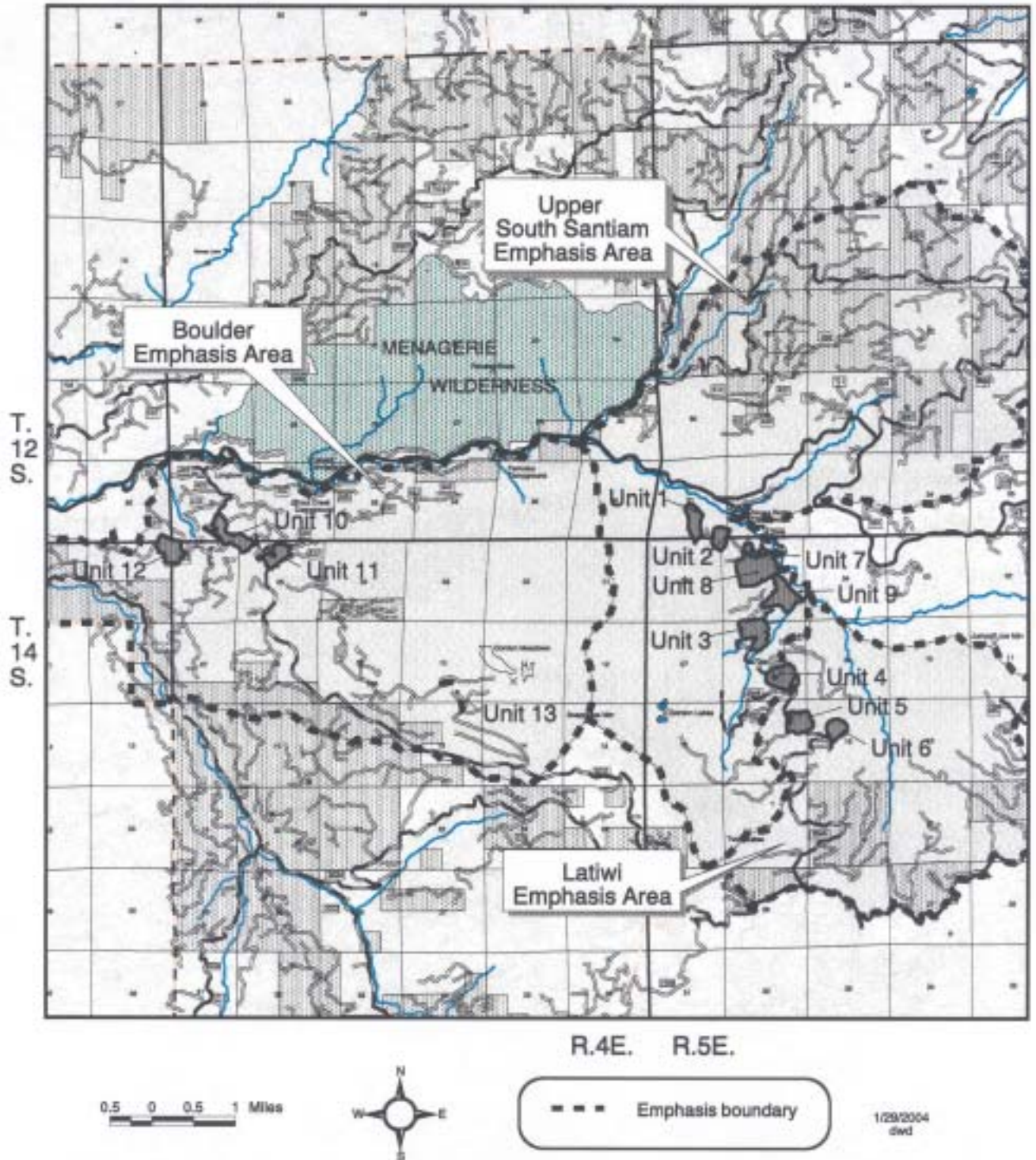
Several of the HE values remain below the objectives for these emphasis areas as stated in the Forest Plan. The Forest Plan big game Standards and Guidelines acknowledge that some areas were below the objectives and in those areas activities should produce a positive trend in the HE values and big game conditions. Both action alternatives result in a positive HE values trend.

Table 13: Road Conditions and Habitat Values for Big Game in Alternatives 2 and 3

	Boulder	Latiwi	Upper South Santiam
Miles of open road	56.6	32.4	62.87
Miles of closed road	13.82	3.13	11.26
Open road density miles/square mile	2.63	3.2	2.78
HE roads	0.42	0.37	0.41
HE overall	0.49	0.46	0.49

Big Game/Snag Emphasis Areas

Gordon Three - Figure 8



Consultation and Coordination with Indian Tribal Governments (Executive Order 13084 and Indian Sacred Sites Executive Order 13007)

The Confederated Tribes of the Siletz and Grand Ronde and Kalapooya Sacred Circle Alliance were notified of the project during the scoping of issues and concerns as part of the public participation process. No comments were received back from these groups. No specific sacred sites have been identified in the proximity of the proposed units. No impacts, as outlined in the American Indian Religious Freedom Act, are anticipated upon American Indian social, economic or subsistence rights.

Environmental Justice in Minority Populations and Low Income Populations (Executive Order 12898)

Federal 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 7000) 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 basic greenery plant species and some mushrooms.

Fisheries

Anadromous fish species found within the planning area included spring chinook salmon and winter steelhead. They are not found within any of the proposed units but both are present within the South Santiam River down stream of House Rock Falls and winter steelhead are present in Canyon Creek. These fish are both listed as threatened under the Endangered Species Act. There are no other fish or aquatic insects found within the project area that are listed or are on the Regional Forester's Sensitive Species list. The two listed fish species above are discussed more specifically in the Biological Assessment for consultation with NOAA Fisheries (Appendix J).

Unit 3 is the only proposed unit that actually has occupied fish habitat, resident cutthroat trout, within its boundary. Units 1, 2, 3, 7, 8, 9, 10, and 11 have fish in adjacent streams (see Appendix A; Unit Prescriptions maps). The fish-bearing streams are Falls Creek, Three Creek, the West Fork of Three Creek (Unit 3), and the South Santiam River. Resident Rainbow trout are found primarily in the main stem of the South Santiam River up as far as House Rock Falls and in Canyon Creek up as far as Two Girls Creek.

Timber sale activities can impact fish habitat in several ways. Primarily impacts are related to sediment inputs, increased turbidity and increased stream temperatures. Also cutting near streams can remove trees that would have, in time, provided large wood for structure in streams.

Spring Chinook Salmon

Three major populations of spring chinook are recognized as making up the Upper Willamette River run (North Santiam, South Santiam, and McKenzie rivers) (Kostow 1995). Adults enter the Columbia River in March and April, and ascend Willamette Falls in May and June.

Migration past the falls generally coincides with a rise in river temperatures above 10°C (53°F) (Howell et al. 1985, Nicholas 1995).

The majority of Willamette spring chinook mature in their fourth and fifth year. Historically, 5-year-old fish comprised the dominant portion of the run, with a significant number of 6-year-old fish. The freshwater phase of Willamette spring chinook is categorized as a Columbia River "ocean-type" (migration to the ocean occurs within their first year vs. the "stream-type" which reside in freshwater for a year or more following emergence). Spawning begins in late August and continues into early October, with peak spawning in September.

Currently, hatchery production dominates in sustaining the Willamette spring chinook. Multiple broodstocks have been the basis of hatchery production, primarily from the Clackamas, Santiam, McKenzie and Middle Fork Willamette (Kostow 1995). This has probably resulted in a reduction in local genetic diversity (NMFS draft 1996), but may have retained some of the unique characteristics of the spring chinook, which ascend Willamette Falls before spawning in the upper tributaries.

Juveniles that overwinter in freshwater require large boulder habitat for winter refuge. High turbidity levels (≥ 60 -70 NTU) have been shown to disrupt behavior of salmonid juveniles, with newly emerged fry appearing to be more susceptible to moderate turbidity levels. Larger juvenile and adult salmonids appear to be little affected by ephemerally high concentrations of suspended sediments (Bjornn and Reiser 1991). However, adults will avoid waters with prolonged high silt loads, or cease migration until suspended sediment levels drop. Adults require large and deep pools for migration to spawning grounds.

As mentioned above, habitat for spring chinook salmon is not found within any of the proposed units. Units 1 and 2 have creeks that drain into non-fish-bearing streams that enter the South Santiam River within approximately one-quarter mile of the units. Unit 10 drains into Falls Creek and some of the east side flows into the unnamed tributary that ends up at Longbow on the Santiam River. Fall Creek is fish-bearing but not anadromous fish. The stream adjacent to Unit

11 flows primarily down towards Longbow Organization Camp and then into the South Santiam River.

Winter Steelhead

Winter steelhead are anadromous rainbow trout and are closely related to the Pacific salmon. However, unlike the Pacific salmon, steelhead do not necessarily die after spawning. Winter steelhead adults in the upper Willamette system generally enter the river after the middle of February and spawn from late March through the end of May. Spawning sites require enough current to ventilate eggs during incubation, with redds located where substrate, depth, and velocity (0.3-3.0m/s) requirements are met. Redds are often constructed at the downstream area of a pool, where transition to a riffle occurs. High turbidity (≥ 60 -70 NTU) has been shown to disrupt behavior of salmonid juveniles, with newly emerged fry appearing to be more susceptible to moderate turbidity levels.

Steelhead juveniles become territorial soon after emergence and drive other individuals away from feeding stations. Fry inhabit shallow gravel areas and gradually move into deeper, swifter water with coarser substrate as they grow. In riffles and runs, rainbow trout of all age classes prefer large substrate. Preferred habitats relate to the presence of overhead and instream cover, velocity refuge with access to swifter current, appropriate substrate size and visual isolation from other fish. Juveniles that overwinter in fresh water require large boulder habitat for winter refuge. Adults require large, deep pools for resting during their migration to spawning grounds.

The life history pattern for winter steelhead in the Willamette system is heavily weighted to 4 - year-old fish with 2 years rearing in fresh water and 2 years in the ocean (Howell et al. 1985).

Winter steelhead are found in the South Santiam River below House Rock Falls and in Canyon Creek generally below the mouth of Two Girls Creek. Possible potential for impacts would be from the haul route on the Gordon Road (2032). Sediment production during winter haul could potentially impact the South Santiam River or Canyon Creek if the 2022 Road is used as a haul route. Improved road conditions, including reshaping, fresh rock, and dry weather haul would greatly reduce potential impacts to anadromous fish habitat in the South Santiam River or Canyon Creek.

Alternative 1 – No Action

There are no direct effects on fish or aquatic insects or their habitat from the No Action Alternative. Indirect effects would be related to not thinning certain riparian stands and therefore having it take longer for trees to attain the larger sizes needed by stream channels.

Alternative 2 and 3

Sediment: There should be no direct or indirect effects or no measurable impacts to fish or aquatic habitat from harvest or haul activities. No harvest buffers, dry weather haul on native surface roads and dust abatement are designed to prevent sediment and turbidity from reaching stream channels. Variable width no harvest buffers from 25 feet on each side to 100 feet on each side were set up based on size and importance of the streams. Alternative 2 includes approximately 100 acres of helicopter harvest while Alternative 3 drops the helicopter harvest

and increases the amount of ground-based and skyline harvest. The difference between these two alternatives is very small and probably not measurable and any affect on sediment delivery is probably within the range of natural variability for this factor.

Temperature: As above, there should not be any increases in temperature from harvest activities due to the riparian buffers set up in both alternatives.

Large Woody Material: Field reviews at this time indicate streams in the project area are short of large wood. Harvest of trees from outside of established riparian buffers is not expected to have more than a negligible effect on fish or their habitat. In the long term, trees should grow more rapidly after thinning thus increasing the potential for instream large wood in the future.

Consultation with NOAA Fisheries is that the actions proposed are not likely to adversely affect either Chinook salmon or steelhead. (NOAA Fisheries Memo, 2/2004)

Cumulative Effects and Management Activities

The Trout Creek, Canyon Creek, Sheep Creek and Sevenmile Creek 6th field watershed activities should not have any significant cumulative effects due to non-federal actions. See Appendix J: Biological Assessment for Spring Chinook Salmon and Winter Steelhead, Table 11 for non-federal acres in the four 6th field watersheds. It is expected that non-federal land within the Watersheds will continue to be managed for timber harvest.

Recreational Fisheries (Executive Order 12962)

Both of the action alternatives are consistent with the Aquatic Conservation Strategy outlined in the Northwest Forest Plan (Cope, 1998 and Larson, 1999 as amended). Mitigating measures have been applied in all action alternatives to maintain anadromous fish and resident fish populations and habitat. These specific ASCOs are discussed in detail in the Appendix.

Fuels/Fire, Air Quality

The Gordon Three area ecosystem is in a Type Two Natural Fire Regime characterized by infrequent (100-200 yrs) high intensity fire that occasionally reaches a very large size. Historical fire occurrence records specific to the area calculates the mean return interval for high intensity fires at 100-200 years and the mean return interval for low intensity fires at 18-80 years.

The sale area units portray Fire Behavior Fuel Model 8 and National Fire Danger Rating (NFDRS) fuel model H which describes a closed canopy stands of short – needle conifers or hardwoods, healthy with sparse undergrowth and a thin layer of ground fuels. Fuel model 8 estimates fuel loadings in the <3 inch dead and live (critical to fire behavior) ranging from 5-12 tons per acre. Fires in fuel model 8 are typically slow-burning with low flame lengths in mild weather conditions.

Fuels are mostly recent light fines and ¼ -1” material and scattered occasional large 30” (average) rotted mossy logs. These managed stands are a single canopy layer without ladder

fuels or few smaller trees. The 40-year-old plantations were last harvested in the 1960's and most fuels were burned leaving only large logs. In summary, there is a low risk of fire occurrence in the existing conditions of the Gordon Three Thin area.

The units along the two main roads of 2032 (Gordon area) and 2044 (Three area) have moderate recreational use. Increased use multiplies the risk or adds to the concern of human caused fire ignitions. Thinning in the proposed units may increase fuel loads in the >3 inch dead woody component to 12-15 tons per acre. Using the BEHAVE Fire behavior prediction model post harvest fuel loadings on a 80 degree day, winds at 6 mph could produce four foot flame lengths creating 2-3 acre fire within a half hour should a fire start initially go undetected. The combination of higher risk due to recreational use within the sale area and increased fire hazard (fuel loadings) threatens the safety of the public, the integrity of public and private property, health of the ecosystem, air, water, and visual qualities.

Air Quality

Conditions affecting air quality should wildfire or prescribed burning occur are wind flows that come from three directions: northwest, southwest and easterly. Average wind speed is five miles per hour with predominant winds northwest to southwest during fire season (July-September) having the capacity to disperse smoke. In the fall these western slopes are affected by dominant strong east winds that have shaped the large fire history of the area. Air movement through all levels of the atmosphere is generally good and inversions are usually not a problem in the area. This watershed is characterized by relatively clean air.

The dominant westerly transport winds may travel to the Cascade Crest and the Mt. Jefferson Wilderness, a sensitive class 1 airshed, which is 40 miles from the planning area. In addition, east and south is Mt. Washington Wilderness and the Three Sisters Wilderness class 1 airsheds that are about the same distance away from the planning area. Burning occurring upwind of these airsheds is generally restricted from July 1st to September 15th.

The communities of Sweet Home and Cascadia reside down drainage from the Gordon and Three Creeks area to the west and the Willamette Valley is further to the west. North of Highway 20 and west of the sale areas is Forest Service ownership and some private forest land. The Three Creeks area has some significant old-growth groves near the plantations which indicated stand-replacing fire have missed the area; this could be because of the north facing aspect of the drainage and relatively moist sites. The Gordon area has been affected by fires in the past as referred to in the South Santiam Watershed Analysis. These communities usually are not in the dispersion path of smoke carried by the dominant westerlies of the area but potentially could be affected by strong fall easterly winds.

Highway 20 lies as close as a quarter mile north of units in the sale. It would be considered a potentially sensitive area if fire produced enough smoke to be a visual obstruction for drivers.

Air quality in mountainous surroundings of the Gordon and Three Creek area is very good and there are no activities that significantly impact this location. The exception is spring and fall burning that may impact the area only a day or two at a time.

Alternative 1 – No Action

With the No Action Alternative the Fuel model will stay the same. This model is currently described as Fire Behavior Fuel Model 8 that estimates fuel loads in the <3inch dead and live (critical to fire ignition) ranging from 5-12 tons per acre. Fires in Fuel Model 8, in mild weather conditions, are typically slow burning with low flame lengths.

Alternative 2 and 3

Tops will be yarded with skyline and helicopter logging systems and treated at the landing. Yarding tops will provide the opportunity to mitigate the additional created fuels calculated to be 11-16 tons per acre in the greater than three inch category. The combination of existing fuels and created activity fuels has the potential to produce Fire behavior fuel models 11 and 12. In these two fuel models, should a fire start, go un-detected, and escape initial attack, the fire would range from 'fairly active' to rapidly spreading fire with high intensities and generally sustained until there is a break or change in fuels. Flame lengths created by this fuel loading generally make fires un-approachable for direct attack by hand crews. However, the increased risk would persist for about 5 years until the fine fuels break down and will diminish over time.

Alternatives 2 and 3 activity-generated fuel loadings and fire behavior would be the same. Alternative 3 has only twelve more acres of ground-based logging than Alternative 2. When processor/forwarder is used for harvesting, the opportunity to whole tree yard and remove fuels from the unit is lost. Fuel remains and is compacted only in the corridors where the forwarder operates. Hand-piling slash will be prescribed along the major traveled forest roads within the sale area to decrease the risk of human-caused ignition. These roads are: 2032, 2044 and 2044-230. Proposed road closure will also cumulatively reduce the risk of human-caused fire ignition for both short and long term. Road are proposed to be closed with berms or gates which can be opened if needed for fire suppression access.

Air Quality

Minimal smoke is expected to be produced by burning the hand piles produced in either action alternative. In addition the timing of the burns will follow Oregon Smoke Management Plan, which will curtail the effect on air quality in Class I airsheds. Other activities associated with this project are expected to have only very local, short-term effects on air quality, mainly by generating dust.

Management Indicator Species

Forest planning regulations require the management of wildlife habitats to “maintain viable populations of existing native and desired non-native vertebrate species in the planning area” (Willamette National Forest Land and Resource Management plan 1990, FEIS III-69).

Management Indicator Species (MIS) selected in the Forest Plan to facilitate management of all species are summarized in the following Table 14.

Effects to northern spotted owls, big game (deer and elk winter range) and cavity excavators (snag dependent species) are addressed in other sections of this chapter.

Table 14: Management Indicator Species

Indicator Species	Habitat Feature	Selection Criteria
Spotted Owl	Old-growth and mature conifers	Ecological Indicator; Federal Register List of T&E species
Pileated Woodpecker	Old-growth and mature conifers	Ecological Indicator
Marten	Old-growth and mature conifers	Ecological Indicator
Elk	Winter range	Commonly hunted
Deer	Winter range	Commonly hunted
Cavity Excavators (Woodpeckers)	Dead and Decaying trees	Ecological Indicator
Bald Eagle	Old-growth conifers near large bodies of water	Federal Register List of T&E species
Peregrine Falcon	Cliff nesting habitat Near abundant prey	Federal Register List of T&E species
Anadromous Fish	Water quality	Commonly fished
Resident Fish	Water quality	Commonly fished

Pileated Woodpecker

Pileated woodpeckers are associated with forest habitats that have large trees, especially snags, for nesting and foraging (Csuti et al., 1997). Snags and down wood within the proposed units are likely used by pileated woodpeckers for foraging.

Alternative 1 – No Action: There will be no direct or indirect effects to pileated woodpeckers under this alternative. There would be no disturbance and no loss of current or future snag habitat.

Alternative 2 and 3: These alternatives will have no effect on old-growth and mature conifer habitat. Both alternatives will reduce the amount of snag habitat that could be used by pileated woodpeckers for foraging, however, most snags that need to be felled are small, less than 10 inches DBH, and will be mitigated for by the creation of up to 5 snags/acre following timber

harvest. Some disturbance will occur during thinning operations. The proposed thinning will encourage the development of late-successional habitat benefiting this species in the long-term.

Marten

Marten prefer mature forests with closed canopies but will utilize other habitats provided down logs are available for cover (Csuti et al. 1997). Marten are likely to inhabit the project area.

Alternative 1 – No Action: There will be no direct or indirect effects to marten under this alternative. There will be no disturbance or loss of future down wood habitat.

Alternative 2 and 3: These alternatives will have no effect on old-growth and mature conifer habitat. The proposed thinning prescriptions will encourage the development of late-successional habitat benefiting this species in the long-term. Some disturbance will occur during thinning operations. The creation of down wood after thinning will provide additional cover for marten.

Bald Eagle

Bald eagles do not occur within the project area. They prefer large bodies of water with sufficient fish or waterfowl populations for prey and large trees for roosting and nesting.

Alternatives 1, 2, and 3: There will be no direct or indirect effects to bald eagles.

Peregrine Falcon

Peregrine falcons require suitable cliffs with ledges for nest sites surrounded by a diversity of habitats for prey species. Suitable cliffs for nesting do not occur within the project area but do in the adjacent areas. One active nest site is located approximately 2.5 miles from the project area.

Alternative 1 – No Action: There will be no direct or indirect effects to peregrine falcons under this alternative.

Alternatives 2 and 3: These alternatives will have no effect on nesting habitat. Surveys of suitable nesting habitat that is currently not occupied will be completed prior to timber harvest operations in Units 1-9 so that any new peregrine falcons are not disturbed during the nesting season. A minimum 2 mile buffer for helicopters surrounding the one known active nest site will be maintained during the nesting season. The proposed thinning prescriptions will encourage a diversity of habitats which will benefit prey species.

Anadromous Fish

Spring Chinook salmon and winter steelhead are both found within the South Santiam fifth field watershed. No suitable habitat is found within any of the proposed units but habitat is found adjacent to the haul routes in the South Santiam River. See Fisheries section in this chapter for full discussion.

Alternative 1 - No Action: There will be no direct or indirect effects to spring chinook salmon or winter steelhead under this alternative.

Alternative 2 and 3: These alternatives are a not likely to adversely affect spawning or rearing habitat for listed spring chinook or winter steelhead, as stated in the Letter of Concurrence from National Marine Fisheries Service dated February 7, 2004. No habitat for listed anadromous species is found within the harvest units. Approximately 1.6 miles of the haul route from the Gordon Thin project area parallels the South Santiam River which is spawning and rearing habitat for spring chinook salmon and winter steelhead. Water quality in this area should be maintained very close to the existing condition by placement of a new layer of crushed rock, and watering the road to reduce dust. Restricting haul to dry weather will occur on native surface roads.

Resident Fish

Resident rainbow and cutthroat trout are both found within the South Santiam fifth field watershed as well as in many of it's tributaries. In the Gordon Thin area, cutthroat trout are found in Falls Creek, Black Creek and the South Santiam River. In the Three Thin area, cutthroat are found in the South Santiam River and Three Creek.

Alternative 1- No Action: There should be no direct or indirect effects to resident rainbow trout or cutthroat trout under this alternative.

Alternative 2 and 3: These alternatives are not likely to adversely impact spawning or rearing habitat for resident rainbow trout or cutthroat trout. Eight units (1, 2, 3, 7, 8, 9, 10, and 11) have resident fish habitat within or adjacent to them. There shouldn't be any direct impacts to resident fish habitat from thinning activities. All of the fish-bearing streams have 100 foot no cut buffers on each side. Water quality in this area should be maintained very close to the existing condition by placement of a new layer of crushed rock on the 1.6 miles in the Gordon Thin area and the fact that the Three Thin road is far enough away from the river so as to minimize potential sediment impacts. Restricting haul on native surface roads to dry weather should also help to minimize impact.

Positive benefits include speeding up the attainment of large wood in riparian reserves and improving road conditions through reconstruction and placement of rock on the roads to reduce surface erosion.

Migratory Birds

On January 10, 2001 an executive order was signed to protect migratory birds. One purpose of the order is to ensure that environmental analysis 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 will be no disturbance or impacts to migratory birds. Any large scale changes in species diversity or numbers will be dependent on natural and human-caused disturbances, primarily wild fire. More subtle changes will 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.

Alternative 2 and 3

The light to moderate thinning planned for each alternative will result in a forest canopy closure of 40 – 60%. Thinning should increase structural diversity within the stands by reducing competition of the overstory trees and accelerate understory development from increased sunlight to the forest floor. This will create a more open forest community than what currently exists, benefiting some bird species but having a negative impact on others.

One study completed on bird response to thinning young Douglas-fir forests in the Oregon Coast Range (Hayes et al. 2002) showed that of the 22 bird species statistically analyzed, detections of nine species decreased and eight species increased relative to controls following thinning. Five species showed no change. The magnitude of response (either positive or negative) for eight of the 17 species varied with thinning intensity. This same general trend of bird response to thinning occurred in the Willamette National Forest Young Stand Thinning and Diversity Study. Four species had a positive response to thinning and six had a negative response (Hager and Howlin 2001). The authors identified five additional uncommon bird species that had much higher detection rates after the stands were thinned, indicating a positive response to thinning. A fairly large number of species in this study had no response.

Thinning will influence abundance of migratory bird species in these stands. Each stand has portions left untreated that will serve as refugia for those migratory bird species negatively impacted. Over the long-term, all migratory bird species should benefit from thinning these dense stands.

Timber harvest activities during the spring and summer may impact nesting birds through disturbance and habitat modification. Seasonal operating restrictions planned for both spotted and great gray owls (see Mitigation Measures Common to Action Alternatives) will provide some level of protection to other bird species as well.

Northern Spotted Owls Habitat

Suitable habitat for the northern spotted owl consists of habitat used by owls for nesting, roosting, and foraging (NRF). Generally this habitat is 80 years or older, multi-storied with canopy closure exceeding 60 percent, and with sufficient 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-only habitat generally consists of mid-seral stands between 40 and 80 years of age with canopy closure of 40 percent or greater and trees with a mean dbh of 11 inches or greater. Dispersal-only habitat is used by owls to move between blocks of suitable habitat and by juveniles to disperse from natal territories

Timber harvest can affect spotted owls by modifying habitat within their home range. 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.

Timber harvest can also affect spotted owls by creating noise disturbance above ambient levels during the spotted owl 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 are located within the median home range radii (1.2 miles) of 7 owl pairs and within 0.25 miles of the activity core of 3 of these pairs.

The proposed units currently provide dispersal-only habitat for spotted owls. Canopy closure within the units is high (>80%) and tree diameter of the dominant and co-dominant trees exceeds 11 inch dbh over portions of the proposed units.

The units and surrounding areas (out to 0.5 miles) were surveyed for spotted owls in 2002 and 2003. No additional spotted owls were located.

Formal consultation with the U.S. Fish and Wildlife Service on this project was completed and a Biological Opinion received (USDI 2/27/03). Timber harvest is allowed provided the standards outlined in the Biological Opinion (pages 8 – 9) are adhered to. Those standards address the need for a biologist to participate in the environmental analysis and to minimize or eliminate disturbance to the spotted owls. Specific requirements are addressed in the mitigation section of this document.

Critical Habitat

The U.S. Fish and Wildlife Service has designated Critical Habitat Units (CHU) across the range of the northern spotted owl. The physical and biological features (referred to as the primary constituent elements) that support nesting, roosting, foraging, and dispersal are essential to the conservation of the species (Depart. of Interior, 1992). Units 1 – 9 are located within CHU OR-16. See Figure 9 – Spotted Owl Critical Habitat.

Alternative 1 – No Action

There will be no direct effects to spotted owls, spotted owl habitat, or spotted owl critical habitat. Habitat within the proposed units will continue to function as spotted owl dispersal habitat.

Alternatives 2 and 3

A total of 491 acres of dispersal-only habitat in Alternative 2 and 437 acres of dispersal-only habitat in Alternative 3 will be degraded. The quality of this dispersal-only habitat will be affected but the functionality will not since all units treated will maintain a minimum 40 percent canopy closure. There will be no reduction in the amount of dispersal habitat.

The creation of 10 or 20 percent $\frac{1}{4}$ acre gaps (Dominant Tree Release) on approximately 398 acres in Alternative 2 and 334 acres in Alternative 3 will not fragment habitat or create areas of non-dispersal habitat.

Thinning will remove some of the current snag habitat benefiting spotted owl prey species for safety concerns, as well as remove future snag habitat. Most current snags are small, less than 10 inches DBH. The loss of snag habitat will be mitigated by the creation of up to 5 snags/acre following timber harvest within habitat proposed for thinning in addition to those portions of the units not proposed for thinning. Created snags will be of a larger diameter than what currently exists. Snag habitat will be created on 604 acres in each of these alternatives.

This project *may affect* dispersal-only habitat by removing up to 60 percent of the existing canopy but will have long-term benefits by encouraging late-successional characteristics to occur more rapidly.

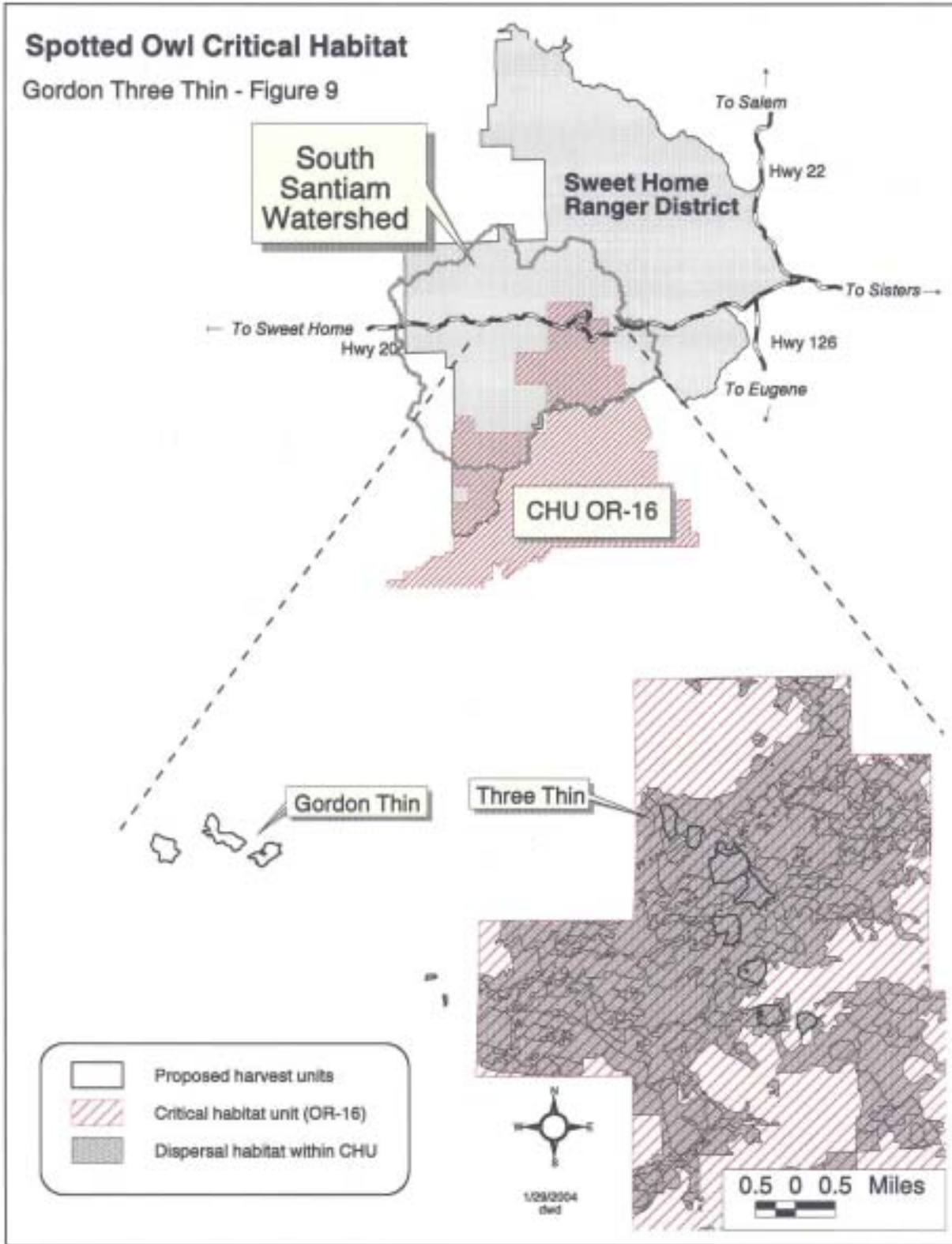
Units 1-9 are located within Spotted Owl Critical Habitat OR-16. Removing up to 60 percent of the existing canopy within these units *may affect* critical habitat but dispersal habitat will be maintained. These thinning prescriptions are designed to encourage the development of late-successional habitat and are beneficial in the long-term.

There will be *no effect* to spotted owls from disturbance within the LSR. There will be a seasonal restriction of March 1 – September 30 on all timber harvest operations that may disturb spotted owls. There will be a seasonal restriction of March 1 – July 15 on all timber harvest operations with potential to disturb spotted owls outside the LSR.

Cumulative Effects and Management Activities

Cumulative effects result from the incremental impacts of past, present, and foreseeable future actions that remove spotted owl habitat. The Gordon Three Thinning planning area has a long history of timber harvest and road building on both private and public lands. These actions have removed suitable spotted owl habitat in the past, which also reduces the amount of interior forest habitat available to spotted owls due to edge effect of the openings. This has allowed both great horned and barred owls to increase within the planning area. Both species can impact spotted owl numbers, either through predation by great horned owls or competition by barred owls for home ranges.

There are no known additional habitat altering projects on public lands currently being planned in this planning area at this time. See Appendix D: Wildlife Biological Evaluation, page 7.



Recreation

Road 2032 is the main access road to the Gordon Thin area for proposed thinning Units 10, 11, 12, and 13. This main access road is also a popular recreation route for forest visitors. The first three miles of this road provide access to four dispersed recreation sites on the South Santiam River and Longbow Organization Camp on the 2032-302 spur. These dispersed sites are frequently occupied during the hot summer months, and the organization camp is occupied most of the summer.

Visitors also use road 2032 to access three hiking trailheads. Unit 11 is directly across the road from the Gordon Lakes trailhead, and Unit 13 is across spur road 2032-345 from the Gordon Meadows trailhead. The third trailhead is further up the road and not directly affected by this project. Hunters also use road 2032 during the fall big game seasons. Hunters travel this road and its spurs to access day hunt opportunities as well as setting up camp at several dispersed sites off the roads. This extensive road system with its many spurs allows hunting parties to separate from others and achieve positive recreation experiences.

The Three Thin area is accessed by Road 2044 and adjoining spurs to Unit 1 through Unit 9. Road 2044 is used by visitors to access House Rock campground, two trailheads, and dispersed recreation sites during the summer and fall seasons. House Rock campground is a popular campground on the district and frequently full on summer weekends. The Santiam Wagon Road crosses road 2044 near the South Santiam River. While this road crossing by the wagon road is not an official trailhead, it offers a small parking area and is occasionally used as trail access.

The eastern trailhead to the Gordon Lakes trail is also accessed off road 2044-230. Most dispersed recreation sites are found on local spurs rather than the main collector road. One exception is a popular site located on the river near the road 2044 crossing and used three seasons of the year. Other sites are used mostly during the fall hunting seasons.

Alternative 1 – No Action

Effects to dispersed recreation sites or trailheads, and traffic conflicts on main access roads will not occur under Alternative 1. Alternative 1 proposes no site disturbances and will not create log truck traffic on roadways frequented by visiting publics. This alternative also does not provide KV funding for recreation projects.

Alternatives 2 and 3

Both action alternatives create potential effects on recreation sites and visitors. These effects should be suitably mitigated through scheduling and responsive actions.

Direct site impacts from this project may occur while thinning Unit 9. A segment of the Santiam Wagon Road recreation route travels through Unit 9. This segment is not part of the historic road protected by the Santiam Wagon Road Special Interest Area (SIA), but is managed as part of the wagon road for recreation visitors. This road segment is an unrocked native surface road spur constructed during past timber harvest. Ground-based thinning equipment and log trucks

would noticeably rut the road surface. Rocking this segment to prevent rutting would compromise the primitive conditions that are desired for the Santiam Wagon Road travel route. Simple road rutting will be mitigated by specifying dry season hauling, repairing and seeding any damaged areas, and preventing the wagon road from being used as a staging area during logging. Temporary skid trails off Road 2044 and other spurs will allow logging equipment to minimize contact with the wagon road.

Action alternatives also will influence recreation visitors with log truck traffic on a road system. Visitors will have to compete with large trucks on a windy, gravel road. Mixing log trucks with recreation traffic will create safety issues and negatively affect visitors' recreation experiences with excessive road dust. Dust creation is probably most significant for camping visitors along the first three miles of road 2032, as it travels along the South Santiam River, and on the road 2044 near the river crossing. Safety and dust impacts will be mitigated for both action alternatives by restricting log haul during summer weekends when most recreation use occurs and required dust abatement. Weekends are defined as 5 pm, Friday to 6 pm, Sunday.

Commercial thinning is not expected to have long-term impacts on dispersed recreation sites or activities within proposed harvest units. Short-term impacts will include noise disturbance to nearby visitors during logging operations, loss of some screening vegetation around sites, and ground disturbance at sites used by logging equipment. These impacts will be mitigated under action alternatives by restricting operations during summer and fall-hunting weekends (including the week of Cascade elk season), cleaning up logging debris at impacted sites, and repairing any site disturbance once the sale is completed. Cleaning up logging debris around dispersed sites will also reduce the potential of fire spreading into the forest from any future, abandoned campfire.

Finally both action alternatives propose to gate or berm selected local roads to improve wildlife habitat conditions. While some of these closures may block some dispersed recreation sites from vehicle access, the loss is not significant and can be mitigated. Appropriate location of gates or berms can help the creation of dispersed sites next to the new closures to replace lost sites. Replacement sites can also be located on other nearby roads. No proposed closures are expected to eliminate heavily used dispersed recreation sites.

Both Alternative 2 and 3 create KV funding opportunities to improve recreation facilities within the sale areas. Improvements will be possible to the Santiam Wagon Road and two trailheads.

Gordon Meadows Roadless Area

Within the planning area is the Gordon Meadows Roadless area. Since the Oregon Wilderness Act of 1984 these lands were re-allocated to the Gordon Lakes 10e Dispersed Recreation (1990 Willamette Forest Plan) and then RO 215 Late-Successional Reserve (1994 Northwest Forest Plan).

Units 1, 2, 3, 4, 5 borders outside the Gordon Meadows Roadless area to the east in the Three Creek area and Unit 13 borders outside to the northwest of Gordon Meadows Roadless area in the Gordon area. All the proposed units for thinning are the result of clear-cut harvesting and planting that were accessed with roads; these units are plantations and were disturbed from their

original/pre-management condition by road building and harvesting equipment. Only Unit 8 could a person walk out of the unit to the west into the Roadless area without crossing a road, see Appendix A: Unit Prescriptions. See previous discussion under Recreation for discussions about road use. Unit 8 has 100 foot no thin buffers to the west on late-successional habitat; no new roads are proposed in the unroaded area or contiguous area.

Alternatives 2 and 3

Short-term impacts from thinning will generally be additional stumps, some soil displacement (see Appendix E: Soils), and skyline corridors. Long-term effects or visible effects of thinning will be hard to distinguish after 10 to 20 years when tree canopies close and as the stands move toward late-successional conditions. There are likely no adverse effects and some beneficial effects by accelerating the growth of the stands to blend with the vegetation characteristics of the Roadless area.

Roads

The system roads in the Gordon and Three Creeks areas are traveled regularly by recreationists and forest management personnel and considered permanent structures. Most main haul routes are Cost Share roads. All work on cost share roads needs to be coordinated with the private landowner that shares in the cost of maintaining common roads on the district. Any reconstruction activity will require cooperators agreement. The two main Forest Service Roads are the 2032 in the Gordon area and the 2044 in the Three Creeks area and both are in relatively good condition. Roadside brushing needs to be done in order to provide for adequate sight distance to accommodate mixed traffic on this route.

Ongoing concerns around access and travel management (Roads) are mitigating resource effects related to roads, while retaining a suitable transportation system to meet access needs, and achieving road maintenance goals with reduced funding sources. These two issues have been addressed with Interim Directive No. 7710-2001-3 for the Forest Service Manual for Transportation Atlas, Records, and Analysis. In general, the Interim Directive requires the implementation of a forest-scale roads analysis and clarifies local manager's discretion and flexibility when implementing roads analysis. The Willamette Forest Roads Analysis was completed in October 1998 and updated in January 2003. While the Gordon Three planning area was not identified as having areas of concern in the roads analysis, there are areas where there are high road densities that have negative effects on elk. In the Forest Roads Analysis - Map 6, the Boulder and Upper South Santiam high emphasis area shows the road density exceeds Big Game Objectives by < 1 mile/square mile (see Figure 8 - Big Game/Snag Emphasis Areas and Table 12: Current Road Conditions).

To meet big game objectives roads will be proposed for closure.

While discussed in greater detail in other sections, roads have recognized effects on resources across the subwatersheds. Within this planning area, resource effects of greatest concern are reduced wildlife habitat values and potential harassment, sediment delivery to streams with anadromous fish and the spread of non-native species down open road corridors. Another concern is the risk of human-caused fires.

Alternative 1 – No Action

If the No Action Alternative is selected the road improvements and closures are less likely to be completed. A limited amount of wildlife and other administrative dollars are available to close the highest priority roads. Road maintenance dollars have been on a downward trend for the Forest Service over the past several years. Road maintenance on these roads will decrease and will need to be prioritized for limited road dollars. Money for road improvement projects are even more difficult to find. There will be no opportunity to collect KV funds to close roads with the no action alternative.

Alternatives 2 and 3

KV funds are generated through the sale of timber for sale area improvements. Roads 2044208 and 2044120 could be gated or bermed with money generated from the sale of timber. A gate on the 2046 could be improved to better enforce the closure on the road. Funds to close six roads will be necessary within the sale area (see Figure 10 for closure reference numbers associated with roads listed in Table 15). Competition for the scarce wildlife money available to close roads could delay road closure (see Tables 15 Closure Funding Source). Two new road closures and one improved road closure would be accomplished soon after the sale of either action alternative, with KV generated dollars.

Existing and Proposed Road Closures

Gordon Three Thin - Figure 10

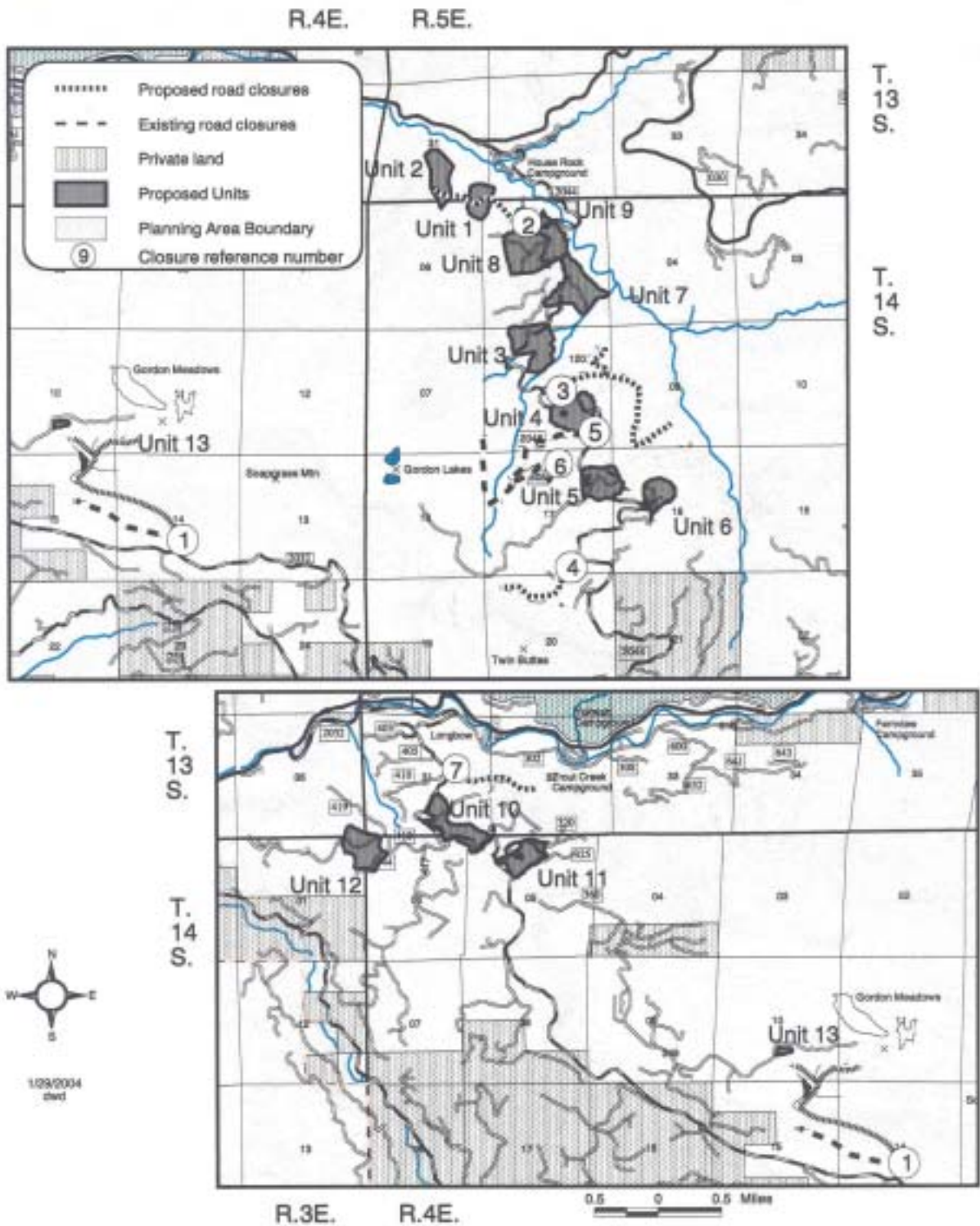


Table 15: Road Closures within the Gordon Three Thin Analysis Area

Map# (Figure 10)	Road # And Locater	Road Designation ML, OL, D	Closure Type	New or Existing Closure	Closure Funding Source	Cost Share	Closure Road Miles	New Road Closure Miles	Comments
1	2032 365	2, 2, L	Berm	New	Wildlife	No	1.86	1.86	
2	2044 208	2, 2, L	Berm	New	KV	Yes	.93	.93	
3	2044 120	2, 2, L	Berm	New	KV	Yes	1.05	1.05	
4	2044 235	2, 1, L	Berm	New	Wildlife	No	.76	.76	In Old- Growth Grove
5	2046	2, 2, L	Gate	*Existing	KV	No	1.88	0	
6	2046 505	2, 1, L	Rip and Plant	Existing	Wildlife	No	.65	0	In Old- Growth Grove
7	2032 315	2, 2, L	Berm	New	Wildlife	No	.78	.78	
<i>Totals</i>							7.13	5.38	

*Replace existing gate with a magnum gate to improve closure.

Access and Travel Management Designation (D):

- Key Forest Roads: P = Primary, S = Secondary
- L = Local

Maintenance Level (ML) and Objective level (OL):

- 5 - for high passenger car road
- 4 - for passenger car moderate user comfort
- 3 - for passenger car low user comfort
- 2 - maintained for high clearance vehicles
- 1 - closed roads

The Willamette National Forest Roads Analysis (January 2003) terminology has been updated concerning Key Forest Travel Routes or Key Forest Roads. Primary and Secondary are now considered Key Forest Roads.

The benefits of closing these roads listed in Table 15 include improved habitat conditions and reduced maintenance cost and have been evaluated at the Forest scale in Chapter VIII of the Forest Roads Analysis.

Sensitive Wildlife and Plant Species

Seventeen Region 6 sensitive wildlife species were evaluated to determine if they or their habitat would be impacted by this project. Habitat does exist for 6 species (Baird's shrew, Pacific shrew, peregrine falcon, Pacific fisher, Oregon slender salamander, and Cascade torrent salamander). The Oregon slender salamander and Cascade torrent salamander have been located within the units. These 6 species are addressed in the Biological Evaluation including cumulative effects analysis.

Habitat does not exist for 11 of the 17 species (least bittern, bufflehead, harlequin duck, yellow rail, black swift, tricolored blackbird, California wolverine, Pacific fringe-tailed bat, foothill yellow-legged frog, Oregon spotted frog, and Northwestern pond turtle).

A pair of osprey has nested in recent years in the vicinity of Unit 1. Osprey are not a Region 6 sensitive species but Forest direction requires protection of the nest tree and no disturbance during the nesting season March 1 to July 1.

Thirty-two Region 6 sensitive plant species were evaluated to determine if they or their habitat would be impacted by this project. Habitat exists for the following eight species: *Asplenium septentrionale*, *Botrychium minganense*, *Botrychium montanum*, *Cimicifuga elata*, *Corydalis aqua-gelidae*, *Eucephalus vialis*, *Iliamna latibracteata*, *Pellaea andromedaefolia*. No sensitive plant species were found in or adjacent to the proposed units. Further information about these species is found in the Biological Evaluation.

Additional sensitive species are addressed in Survey and Manage section page 79.

Alternative 1 – No Action

Although no sensitive plant species were found in the proposed units, there is habitat for eight of them. Habitat for most of these will deteriorate as the dense canopies of Douglas-fir close in and darken the forest floor. The *Botrychium* species require the presence of western redcedar, which is currently a minor component of the stands. Without thinning, the western redcedar will be suppressed by the dominant Douglas-fir and will not provide habitat for these species. Additional species whose habitat will deteriorate due to a closed canopy are *Cimicifuga elata*, *Eucephalis vialis*, and *Iliamna latibracteata*. Habitat for two species will not be affected because they are rock dwellers and rock openings are generally naturally maintained.

Alternative 2

Habitat for five of the eight sensitive plant species may be improved by thinning. A population of *Cimicifuga elata* is located approximately ¼ mile north of Unit 10, and thinning this stand may allow the species to spread. *Cimicifuga elata* requires a hardwood component, usually fulfilled by bigleaf maple. The thinning prescription retains all bigleaf maple and releases those that are greater than 12 inches DBH, thereby encouraging the presence of maple (Appendix A). Thinning will also enhance habitat by opening the stand so that more light gets to the forest floor. The thinning prescription will enhance habitat for *Botrychium* species by selecting for western redcedar, with which *Botrychium* species are associated. All western redcedar will be retained and those over 8" DBH will be released. *Eucephalis vialis*, and *Iliamna latibracteata* prefer open forest stands and habitat for them will be enhanced by thinning. Habitat for *Corydalis*

aqua-gelidae will not be affected by thinning because it occurs only along streams and these are buffered from thinning activity.

Alternative 3

Fewer acres are thinned under Alternative 3, therefore fewer acres of potential habitat are improved through thinning.

Snag Habitat and Down Wood

Snag Habitat

Dead and dying trees (snags) 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).

Woodpeckers are one group of wildlife species dependent on snags for foraging, roosting, courtship, and nesting. Abandoned woodpecker cavities are used extensively by other animals (secondary cavity users) for cover and nest sites. An absence of suitable snags can greatly limit those wildlife species dependent on them.

Down wood 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.

Forest Plan standards require snags and down wood be retained within harvest units after timber harvest is complete. In general, snags will be retained at the minimum 40% level (1.5 snags/acre for low elevation) of the potential population of primary cavity excavators and down wood will be retained at a minimum 240 linear feet/acre. The amount of down wood required can be adjusted for partial harvest areas to reflect the timing of stand development cycles. Down wood already on the ground should be retained and protected from disturbance to the greatest extent possible during harvest activities.

Snags and down wood have distribution, size, and quality standards identified in the Forest Plan. Additional direction for the retention of snags and down wood in Late – Successional Reserves is outlined in the Mid - Willamette LSR Assessment (August 24, 1998).

All the snags and most of the down wood were removed when the units were harvested approximately 40 years ago. Large down wood remaining is well decayed. Natural mortality of trees in the stands has resulted in low amounts of small snags and down wood. The current level of snag habitat within emphasis areas (see Figure 8) and subbasins are identified in Table 16.

Table 16: Existing Snag Habitat per Analysis Area

Emphasis Areas*	Latiwi	Upper South Santiam	Boulder		
			06i	06j	06k
Subbasins	06f	06h	06i	06j	06k
Proposed Units	4,5,6	1,2,3,4,7,8,9	10,11	12	11
Percent Habitat	41	57	48	33	55

*All ownerships.

Snag habitat in each analysis area is concentrated in Seral Stages 3 and 4 (see Table 17). Few snags were retained in past timber harvest units (Seral Stages 1 and 2), except for harvest units less than 10 years old. Percent habitat in each analysis area exceeds 40 percent except for 06j. Snag habitat exceeds 50 percent within 06j if calculated on public lands alone.

Down Wood

Stands within the vicinity of this project have various amounts of down wood depending on fire history, stand age, and past timber harvest. Down wood in a natural stand accumulates gradually overtime from the fall of living or dead trees or suddenly from natural disturbances such as fire, wind, or insects. Old-growth habitat typically has the greatest amount of down wood, however, some natural young Douglas-fir stands have large accumulations carried over from earlier stands (Franklin et al. 1981).

The distribution of seral stage acres (Table 17) is an indication of the amount of down wood available within each subwatershed. In unmanaged stands there typically would be high concentrations of down wood from the previous stand in Seral 1 lasting into Seral 2. Much of the down wood from the previous stand would be well decayed in Seral 3 and Seral 4 but there would be increased input of new wood from natural tree mortality. New down wood in Seral 3 and Seral 4 would be of much larger material, which persists longer.

Within these subwatersheds, the Seral 1 and Seral 2 habitat is the result of past timber harvest where most of the down wood was removed for wood fiber or lost during slash burning operations. Down wood that does remain is mostly large and well decayed. The Seral 3 and Seral 4 habitat are unmanaged stands with normal amounts of down wood.

One way to measure down wood is the percent coverage on the forest floor. If the objective is to manage down wood for wildlife, ecosystem functions, and natural conditions at a high level, down wood coverage should average 17 percent across the landscape, based on forest inventory and wildlife data of unmanaged stands (DecAid). This would include all decay classes of down wood greater than 4 inches. Approximately half the down wood should be in decay class 1-4 and half in decay class 5.

The percent cover of down wood within the units proposed for treatment is approximately 6 percent. Distribution and amounts vary across the units. Most of the material is large, but well decayed. There is also some accumulation of down wood from natural mortality of trees from the current stand. This level of down wood is likely typical of stands harvested during that time period but is considerably less than what would occur naturally.

Alternative 1 – No Action

There will be no effects to snag habitat. Snags will continue to be created naturally as the stands self-thin.

There would be no effect to down wood. Down wood accumulation will accelerate over the next few years from natural mortality of small diameter trees within the stands.

Alternative 2 and 3

Snag Effects: Proposed thinning operations in each alternative will result in the loss of a portion of the current snag habitat within the units as well as future snag habitat from suppression. Current snags that will be affected are small (less than 10 inches DBH) and do not count towards the 40 percent level needed for primary cavity excavators. They are too small to be used by most cavity-nesting bird species but do provide habitats for other wildlife species. Snags that need to be felled will remain on site as down wood.

The loss of snag habitat will be mitigated by the creation of up to 5 snags/acre following timber harvest within habitat proposed for thinning in addition to those portions of the units not proposed for thinning. Created snags will be of a larger diameter than what currently exists. Maximum snag habitat will be created for 646 acres in each of these alternatives and may add up to 3,230 snags. However, snags will not be created in special habitat and weed buffers.

These thinning prescriptions are designed to encourage late-succession conditions within the LSR. Thinning these units will allow the remaining trees to grow to a larger size so that future snags will provide for a wide range of wildlife species.

There will be no change to snag habitat within the snag analysis areas.

Down Wood Effects: Thinning prescriptions within the proposed units are designed to remove some of the standing trees, which will result in less input of down wood from small trees for the future. Trees remaining after thinning will be free to grow larger resulting in fewer but larger trees for down wood in the future. In general, the larger the diameter and the greater the length of a log, the more useful it is however, small material is better than none since even small logs will provide habitat for some wildlife species (Maser et al. 1979).

There will be an increase in down wood in decay class 1 following thinning by falling up to 5 trees/acre. Down wood will be created throughout the stands, including portions of the stands that were not treated. Down wood will be created for 646 acres in each alternative up to 3,230 trees for down wood. However, down wood will not be created in special habitat and weed buffers. Trees selected for down wood will be from the larger size class trees available. In addition, tops from the creation of snags will provide for small diameter down wood.

The percent of down wood coverage within the units will improve approximately 1 percent after treatment.

Soils and Geology

The Gordon Three project area lies well within the Western Cascades physiographic region. Rocks are primarily tuffs and breccias of volcanic origin and are generally Eocene or Oligocene in age (around 32 to 17 million years). Much of the project area was likely glaciated in the early to mid Pleistocene. Most soils formed directly from the volcanic bedrock, are very productive, and range from silt loams to gravelly or cobbly sandy loams. Depth to bedrock for the Gordon area ranges from 3 to greater than 10 feet. Depth to bedrock for the Three Creeks area ranges from 3 to greater than 6 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. For both areas the proposed managed plantations have side slope ranging from zero to 80%. The Gordon units are generally on gentler slopes and are usually less than 40%, while half of the Three Creek units have portions of the units that have 30% slopes for ground-based harvesting systems.

All the proposed units are managed plantations that originated as clear cuts, which were harvested with ground-based or cable logging systems. Given that the ground-based logging systems occurred in portions of these units over 40 years ago and prior to the establishment of Regional Guidelines, compaction at the completion of harvest activities may have once exceeded the standards. Some of that compaction has been naturally ameliorated over time by root growth, animal borrowing, and freeze/thaw; some likely remains, although finding it is difficult.

For this project, transects were walked across the proposed units in order to quantify past impacts. Estimated compaction is given in percent and correlated with the presence of locatable skid roads or landings. The percentage is the amount compacted within the activity area. For this analysis, visible skid roads were considered fully compacted even though this is not the case due to natural amelioration overtime. For the four Gordon units, compaction ranged from five to 21% and only Unit 12 had a portion of it at 21%. The five units with locatable skid roads and landings in the Three Creeks area ranged from three to 15% compacted (see Soil and Watershed Report).

Alternative 1 – No Action

With bio-turbation and freeze/thaw, compaction would slowly be reduced. Short-term impacts from harvest, such as soil disturbance, dust, noise and slash accumulation, would not occur.

Alternative 2 and 3

On a per acre basis, where an activity is proposed, any action alternative requires the use of same existing skid road system. The volume removed in any alternative is sufficient to compact the ground, and the effects to the soils are considered nearly identical. Since the skid road system is for the most part already in place, the difference in net effect between the options is minor. In all cases, the existing skid road system will be utilized as much as possible. In summary, the direct effects by any action alternative on the soils resource are very limited in scope. The only concern from a cumulative effect standpoint is excessive compaction, and mitigations are in place to ensure that does not occur.

Cumulative Effects and Management Activities

With proper project implementation, as specified by my recommendations (Doug Shank, Sweet Home District Geologist, Appendix E: Soils, pages 10 and 22), unacceptable cumulative effects on the soils resource are not anticipated from any of the action alternatives (BMP W-5).

Stand Late-Successional Structure, Vigor and Diversity

The existing conditions of all the managed stands proposed for treatment are the result of clearcutting between 1950 and 1969. Since initial reforestation, additional conifer and hardwood seedlings have entered these stands through natural seeding. These 40 plus year old plantations are generally dense, even-aged, single canopy stands ranging from 250 to 350 trees per acre (TPA) of greater than 7 inch diameter. The lower elevation units are primarily Douglas-fir (Units 1-4, 7-12). As elevation increases more noble firs are present and Units 5, 6 and 13 consist mainly of noble fir.

The stand development of the proposed units is in the Stem Exclusion Stage as included in the following definitions.

Seral Stage definition in “*Forest Stand Dynamics*” written by Chad Oliver (1990, pgs. 148-159):

- **Stand Initiation stage** - After a disturbance, new individuals and species continue to appear for several years.
- **Stem Exclusion stage** - After several years, new individuals do not appear and some of the existing ones die. The surviving ones grow larger and express differences in height and diameter; first one species and then another may appear to dominate the stand.
- **Understory Reinitiation stage** - Later, forest floor herbs and shrubs and advance regeneration again appear and survive in the understory, although they grow very little.
- **Old-Growth stage** - Much later, overstory trees die in an irregular fashion, and some of the understory trees begin growing to the overstory.

Appendix C in the Mid-Willamette LSR Assessment (1998) classifies these plantations as Early-mid seral stage because of their age and Mid Seral because of the dominant size class of 9-21 inch. The average Gordon Three stand diameter is 12 inches and ranges between 7 and 22 inch trees (see Unit 10/F1 stand exam summary in Appendix I). Since these plantations are in relatively high growing sites they have larger diameters, however, there is little understory development and the forest floor is generally bare of herbs and shrubs; relating to the Stem Exclusion stage addressed in the above definition.

Stand vigor and growth is slowing as indicated by decreased radial growth from stand exam increment boring core samples. Some smaller diameter trees have begun to die due to overcrowding and competition between trees for nutrients and light. These dense even-aged, single canopy stands are firmly in the beginning of their mid seral development stage and have not yet transitioned to late-successional forest habitat.

The shortage of old-growth habitat is displayed in the Distribution of Seral Stages Acres, Table 17, for the planning area subwatersheds. Approximately 18% (10,038/55,123 acres) of the four subwatersheds are in the Late-Successional seral stage and 25% (13,660/55,123 acres) is in the Stem Exclusion (early seral) stage. Thinning the Stem Exclusion stands will increase the rate they will grow into the desired Late-Successional structure. The remaining trees after thinning will have more growing space and nutrient availability thus also increasing their vigor.

Table 17. Distribution of Seral Stages Acres by Subwatersheds and Watershed

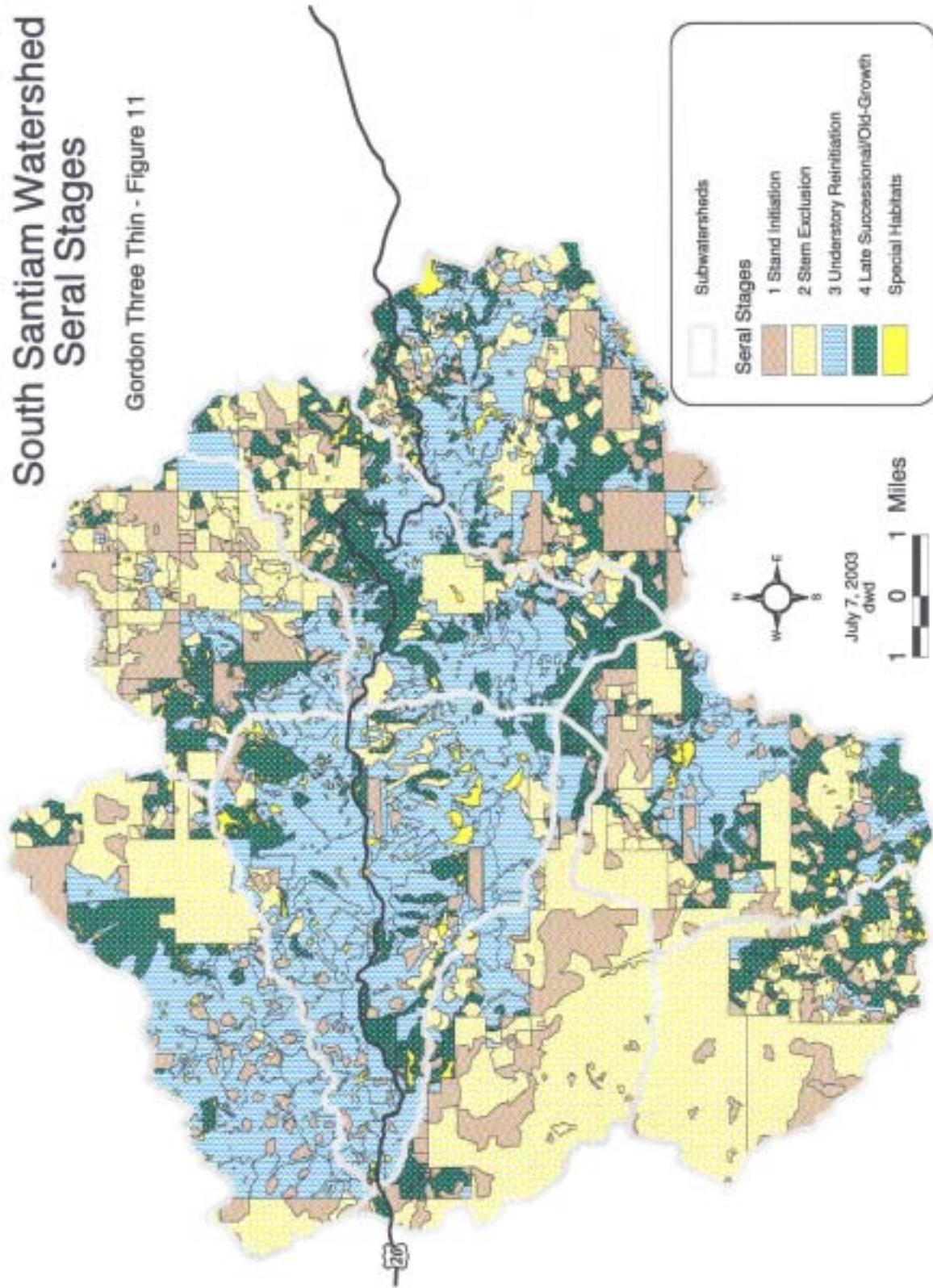
Seral Stages	Canyon Creek Subwatershed	Trout Creek Subwatershed	Sevenmile Creek Subwatershed	Sheep Creek Subwatershed	Total Subwatershed Acres/Seral Stage	Total S. Santiam Watershed Acres/Seral Stage
Seral 1 - Stand Initiation	2,753	1,028	3,192	936	7,909 (18%)	16,396 (16%)
Seral 2 - Stem Exclusion	6,780	1,143	2,821	2,916	13,660 (25%)	32,067 (32%)
Seral 3 - Understory Reinitiation	1,456	11,498	4,524	4,417	21,895 (40%)	32,867 (32%)
Seral 4 - Late-Successional /Old-Growth	988	2,159	3,401	3,490	10,038 (18%)	17,715 (17%)
Non Forested & Special Habitats	71	868	416	266	1,621 (3%)	2,569 (3%)
	12,048	16,696	14,354	12,025	55,123 Total Acres	101,615 Total Acres

Non-Forested and Special Habitats: For this analysis special habitats are considered non-forested stands. However, not all non-forested areas are special habitats.

The Canyon, Trout, Sevenmile and Sheep Creek subwatersheds are in the South Santiam Watershed. The South Santiam Watershed has a total 101,615 acres (including private ownership) and a total of eight subwatersheds. When analyzed further, a comparison of the distribution of seral stages for the entire South Santiam Watershed results in greater acres in the Stem Exclusion stage of 32% (32,067/101,615 acres) and less in the Late-Successional stage of 17% (17,715/101,615 acres).

South Santiam Watershed Seral Stages

Gordon Three Thin - Figure 11



Alternative 1 – No Action

These plantations will continue to grow gradually over time but they will develop differently from existing stands that have achieved old-growth dimensions (Tappeiner et al. 1997). Tappeiner states "...it appears that the old stands developed with low density, regenerated over time, and had little intertree competition." Inherent in managed stands are high-density plantings to insure growth survival. For these stands, Douglas-fir will become more dominant as crowns crowd together and shade out understory conifers, shrub vegetation and many hardwoods. The dominants will continue to develop and many of the intermediates and suppressed will slowly be removed from the stand through mortality and decay. On most acreage, the stems per acre will decrease to approximately half of current conditions in about 70 years. A relatively even-aged stand of predominately Douglas-fir will emerge with a scattering of shade-tolerant conifers in the understory. In those areas with very heavy stocking and stagnant growth, little change will occur and trees in these stands will remain small and suppressed. In overstocked conditions crowns become smaller indicating less vigor and more susceptibility to insect and disease attack.

The desired future condition to accelerate late-seral characteristics would not occur through the No Action Alternative. Through modeling the stands are predicted to reach some late-successional characteristics such as large Douglas-firs at stand age of 200 or year 2163. However, there is no new cohort or multiple canopies developing, the shade tolerant trees are stagnating and there is a lost opportunity for recovery of wood fiber.

Unit 10 was used as a sample stand and modeled to grow out over 200 years. Stand growth and treatments were modeled using the updated Forest Vegetation Simulation (FVS) Model 6.21, Suppose Version 1.14, Westside Cascades Geographic Variant (Wykoff, et al. 1982). This model simulates the growth and yield of stands over time. Treatments were modeled for ten-year increments to a 200-year time period; model runs are available in the project files.

Alternative 2 and 3

Both alternatives have the same thinning treatments applied to the thirteen units but Alternative 2 treats approximately 54 more acres with the inclusion of steeper slopes requiring helicopter yarding. Growth projections and modeling of future stand conditions were analyzed by the FVS model for three thinning density reductions to 70, 90 and 110 trees per acre (TPA). Trees per acre reflect the net tree numbers to be retained on each stand after snag and coarse wood prescriptions are met. The sample stand used (Unit 10) is somewhat better than average with respect to growth than the other units but is representative in species composition, aspect, slope and general attributes of the stand. The model uses data from stand exam plots taken to the Pacific Northwest Forest Service Region 6 specifications. The results of this growth model are displayed in Figure 12a,b,c for the stand when thinned in year 2003 to 70, 90, and 110 TPA (respectively) and grown to age 80 at 2043. The most notable result is increased small tree regeneration with thinning; allowing more light to the ground for seedling and understory development (refer to Figure 5b No Action Model).

Figures 12abc:

Modeled growth results from thinning to 70, 90, and 110 TPA at age 80.



Diameter growth rates will increase, as a direct effect of thinning. The resulting stand, freed from inter-tree competition, will have large-diameter trees sooner thus accelerating the development of late-successional structure. At age 80 the quadratic mean diameter greater than seven inches (at Diameter Breast Height –DBH) will be three to four inches larger than if left un-thinned (see Table 18); thinning to 70 TPA results in 22.48 inch diameter at age 80 versus with no treatment (existing 225 TPA at average 12 inch diameter) the trees grows slower reaching 18.42 inch diameter at age 80.

Table 18: Diameter Growth

Age 40 @2003	Age 80 @2043
Existing 225 TPA	18.42 DBH
Thin to 70 TPA	22.48 DBH
Thin to 90 TPA	22.05 DBH
Thin to 110 TPA	21.55 DBH

Increased growth rates will speed the development of high-quality snags and large, coarse woody debris.

Live-crown ratios will increase under all treatments. Conifers go through a replacement period within their crowns after thinning, where needles maintained under low light (shade needle) will be replaced by needles adapted for higher light conditions (sun needles). Once that replacement occurs, crown growth will accelerate until crowns grow together and light again limits growth. Live crown ratio (to bare bowl/stem of tree) can be considered an index of individual tree vigor (Oliver and Larson 1996). Thinning to 70 TPA will maintain the larger crown ratios longer. Trees with large crown ratios will not only grow faster, but will be more resistant to insects, diseases, and other environmental hazards.

Because of previous management direction, Douglas-fir was the species of choice when planting or pre-commercial thinning activities occurred. Now some stands or portions of units show high percentages of Douglas-fir in the overstory. Thinning will allow for the selective removal of Douglas-fir, a high value wood product, and the enhancement of other conifer species and hardwoods by their selective retention. This will also make the stand as a whole more resilient.

A second thinning entry is likely to occur in the next 20 or 30 years due to retaining a relatively moderate level of trees per acre at these initial thins. Units located near main roads and benefits to further accelerating late-successional structure from the second thinning density reduction will result in increased diameter growth along with other late-successional characteristics such as multiple canopy enhancement.

Variable thinning as discussed in the Mid-Willamette LSR Assessment (1998) will be achieved with dominant tree release (DTR) and no-thin Retention Areas (RA) interspersed with the 70, 90 or 110 TPA thinning densities throughout the units. A certain amount of the best dominant trees will be located and the smaller trees will be removed around them for 66 feet or ¼ acre DTRs. Units 1, 2, 3, 7, and 9 will have 10% of the acres in DTRs and Units 4 and 5 will have 20%. The dominant trees will be released from direct competition and tree seedlings will be planted to start a second age class/multiple canopy or cohort surrounding the retained dominant trees. In addition, retention areas (RA) will be in the same

percentages. The size range of RA will vary but will be at least 1/4 acre and will be grouped to retain processes and conditions for plant and wildlife diversity benefits. Different combinations of DTR and RA or neither are prescribed based on site specific conditions and are fully disclosed in Appendix A: Units Prescriptions. The resulting combination of thinning prescriptions will give the stands and landscape a variable thin appearance and in the long term more closely resemble the randomness of late-successional stands.

The Mid-Willamette LSR Assessment also directs the consideration depending on site-specific conditions of no-thin buffers next to existing Late-Successional structure. Buffers have been prescribed for eight out of 13 units; see Appendix A: Units Prescriptions or Alternative tables in Chapter 2. These no-thin buffers are generally 100 feet wide; however, some snags and down wood creation will occur in these areas. This Coarse Woody Debris will remain on site to provide additional stand structure and diversity of habitat.

Survey and Manage/Sensitive Species: Lichens, Fungi and Bryophytes; Mollusks

Recent direction for this Environmental Analysis has changed formerly Survey and Manage Species to the Sensitive Species Program by the *Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines, March 2004*.

Surveys were conducted for Survey and Manage Species in accordance with current protocols. These species include vertebrates, fungi, lichens, bryophytes, and mollusks. They are afforded protection under the Forest Plan, as 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* (2001), and subsequent Annual Species Review. Protection measures are developed for each site using published management recommendations and professional judgment.

Surveys for red tree voles (*Arborimus longicaudus*) or great gray owl (*Strix nebulosa*) are not required.

Great gray owls typically nest above 3000 foot elevation in conifer habitat that is greater than 80 years old with a canopy closure over 60 percent located within 1000 feet of a natural meadow larger than 10 acres (R6 Survey Protocol for the Great Gray Owl, April, 1995). Surveys are required for ground disturbing activities that impact nesting habitat. Specific mitigation measures in the Northwest Forest Plan (1994) for the great gray owl include the following: provide a no-harvest buffer of 300-feet around meadows and natural openings and establish ¼ mile protection zones around known nest sites (ROD C-21). Unit 13 is located adjacent to suitable nesting habitat and non-natural openings created when the unit was harvested approximately 40 years ago.

The red tree vole is an arboreal rodent typically found in late-successional Douglas-fir forests. Surveys are required for habitat disturbing projects. The average tree diameters in the proposed units do not meet minimum size requirements for suitable habitat (Survey Protocol for the Red Tree Vole, Version 2.1). Habitat within the units is not suitable red tree

vole habitat and surveys are not required. A small clump of arboreal rodent nests was located in Unit 2. A total of eight nests were checked with one showing previous red tree vole use, now abandoned. Red tree voles had likely dispersed out from the adjacent old-growth stand but were unable to persist in the unsuitable habitat. There is no required management for this site.

Species are categorized according to their rarity and types of surveys required, as follows:

- **A** – Rare species for which pre-disturbance surveys are practical; manage all known sites and do strategic surveys.
- **B** – Rare species for which pre-disturbance surveys are not practical; manage all known sites and do strategic surveys.
- **C** - Uncommon species for which pre-disturbance surveys are practical; manage high-priority sites and do strategic surveys.
- **D** - Uncommon species for which pre-disturbance surveys are not practical; manage high-priority sites and do strategic surveys.
- **E** – Rare species for which the status is undetermined; manage all known sites and do strategic surveys.
- **F** – Uncommon species for which the status is undetermined; do strategic surveys only.

Several survey and manage species were found that require protective measures (manage all known sites). These species are listed in Table 19.

Table 19: Survey and Manage/Sensitive Species Located

Unit #	Plant Survey and Manage/Sensitive Species Located	Number of Sites	Category
1	No survey and manage/sensitive species found		
2	No survey and manage/sensitive species found		
3	<i>Pseudocypbellaria rainierensis</i>	4	A
4	<i>Pseudocypbellaria rainierensis</i>	1, riparian	A
5	No survey and manage/sensitive species found		
6	No survey and manage/sensitive species found		
7	<i>Leptogium cyanescens</i>	1	A
	<i>Pseudocypbellaria rainierensis</i>	3	A
8	<i>Leptogium cyanescans</i>	2	A
9	No survey and manage/sensitive species found		
10	<i>Leptogium cyanescans</i>	1	A
11	No survey and manage/sensitive species found		
12	No survey and manage/sensitive species found		
13	<i>Bridgeoporus nobilissimus</i>	4	A
	<i>Racomitrium aquaticum</i>	historical record	E
	<i>Rhizomnium nudum</i>	2, out of unit	B

This list does not include species that were recently dropped during the 2002 annual Species Review.

Bridgeoporus nobilissimus is a fungus that inhabits large-diameter noble fir stumps and snags. It continues to be very rare despite several years of survey effort throughout the Region. Four noble fir stumps adjacent to Unit 13 contain noble polypore conks. The Forest Plan, as amended, requires a management plan to be written for each population. The management plan for the Gordon population is available in the District files. Management guidelines include enhancing the presence and growth of noble fir in the area and restricting

the use of fertilizer because it enhances decomposition of the stumps on which *Bridgeoporus nobilissimus* relies.

Leptogium cyanescens is a tiny lichen that grows among the mosses on the trunks and branches of hardwoods, particularly bigleaf maple. It may be more common than previously thought.

Mollusk species surveyed for are *Pristiloma arcticum crateris*. Surveys are required for ground disturbing projects. Surveys using the Survey Protocol Version 2.0 (10/29/97) were completed in 2001 – 2003. *Pristiloma sp.* was not found.

Pseudocyphellaria rainierensis is a foliose lichen and more closely associated with old-growth forest than the other survey and manage lichens. In this sale area it is found on the edges of the managed stands where there is old-growth forest adjacent to the stand.

Alternative 1 – No Action

Over 30 survey and manage known sites were located in or adjacent to the proposed thinning stands. The effect of not thinning the stands on these species varies, depending on the species and where they were found. Several of the locations are on the edge of old-growth forests; these will likely be unaffected by a dense canopy developing nearby. These include the *Rhizomnium nudum* sites and most of the sites of *Pseudocyphellaria rainierensis*. Those sites found in the interior of the younger stands may be negatively affected by the development of a dense closed canopy. These species must have adequate light in order to photosynthesize; also, a deep dark stand tends to favor greater moss cover, which can out compete the lichens. *Leptogium cyanescens* has only been found on shrubs and bigleaf maple and these species would likely drop out of the stand unless thinning takes place.

There will be no direct or indirect effects to great gray owls, and red tree voles under this alternative.

Alternative 2 and 3

Survey and manage sites located in proposed units are generally protected with no harvest buffers of varying sizes, depending on the species and the thinning prescription. The buffers are expected to help retain microclimatic conditions of each site; there is some risk that the buffers are not of sufficient size to ameliorate all changes in microclimatic features. Several studies have been conducted to determine the distance into a stand that specific microclimatic features are affected when adjacent stands are harvested, however, there is still uncertainty with regard to how thinning affects microclimate in adjacent stands.

The variable thinning prescriptions will, in the long-term, enhance habitat for most survey and manage species. Larger diameter trees, retention areas, dominant tree release, and the retention of minor tree species will add complexity to these forests. Thinning is expected to enhance *Leptogium cyanescens* habitat by encouraging the hardwood and shrub substrates on which it grows.

Some species of mycorrhizal fungi may suffer short-term declines after thinning due to the removal of host trees. Also, any undetected sites of survey and manage lichens may be impacted. However, any negative effects to survey and manage species habitat are expected to be short-term.

Each alternative will thin a dense conifer stand within 300 feet of a non-natural opening. Great gray owl nesting habitat will not be affected. To minimize any disturbance to nesting great gray owls within the vicinity, all harvest activity will be done after July 31

The removal of up to 60 percent of the canopy through thinning and the creation of gaps will affect the ability of red tree voles to disperse through the units. This is not expected to affect the viability of the species and will in time be beneficial by encouraging the development of late-successional habitat

Chapter 4: Coordination; Agencies and Persons Consulted; Literature Citations

The following lists members of the interdisciplinary team (IDT) responsible for coordinating, conducting and contributing to the environmental analysis.

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FEDERAL, STATE, AND LOCAL AGENCIES; TRIBES and OTHERS:

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:

The Sweet Home Ranger District prepared a Project Initiation Letter dated December 9, 2002 detailing the proposed actions and issues and mailed it to over 90 people, agencies and organizations who either have expressed an interest in the area or project, or who might be interested. Recipients included Grand Ronde Tribe, Santiam Wilderness Committee, Oregon Natural Resource Committee, Oregon Department of Fish and Wildlife, and the City Manager of Sweet Home. In response we received correspondence from Oregon Natural Resource Committee and Frontier Technology, Inc. (see Public Involvement section in Chapter 1).

On January 15, 2003 a field review of the Falls Creek Hydro Project Penstock was conducted with a Frontier Technology, Inc company representative.

On July 21, 2003 a field review of the Gordon area was conducted with representatives from Oregon Natural Resources Council and Cascadia Wildlands Project.

Consultation has also occurred with the US Fish and Wildlife Service for Threatened and Endangered Species and the National Oceanic Atmosphere Administration for Fisheries.

All correspondence and full text of the letters are available at the Sweet Home District Office.

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Chapter 5: Response to Public Comments and Changes to March 2004 EA

Response to Public Comments

The public comment period for the Gordon Three Thin EA was advertised in the *Register–Guard* from March 29, 2004 to April 28, 2004. One e-mail letter was received from Doug Heiken representing Oregon Natural Resources Council (ONRC) dated 4/23/2004. Seven comments were offered with the intent of improving this project and the analysis supporting it and generally stating support for the project. The comments and responses to the comments are as follows.

1. *“The EA is not totally clear on what kind of stands these are. We assume that all harvest units are approximately 40 year old relatively dense uniform stands of Douglas-fir that resulted from planting following clearcutting.”*

EA, Chapter 1, page 4, Purpose and Need for Action, second paragraph. *“Existing stocking levels in these thirteen (13) plantations...”*

EA, Chapter 3, page 74, Stand Late-Successional Structure, Vigor and Diversity. *“The existing conditions of all the managed stands proposed for treatment are the result of clear-cutting between 1950 and 1969. Since initial reforestation, additional conifer and hardwood seedlings have entered these stands through natural seeding. These 40 plus year old plantations are generally dense, even-aged, single canopy stands ranging from 250 to 350 trees per acre (TPA) of greater than 7 inch diameter. The lower elevation units are primarily Douglas-fir (Units 1-4, 7-12). As elevation increases more noble firs are present and Units 5, 6 and 13 consist mainly of noble fir.”*

Appendix I: FVS Model Thinning Analysis, page 7, Table 7: Stand Treatment History.

2. *“Please specify that ground-based equipment will be light-touch equipment other than traditional tractors, and be operated only when the ground is dry.”*

All ground based yarding will be done with state-of-the-art cut-to-length (CTL) equipment, generally a processor/forwarder that is considered light-touch equipment. Locations of forwarder roads have to be approved by Forest Service sale administrator to insure low impact to soils (C6.41 Contract Provision). This type of equipment travels on top of generated slash, from tree limbing, thereby reducing soil compaction and displacement. The normal contractual operating season is from June 1 to October 31. During heavy rains when excessive disturbance occurs operations will be suspended.

EA, Chapter 2, page 27, Mitigation Common to All Alternatives, Fisheries, last bullet.

“Dust abatement and fresh rock will be used on roads paralleling the South Santiam River and Canyon Creek to minimize sediment delivery to streams with ESA listed species. Dry weather haul will be required on native surface roads.”

3. *“The EA says that there will be stream crossings but does not explain where, which streams, fish use; how many riparian trees will be cut; etc. The FS should consider implementing the sale in such a way that ground-based stream crossings are unnecessary and skyline-cable stream crossings are minimized.”*

Unit 1 will have a skyline corridor across the intermittent stream in the northern portion of the unit (see Appendix A: Unit Prescriptions, page 4, Unit 1 and 2, Skyline Landing and stream locations). Skyline corridors for this size of timber are small generally 15 foot wide and trees cut within the riparian buffer will be left on the ground. Full suspension of logs removed through the riparian buffer is prescribed to prevent ground disturbance. Unit 5 has an existing logging spur road that crosses an intermittent stream that will be used again in the cut-to-length portion of the unit (see answer to question 2. above).

4. *“We concur with the idea that the outer half of riparian reserves can often be thinned to the benefit of the terrestrial and riparian resources, however this project treats a very high percentage of all the riparian areas.”*

EA, Chapter 2, page 27, Mitigation Common to All Alternatives, Fisheries, second bullet. There is a minimum 25-foot no-thin buffer for all streams which will protect stream side areas, there are also 50 foot and 100 foot no-thin buffers.

EA, Chapter 2, page 30, Mitigation Common to All Alternatives, Special Habitats, third bullet.
EA, Chapter 3, page 43, Table 9: Unit and Riparian Acres under Alternative 2 does display 73% (140 acres) of treated Riparian Reserves. However, for the landscape, treatment of riparian associated areas is low. There are over 13,000 acres of plantations (40-year-old Douglas-fir) in this seral stage in the Canyon, Trout, Sevenmile, and Sheep Subwatersheds. Generally riparian areas range from 20 to 30 percent of the landscape. A quarter of 13,000 acres is 3,250 acres. EA, Chapter 3, page 74, Table 17: Distribution of Seral Stages Acres by Subwatershed and Watershed.

5. *“Let's not forget that there are still lots of disturbance mechanisms at work in the forest-- moderate fire, wind, ice, insects, and disease may help thin these stands, so we should not feel like we have to be entirely "thorough" with thinning treatments Was there any mortality or top kill in these stands?”*

EA, Chapter 1, page 4, Purpose and Need for Action, second paragraph. Because these stands are overcrowded and inter-tree competition is occurring natural mortality is ongoing.

EA, Chapter 2, page 21, Table 2: Alternative 2, column 2 and 4. Not all acres will be thinned, 646 acres were initially proposed to thin; after riparian and late-successional buffers, sensitive species, weed containment areas, and special habitats acres are removed from thinning, 491 acres are proposed to thin.

6. *“This project area and these thinning units are adjacent to an inventoried roadless area. This should have been noted in the EA. Be sure that any uninventoried roadless areas adjacent to this IRA are considered in the planning and implementation process. Do not build any roads in the unroaded area or contiguous area.”*

Within the planning area is the Gordon Meadows Roadless area. Since the Oregon Wilderness Act of 1984 these lands were re-allocated to the Gordon Lakes 10e Dispersed Recreation (1990 Willamette Forest Plan) and then RO 215 Late-Successional Reserve (1994 Northwest Forest Plan).

Units 1, 2, 3, 4, 5 are adjacent to the Gordon Meadows Roadless area to the east in the Three Creek area and Unit 13 is adjacent to the northwest of Gordon Meadows Roadless area in the Gordon area. All the proposed units for thinning are the result of clear-cut harvesting and planting that were accessed with roads; these units are plantations and were disturbed from their original/pre-management condition by road building and harvesting equipment. Only from Unit 8 could a person walk out of the unit to the west into the Roadless area without crossing a road, see Appendix A: Unit Prescriptions. Unit 8 has 100 foot no thin buffer to the west on late-successional habitat; no new roads are proposed in the unroaded area or contiguous area.

Short-term impacts from thinning will generally be additional stumps, some soil displacement (see Appendix E: Soils), and skyline corridors. Long-term effects or visible effects of thinning will be hard to distinguish after 10 to 20 years when tree canopies close and as the stands move toward late-successional conditions. There are likely no adverse effects and some beneficial effects by accelerating the growth of the stands to blend with the vegetation characteristics of the Roadless area.

EA, Chapter 3, page 74, *“Stand Late-Successional, Vigor and Diversity”*.

EA, Chapter 3, page 63, *“Recreation”*.

EA, Chapter 3, page 42, *“Alternative 2, Hydrology”*.

7. *“Extreme care is required in order to protect water quality and native salmonids, some of which are Threatened. Dry weather hauling (not just dry season hauling) must be required. Ground-based logging and stream crossings must be avoided or minimized.”*

Refer to response for question 2.

EA, Chapter 2, page 27, Mitigation Common to All Alternatives, Fisheries, last bullet.

“Dust abatement and fresh rock will be used on roads paralleling the South Santiam River and Canyon Creek to minimize sediment delivery to streams with ESA listed species. Dry weather haul will be required on native surface roads.”

The last sentence will be made into a separate bullet in the June 2004 Gordon Three Thin EA.

EA Changes to June 2004 Gordon Three Thin EA

Add Chapter 5: Response to Public Comments; Changes to March 2004 EA

Table of Contents Changes for page numbering and headings

Chapter 3, page 64, added discussion on Gordon Meadows Roadless Area

For the Gordon Three Thin EA all previous Survey and Manage Species are now classified as Sensitive Species

- Chapter 3, page 80, changed sub-heading from “Survey and Manage: Lichens, Fungi and Bryophytes” to “Survey and Manage/Sensitive Species: Lichens, Fungi and Bryophytes; Mollusks”.
- Chapter 3, page 80, under heading “Survey and Manage/Sensitive Species: Lichens, Fungi and Bryophytes; Mollusks” added first paragraph about 2004 ROD To Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines.
- Change Tables 2, 3, 4, 19 to include Survey and Manage/Sensitive Species titles, also changed topic titles to read Survey and Manage/Sensitive Species.
- In Chapter 3, page 69, added to “Sensitive Wildlife and Plant Species”, one sentence “Additional sensitive species are addressed in Survey and Manage section page 80.”
- New literature citation

Northwest Forest Plan was amended to change the documentation requirements with regard to the 2004 ROD clarifying provisions relating to the Aquatic Conservation Strategy.

- In Chapter 3, under 3. Riparian Management, page 38 the first paragraph was added to addresses amended requirements.
- New literature citation

Changed title of Chapter 3 to Existing Condition and Environmental Consequences.

Cumulative Effects and Management Activities

- In Chapter 3, Fisheries, page 53, added copied Cumulative Effects discussion from Appendix J: Biological Assessment for Spring Chinook Salmon and Winter Steelhead, page 31.
- In Chapter 3, Soils and Geology, page 72, added copied Cumulative Effects discussion from Appendix E: Soils, pages 10 and 22.
- In Chapter 3, Northern Spotted Owls, page 61, added copied Cumulative Effects discussion from Appendix D: Wildlife Biological Evaluation, page 7.
- Chapter 3, added to last sentence of first paragraph under Sensitive Wildlife and Plant Species “...including cumulative effects analysis.” EA, page 69

Appendix A: Gordon Three Thin Unit Prescriptions

Common to all units:

1. We will use numbers from the Forest Vegetation Simulator (FVS) model to determine leave trees per acre to achieve the target canopy closure. Target canopy closures are plus or minus 5%.
2. The target canopy closure listed will be desired after snag and down woody creation. We will need to leave additional trees if down and snags will be created using KV funds.
3. Douglas fir, Western hemlock and red alder will be thinned using the designate by description diameter and distance prescription (dxd) to leave the target canopy closure. This will retain larger diameter trees using a thin from below prescription. No tree over 20" will be harvested within the units that are in the LSR allocation (all except Unit 12). No pruned trees will be harvested in Units 10 and 12.
4. Wet areas of alder with skunk cabbage will be protected by exclusion from harvest units. The first tree away will be used as a boundary tree giving a one-tree width buffer generally.
5. All Western red cedar will be retained, cedar over 8" will be spaced off as a leave tree for dxd.
6. All big leaf maple will be retained, maple over 12" will be spaced off as a leave tree for dxd.
7. All Pacific yew will be retained.
8. Unit prescription may include retention areas where all trees will be designated for leave. Leave areas should be located around existing large woody debris for Oregon slender habitat. In general an equal amount of dominant tree release areas will be included where all trees will be removed around a dominant tree.
9. Dominant tree release radius will be 66 feet slope distance. This is equal to ¼ acre with an adjustment for slope. Retention areas will be a minimum of 66 feet and may be grouped to a larger size to retain processes and conditions for plant and wildlife diversity benefits.
10. Retention areas (RA) and dominant tree release (DTR) areas will cover 10% of the area within units 1, 2, 3, 7 and 8. Units 4 and 5 have 20% of the area in this prescription. Units 6, 9 and 13 will not have any areas RA/DTR areas. Units 10 and 11 will have 10% of the area in DTR only and Unit 12 will have 10% in RA only. For 10% four ¼ acre areas will be left per ten acres of unit. For 20% eight ¼ acre areas will be left per ten acres of unit. This will leave 10 or 20% of the area in retention and 10 or 20% in openings surrounding a dominant tree. Retention areas will also be grouped to provide greater maintenance of microclimates.
11. Areas adjacent to old-growth generally have a one hundred foot buffer. This area will be a good place for snag and down wood creation in clumps. Snags and down wood need good distribution. Areas to be protected are noted on planning maps and in unit prescriptions.
12. Stream buffer widths noted are for each side of the stream. Those small intermittent streams that are separated by roads or distance from the South Santiam will have 25' no-thin buffers for a total of 50'. Those small streams that flow directly into the South Santiam will generally have a 50' no-thin buffer for a total of 100'. The forks of Three Creek and the South Santiam River will have 100' no-thin buffers on each side. All perennial streams will have a 50' no-thin buffer.
13. Areas of protection for survey and manage species will be noted on the planning maps. Generally these are mostly designated to be retention areas. Many fall adjacent to old-growth and are within the one hundred foot buffer. Exceptions are noted on planning maps and in unit prescriptions.
14. Logging is planned for summer and fall. No haul will be permitted during the weekends from June 1 to October 31. Dust abatement will need to be applied when needed during haul. Any activity during wet weather will need close monitoring to prevent rocking existing native surface roads and excessive soil disturbance from ground-based operations.
15. Tops will be yarded in skyline and helicopter yarding areas. The ground-based systems will crush and use the slash in the skid roads. Hand piling will be collected along the major forest roads: 2032, 2044 and 2044230.

Table 1: **Alternative 2** Gordon Three Thin

Units	Tot. Ac.	Buffer Ac: RR, S&M LS, SH, Weeds	Thin Ac.	TPA Reten.	Target% Canopy Closure	RA/DTR Areas in % of unit	Skl. Ac.	Grd Ac.	Hel. Ac.	Add. CWD& Snags	Est MBF /Ac	Est.Total Remove MBF
1	27	RR; TORR; ALRU/LYAM -Total 3ac	24	70&110	40% 18ac & 60% 6 ac	10%ea RA/DTR	10	9	5	10	12 Avg.	288
2	38	RR; Rock BAWR; -Total 6ac	32	70&110	40% 23ac & 60% 9ac	10%ea RA/DTR	9	0	23	10	11 Avg.	352
3	60	RR; LS; PSRA -Total 13ac	47	70&110	40% 26ac & 60% 21ac	10%ea RA/DTR	21	0	26	10	8 Avg.	376
4	51	RR; ALRU/LYAM; Rock/LS; Rock pit; -Total 3ac	48	90	50%	20%ea RA/DTR	12	18	18	10	10 Avg.	480
5	44	RR+ALRU/ LYAM; LS; BAWR -Total 7ac	37	70	40%	20%ea RA/DTR	18	19	0	10	10 Avg.	370
6	30	ALRU/LYAM; LS; Trees too small -Total 2ac	28	90	50%	None	18	10	0	10	8 Avg.	224
7	92	RR; LS; ALRU/LYAM; LECY -Total 16ac	76	90	50%	10%ea RA/DTR	55	16	5	10	12 Avg.	912
8	97	RR; LS; Rock LECY; ALRULYAM -Total 16ac	81	90	50%	10%ea RA/DTR	53	6	22	10	12 Avg.	972
9	17	LS; RR ALRU/LYAM -Total 1ac	16	90	50%	None	9	7	0	10	12 Avg.	192
10	55	RR; BRSY; LECY -Total 23ac	32	90	50%	10% DTR only	6	26	0	10	13 Avg.	416
11	37	RR; LS; BRSY -Total 16ac	21	90	50%	10% DTR only	11	10	0	10	11 Avg.	231
12	48	RR; BRSY; -Total 7ac	41	110	60%	10% RA only	0	41	0	10	5 Avg.	205
13	50	BRNO -Total 42ac	8	70	40%	None	0	8	0	10	16 Avg.	128
Total	646		491				222	170	99		11 Avg.	5146

All acres are estimates. RR – Riparian areas w/in Riparian Reserves that have no-thinning; ALRU/LYAM – red alder/skunk cabbage; S&M – Survey and Manage; LS – Late-Successional; SH – Special Habitats; Grd., Skl., & Hel.= Ground, Skyline and Helicopter based logging systems; LECY-Leptoguim cyanescens; BRSY=false brome; BAWR = Oregon Slender Salamander; TORR=Torrent Salamander; BRNO= Bridgeporus nobilissimus; PSRA=Pseudocypbellaria rainierensis; DTR=Dominant Tree Release; RA= Retention Areas

Alternative 2 Prescriptions:

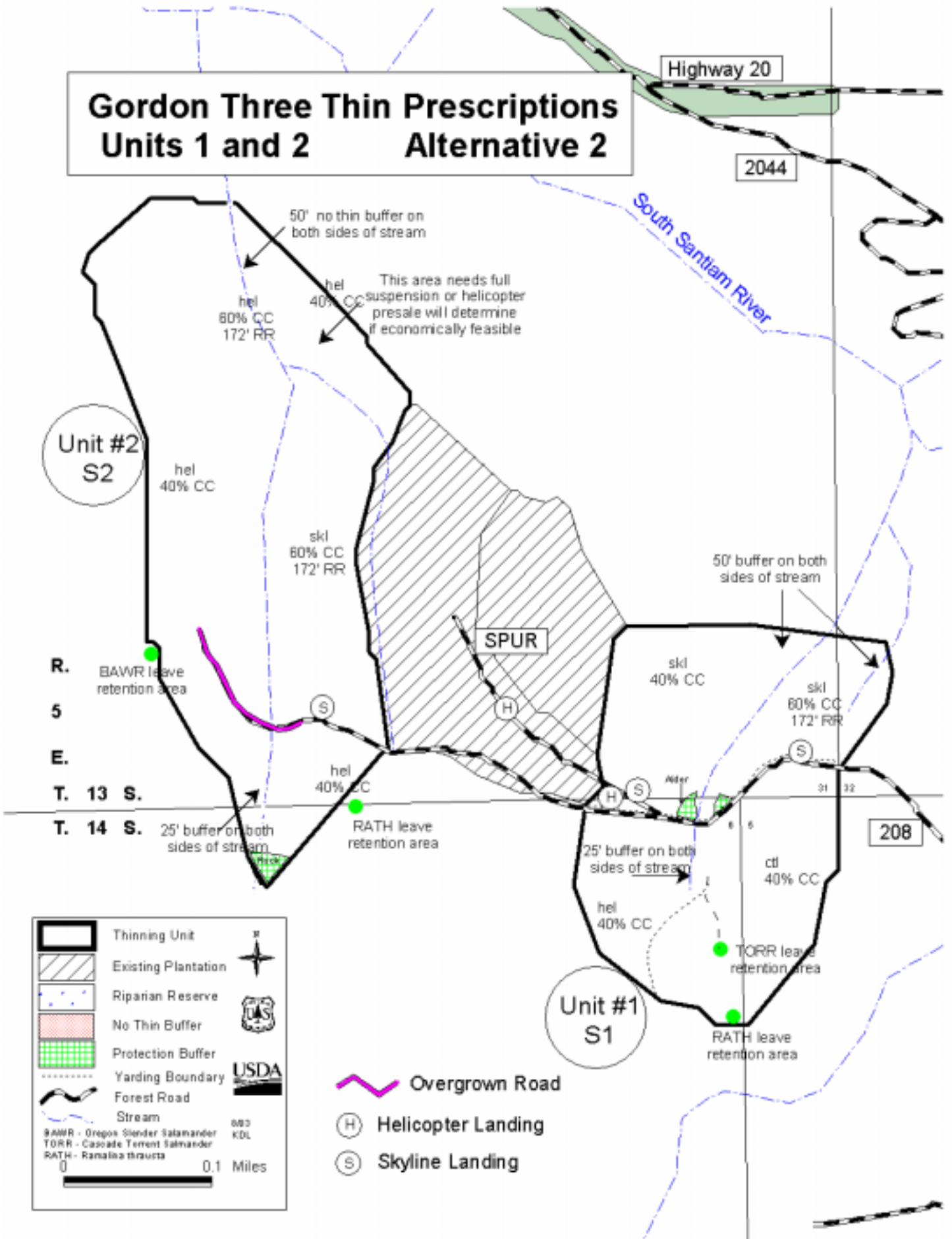
- Unit 1-40% & 60% Canopy Closure (CC) retention; Retention Areas (RA)/ Dominant Tree Release (DTR) approximately 10 ea. ; may group RA.
- Unit 2-40% & 60% CC retention; 10% RA/ DTR approximately 13 ea.; may group RA.
- Unit 3-40% & 60% CC retention; 10% RA/ DTR approximately 19 ea.; may group RA.
- Unit 4-50% CC retention; 20% RA/ DTR approximately 38 ea.; may group RA.
- Unit 5-40% CC retention; 20% RA/ DTR approximately 30 ea.; may group RA.
- Unit 6-50% CC retention; No RA/DTR because of wind exposure.
- Unit 7-50% CC retention; 10% RA/ DTR approximately 30 ea.; may group RA.
- Unit 8-50% CC retention; 10% RA/ DTR approximately 32 ea.; may group RA.
- Unit 9-50% CC retention; is flatter than units 1 and 2 and above the Falls; no DTR/ RA – want less visible because of recreation use.
- Unit 10- 50% CC; 10% DTR approximately 13; no retention areas because weed buffer will account for retention area; Weeds – BRSY (false brome)/RUDI (blackberry)- 100' no-thin buffer along rd.; underplant near road and DTR
- Unit 11-50% CC; 10% DTR approximately 8; no retention areas because weed buffer of BRSY/RUDI will account for retention area; improve trailhead, Be aware of Falls Creek Hydro pipeline and unit location.
- Unit 12–60% CC, No DTR, 10% RA only approximately 16.
- Unit 13–40% CC, No DTR/RA, retain biggest NF, make down wood outside small units, collect KV for PCT and girdling some DF to release NF outside small units.

Survey and Manage Species Located on Maps:

- PSRA – *Pseudocyphellaria rainierensis*
LECY – *Leptogium cyanescens*
TORR – *Rhyacotriton cascadae* / Cascade torrent salamander
BAWR - *Batrachoseps wrighti* / Oregon slender salamander

*3/5/04 *Ramalina Thrausta* (RATH) and *Megomphix hemphilli* (MEHE) dropped as Survey and Manage Species in January 2004.

Gordon Three Thin Prescriptions Units 1 and 2 Alternative 2



Unit #1

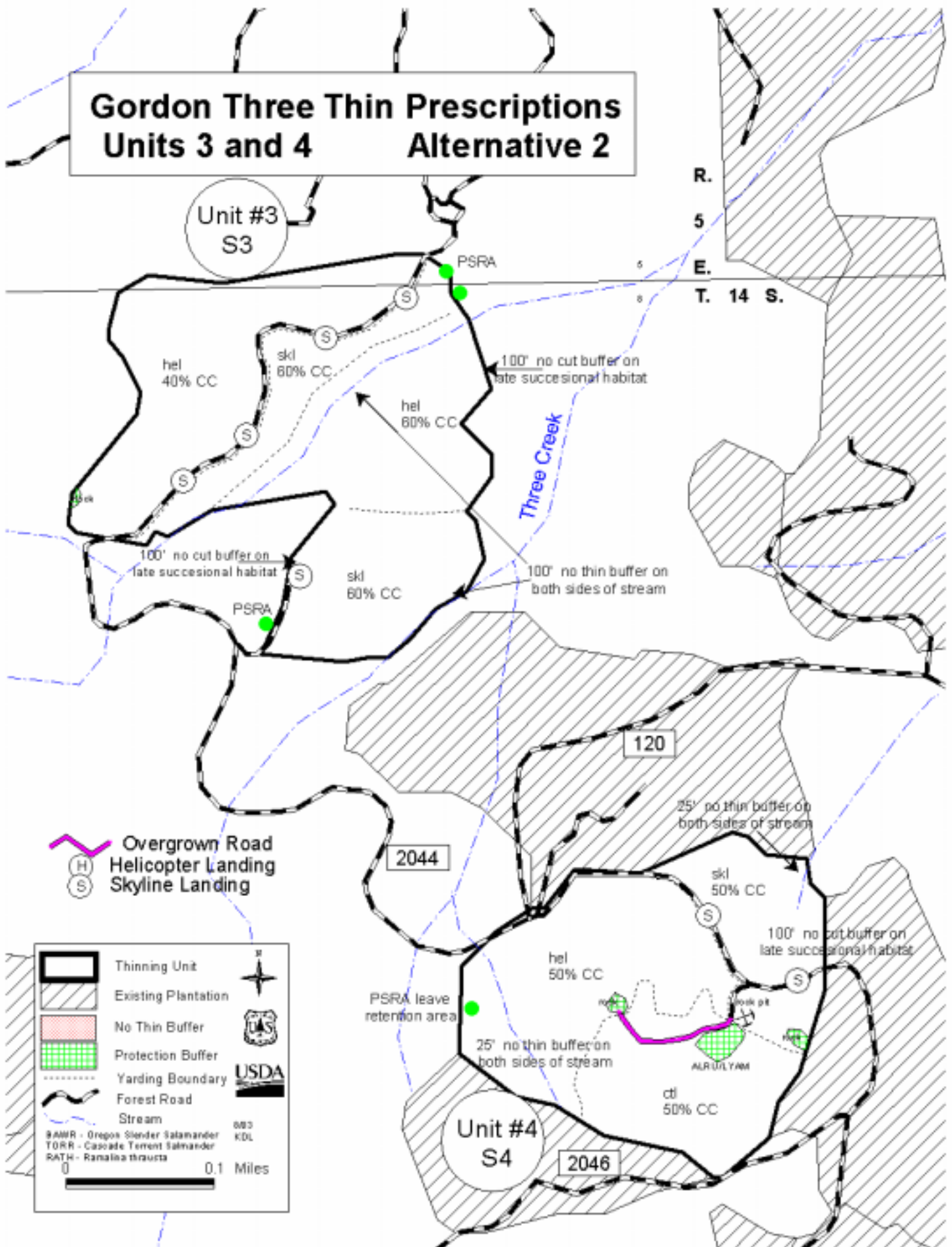
- **Canopy Closure:** 60% and 40%. The riparian reserve area for the two streams within the unit has a 60% target canopy closure because they feed directly into the South Santiam below the fish barrier. The rest of the unit has a 40% target canopy closure.
- **% Retention/Release:** The unit will have 10% in retention areas (RA) and 10% in dominant tree release (DTR) areas of ¼ acre in size, 66 feet radius slope distance. 10% will be 4 areas per ten acres of unit. May group RA.
- **Logging Method:** An area north of forest road 208 will be skyline logged with one end suspension. The area south of the road will be split between helicopter yarding to the west and a ground-based system to the east. The yarding boundary will be the edge of the bench located in the eastern half of the unit. Two skyline landings are recommended to prevent yarding through the riparian area.
- **Buffers:** There is an area that is dominated by red alder and skunk cabbage that will be buffered just north of the road; most is within no-thin buffer (see map).
 - Stream no-thin buffers are located on map. They are 50' on both sides of the stream for 100' of total buffer north of the road and 25' for 50' total south of the road (see map).

Unit #2

- **Canopy Closure:** 60% and 40%. The riparian area for the two streams within the unit has a 60% target canopy closure target because they feed directly into the South Santiam below the fish barrier. Because 172' takes out most of the area between the two streams we will maintain the 60% target CC between the streams. The rest of the unit has a 40% target canopy closure.
- **% Retention/Release:** The unit will have 10% in retention areas and 10% in dominant tree release areas of ¼ acre in size, 66 feet radius slope distance. 10% will be 4 areas per ten acres of unit.
- **Logging Method:** The area north of forest road 208 and east of the stream will be skyline logged with one end suspension. The area west of the interior stream (see map) and the area south of the road will be helicopter logged. The area north of the eastern stream will need to be fully suspended by skyline or helicopter logged.
- **Buffers:** There is a rock located at the southern most tip of the unit at the head of the stream (see map). This area will be excluded from the thinning unit.
 - There is one survey and manage species that will require a retention area location near the western boundary (see map).
 - Stream no-thin buffers are located on map. They are 50' on both sides of the stream for 100' of total buffer north of the road and 25' for 50' total south of the road (see map).

Units 1 and 2

- The helicopter logging within the units will be flown to a landing on an old spur road within a young plantation between the units on the north side of the road (see map).

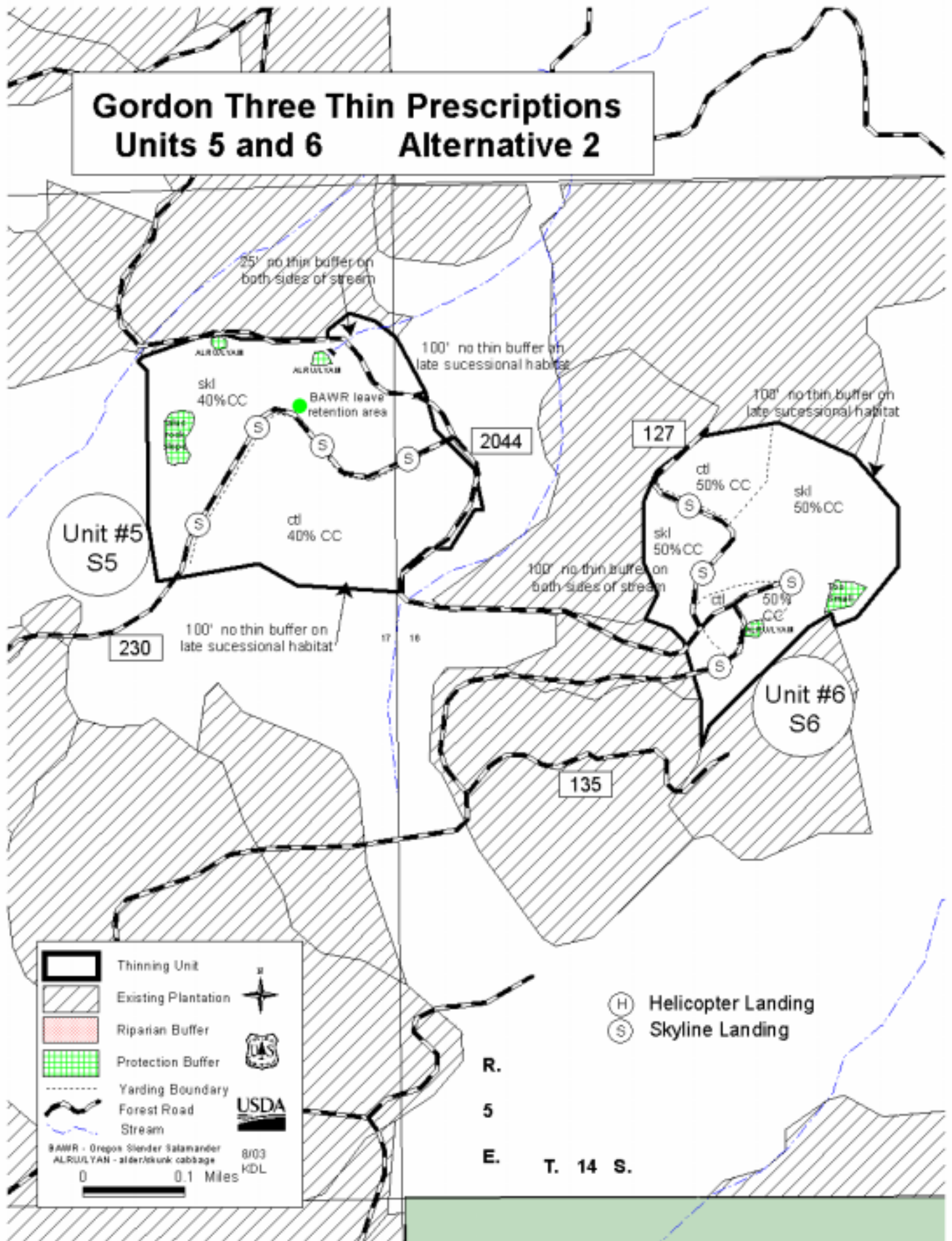


Unit #3

- **Canopy Closure:** 60% and 40%. The unit has a 40% target canopy closure north of forest road 2044. This area will be helicopter logged to road 2044. The rest of the unit has a target canopy closure of 60% due to the proximity of the two forks of Three creek. These streams are fish bearing. A no-thin buffer of 100' on each side of the stream for a total of 200' will be implemented on both streams within the unit.
- **% Retention/Release:** The unit will have 10% retention areas and 10% in dominant tree release areas of ¼ acre in size, 66 feet slope distance. May group RA.
- **Logging Method:** The area north of forest road 2044 will be helicopter logged to the skyline landings shown on map. The strip between road 2044 and the west fork of Three Creek as well as the area in the south shown on the map will be skyline logged with one end suspension. There is an area south of the west fork of Three Creek and north of the skyline yarding that will be helicopter logged. This area will be 40% in DTR to achieve the 60% canopy closure. That means there will be 16 DTR for each ten acres of unit but no other thinning.
- **Buffers:** There will be a buffer of 100' slope distance on the late successional habitat to the northeast and along the southwest boundary (see map). The buffer will additionally protect the three survey and manage species sites within the unit (see map). A skyline landing will be placed within the southwest buffer on the end of an existing road. Locate landing to minimize impacts to the buffer. No dominant tree release areas should be placed within 100' of the unit boundary.
 - There is one area of rock that will be excluded from the thinning unit (see map).

Unit #4 (In the Three Creeks Old-growth Grove)

- **Canopy Closure:** 50%. This unit has a target canopy closure of 50% throughout.
- **% Retention/Release:** The unit will have 20% retention areas and 20% in dominant tree release areas of ¼ acre in size, 66 feet slope distance. May group RA.
- **Logging Method:** The northwest portion of the unit is shown as helicopter yarding. The unit is within the Three Creeks Old-growth Grove where road building is discouraged by the current management plan. Red alder closes the main spur. The spur will need to be reopened for the ground-based yarding system. The southern portion of the unit is planned for a ground-based yarding system (see map). The area to the northeast of road 2044 is planned for skyline logging. There is a small area of downhill skyline east of the rock pit.
- **Buffers:** The streams within the unit will have a 25' no-thin buffer on both sides for a total of 50 feet buffer width (see map).
 - There are two areas of rock that will be excluded from the thinning unit (see map).
 - There is a wet area of LYAM/ALRU above the old rock pit that will be excluded from thinning.

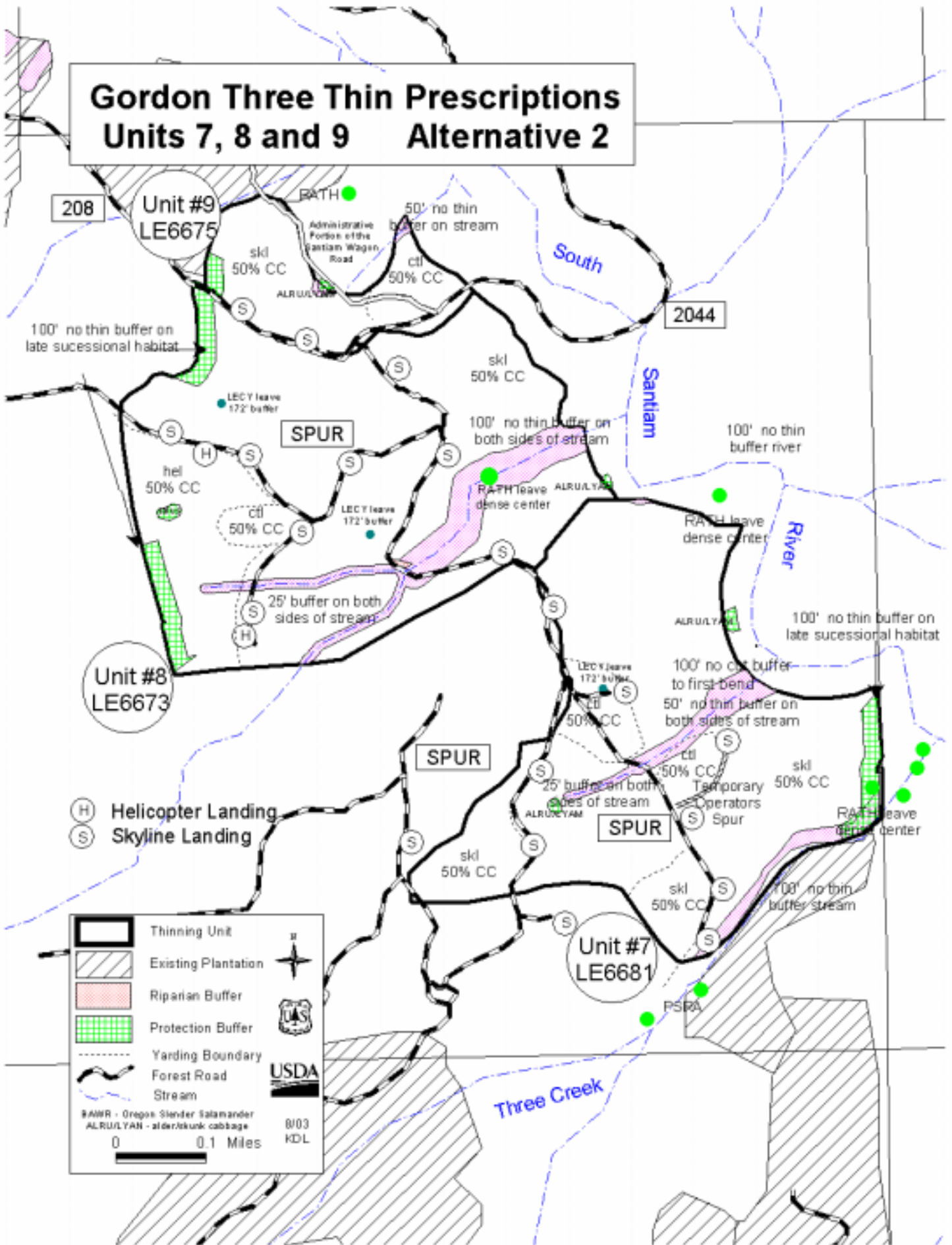


Unit #5 (In the Three Creeks Old-growth Grove)

- **Canopy Closure:** 40%. This unit has a target canopy closure of 40% throughout.
- **% Retention/Release:** The unit will have 20% retention areas and 20% in dominant tree release areas of ¼ acre in size, 66 feet slope distance. Eight per ten acres. May group RA.
- **Logging Method:** The area north of road 2044 is planned for skyline logging. The southern portion of the unit is planned for a ground-based yarding system (see map).
- **Buffers:** The stream within the unit will have a 25' no-thin buffer on both sides for a total of 50 feet buffer width. The stream is only in the unit for about 50 feet, it begins at an area of ALRU and LYAM that will be excluded from the unit. There is another area of ALRU/LYAM that will be excluded just south of road 2044 (see map).
 - There is an area of rock that will be excluded from the thinning unit in the western portion (see map).
 - There is a 100' no-thin buffer on the western and southern boundary as well as a short buffer of the same size in the northwest corner of the stand (see map). The buffer will protect the late successional habitat outside the unit
 - There is one survey and manage species that will need a retention area for protection (see map).

Unit #6 (In the Three Creeks Old-growth Grove)

- **Canopy Closure:** 50%. This unit has a target canopy closure of 50% throughout.
- **% Retention/Release:** The unit has no retention areas and dominant tree release areas. The unit is on an exposed ridge and we do not want to take the chance of windfall.
- **Logging Method:** The northwest portion of the unit is shown as ground-based logging as well as a small area near forest road 127 (see map). The rest of the unit is planned for skyline logging.
- **Buffers:** There is a 100' buffer of the late successional habitat to the east of the unit.
 - There is a small LYAM/ALRU area just east of road 127 that will be excluded from the unit.
 - There is an area that will be excluded because it is not of merchantable timber size at this time (see map).



Unit #7

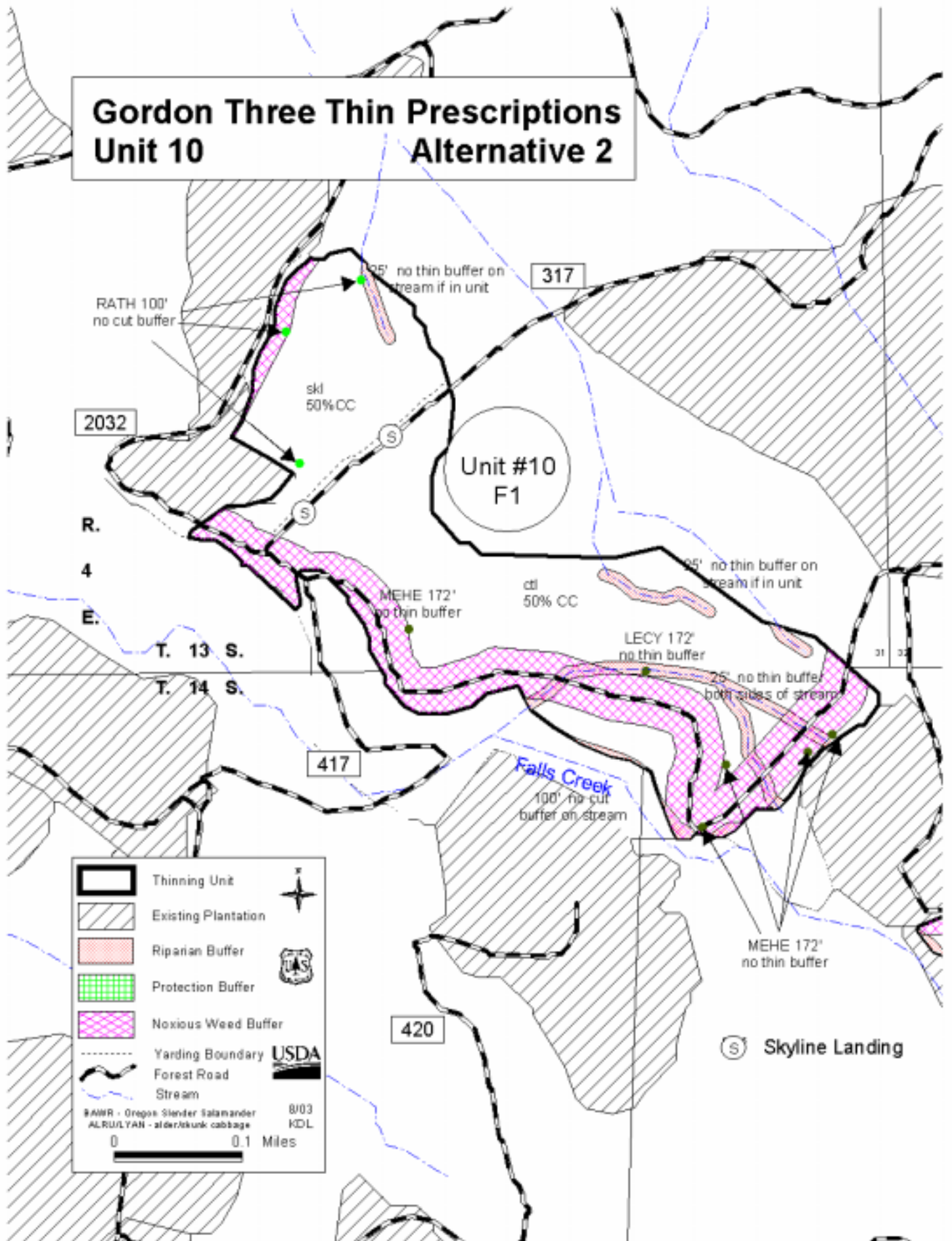
- **Canopy Closure:** 50%. This unit has a target canopy closure of 50% throughout.
- **% Retention/Release:** The unit will have 10% retention areas and 10% in dominant tree release areas of ¼ acre in size, 66 feet slope distance. May group RA.
- **Logging Method:** The south portion of the unit is planned for skyline logging down hill to the end of the spur. There are also three small areas of ground-based logging along forest road 2044 and the spur (see map). The rest of the unit is planned for skyline logging.
- **Temporary Road:** A 650' temporary operators spur will be constructed using native materials and subsoiled and seeded with native grasses upon completion. The existing spur is closed and the culverts have been removed; the spur will need to be reopened and temporary culverts installed.
- **Buffers:** There is a 100' buffer of the late successional habitat to the east of the unit.
 - There is a small LYAM/ALRU area just east of road 2044 that will be excluded from the unit.
 - Three Creeks and the South Santiam River will have a 100' no-thin buffer where they are adjacent to the unit. The interior stream will have a 50' buffer on either side east of road 2044 and 25' to the west. The first leg of the stream up from the South Santiam will also have a 100' buffer to the first bend (see map).
 - There is a PSRA located south of the unit, if the buffer for Three Creeks doesn't give it 100' of no-thin buffer the buffer needs to extend into the unit.
 - There is a LECY that will need a 172' radius no-thin buffer near the junction of 2044 and the spur. This LECY could make the landing unusable check location with botanist.

Unit #8

- **Canopy Closure:** 50%. This unit has a target canopy closure of 50% throughout.
- **% Retention/Release:** The unit will have 10% retention areas and 10% in dominant tree release areas of ¼ acre in size, 66 feet slope distance. May group RA.
- **Logging Method:** The southwest portion of the unit is planned for helicopter logging except for a small area ground-based logging (see map). The rest of the unit is planned for skyline logging.
- **Buffers:** There is a 100' buffer of the late successional habitat to the west of the unit.
 - A small LYAM/ALRU area on the eastern boundary will be excluded from the unit.
 - The South Santiam River will have a 100' no-thin buffer where they are adjacent to the unit. The interior stream will have a 100' buffer on either side east of road 2044 and 25' to the west.
 - Two LECY sites will need a 172' radius no-thin buffers west of road 2044 (see map).

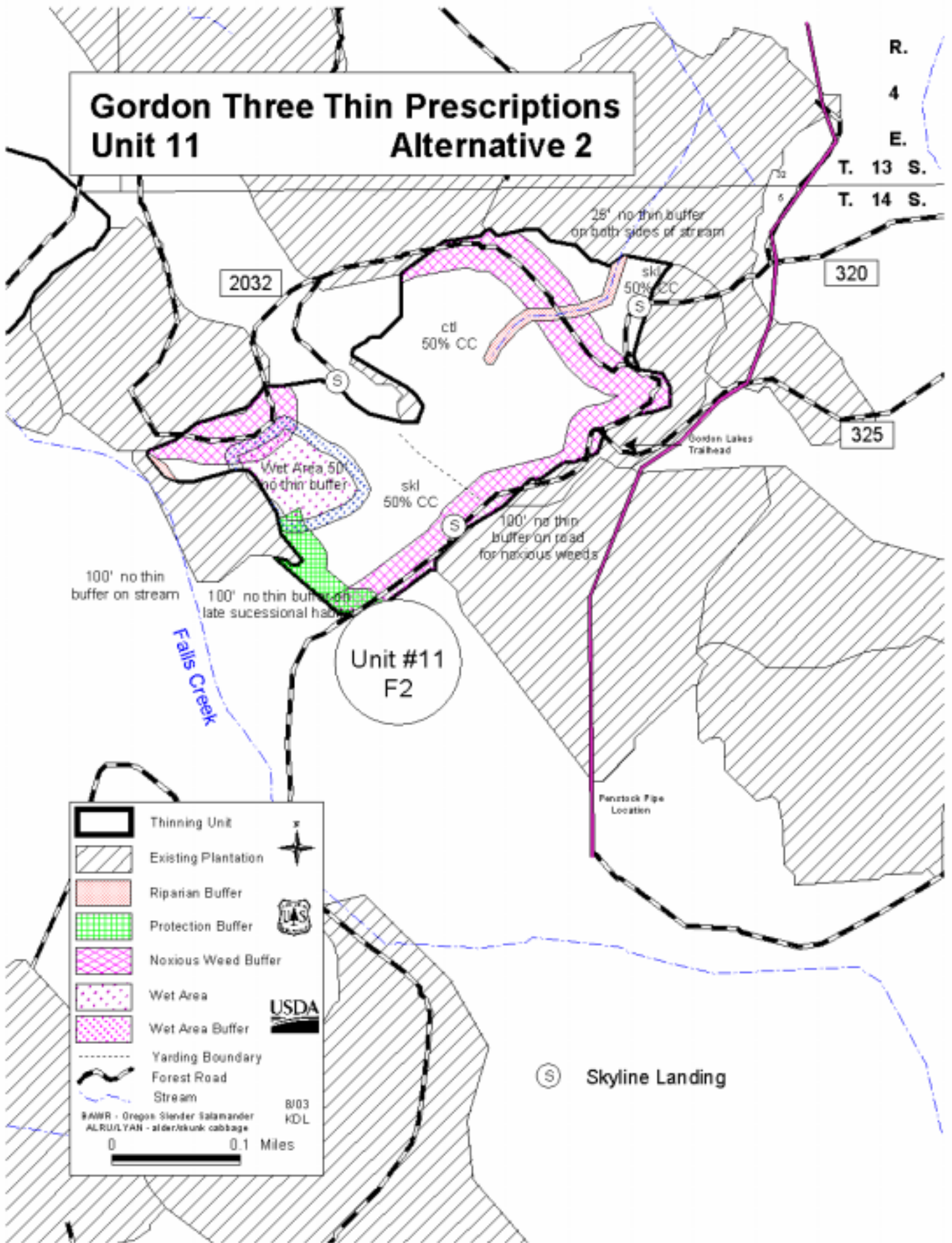
Unit #9 (North of Roads 2044 and 208)

- **Canopy Closure:** 50%. This unit has a target canopy closure of 50% throughout.
- **% Retention/Release:** The unit has no retention areas and dominant tree release areas. The unit is adjacent to the administrative portion of the Santiam Wagon Road.
- **Logging Method:** The western portion of the unit is planned for skyline logging. The area east of the wagon road will be ground-based logged, do not use the wagon road for logging.
- **Buffers:** There is a 100' buffer of the late successional habitat to the west of the unit. There is a small LYAM/ALRU area just south of the wagon road that will be excluded from unit.



Unit #10

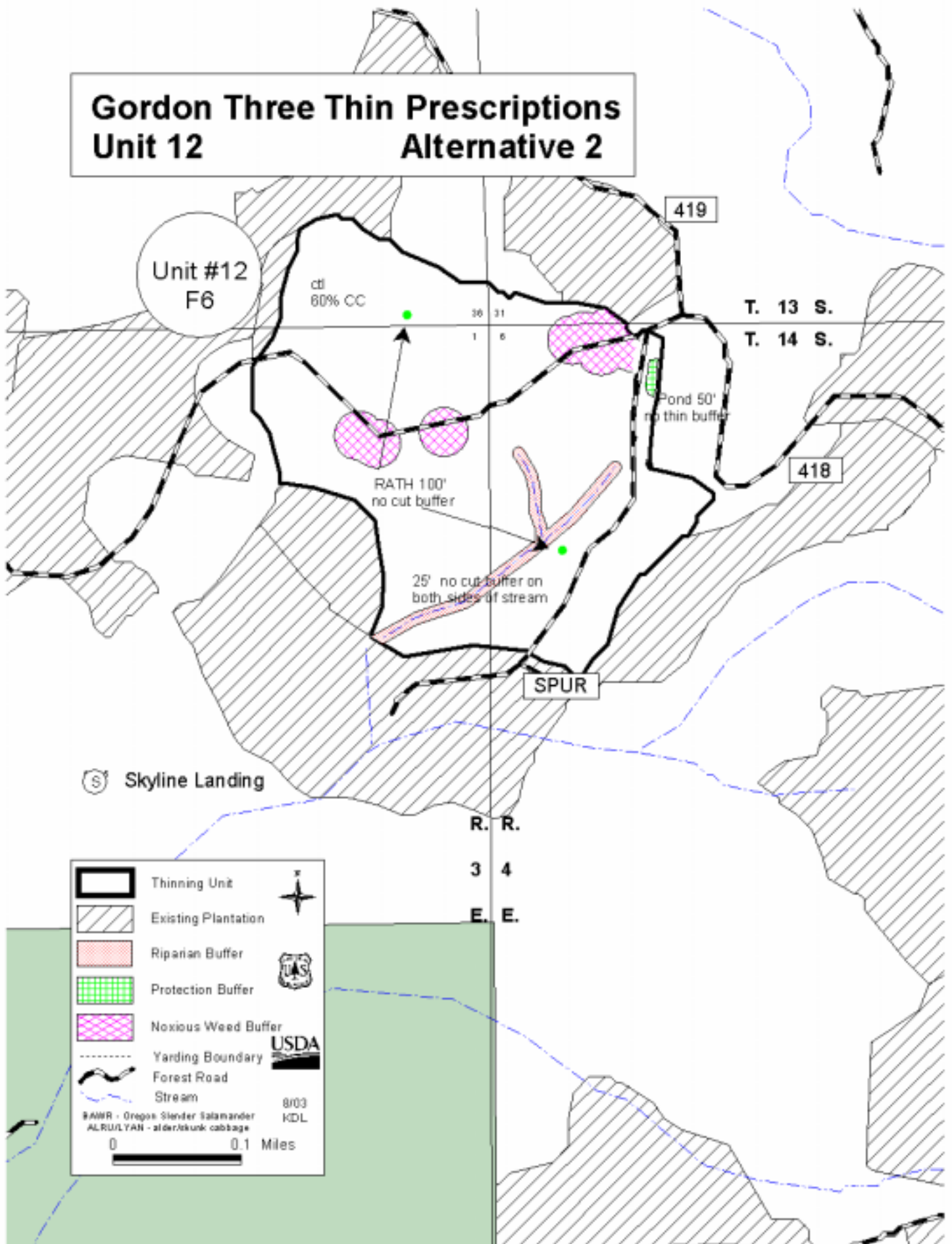
- **Canopy Closure:** 50%. This unit has a target canopy closure of 50% throughout.
- **% Retention/Release:** The unit will have no retention areas and 10% in dominant tree release areas of ¼ acre in size, 66 feet slope distance. The buffers within the unit exceed 10% of the area in retention.
- **Logging Method:** The area west of road 317 is planned for skyline logging. The rest of the unit will be ground-based logged.
- **Buffers:** The stream north the unit will have a 25' no-thin buffer if it extends into the unit. Falls Creek is adjacent to the south boundary of the unit; it will have a 100' no-thin buffer.
 - There are locations of two noxious weeds within the unit. Himalayan blackberry and false brome exist adjacent to road 2032. A no-thin buffer of 100' along the entire length of the road within the unit is planned for protection. In addition one location of false brome extends past the 100' buffer near the LECY location, this will need additional buffer width. We need to locate any skid roads to miss the areas of noxious weeds to minimize spread.
 - There is one LECY location within the unit that will need a 172' diameter no-thin buffer (see map).
 - A stream in the northeast corner of the unit will have a 25' no-thin buffer on both sides for a total of 50'.
 - Another stream is located near the northeast boundary, check to see if it is within the unit, if it is it will have a no-thin buffer of 25'.
 - The stream located near the weed buffer will have a 25' no-thin buffer on both sides. The area between the stream and weed buffer may need to be dropped.



Unit #11

- **Canopy Closure:** 50%. This unit has a target canopy closure of 50% throughout.
- **% Retention/Release:** The unit will have no retention areas and 10% in dominant tree release areas of ¼ acre in size, 66 feet slope distance. The buffers within the unit exceed 10% of the area in retention.
- **Logging Method:** The area southwest with the unit is planned for skyline logging. The northeast portion of the unit is planned for a ground-based yarding system (see map).
- **Buffers:** The stream within the unit will have a 25' no-thin buffer on both sides for a total of 50 feet buffer width. Falls Creek is adjacent to the south boundary of the unit; it will have a 100' no-thin buffer.
 - There are locations of one noxious weed within the unit. False brome exists adjacent to road 2032. A no-thin buffer of 100' along the entire length of the road within the unit is planned for protection. We need to locate any skid roads to miss the areas of noxious weeds to minimize spread.
 - The southern boundary of the unit is adjacent to late successional forest and will need a 100' no-thin buffer.
 - The penstock pipe lays to the east of the unit and will need to be avoided by all large equipment for protection. The area east of the spur could be added into the unit, it does not involve the penstock because it is buried in the road. If heavy equipment goes over the spur road above the penstock a heavy metal plate (or equivalent) must be placed over the spur/penstock as a bridge for protection.
 - A wet area in the western portion of the unit will be excluded from thinning. A no-thin buffer of 50' around the wet area is planned.

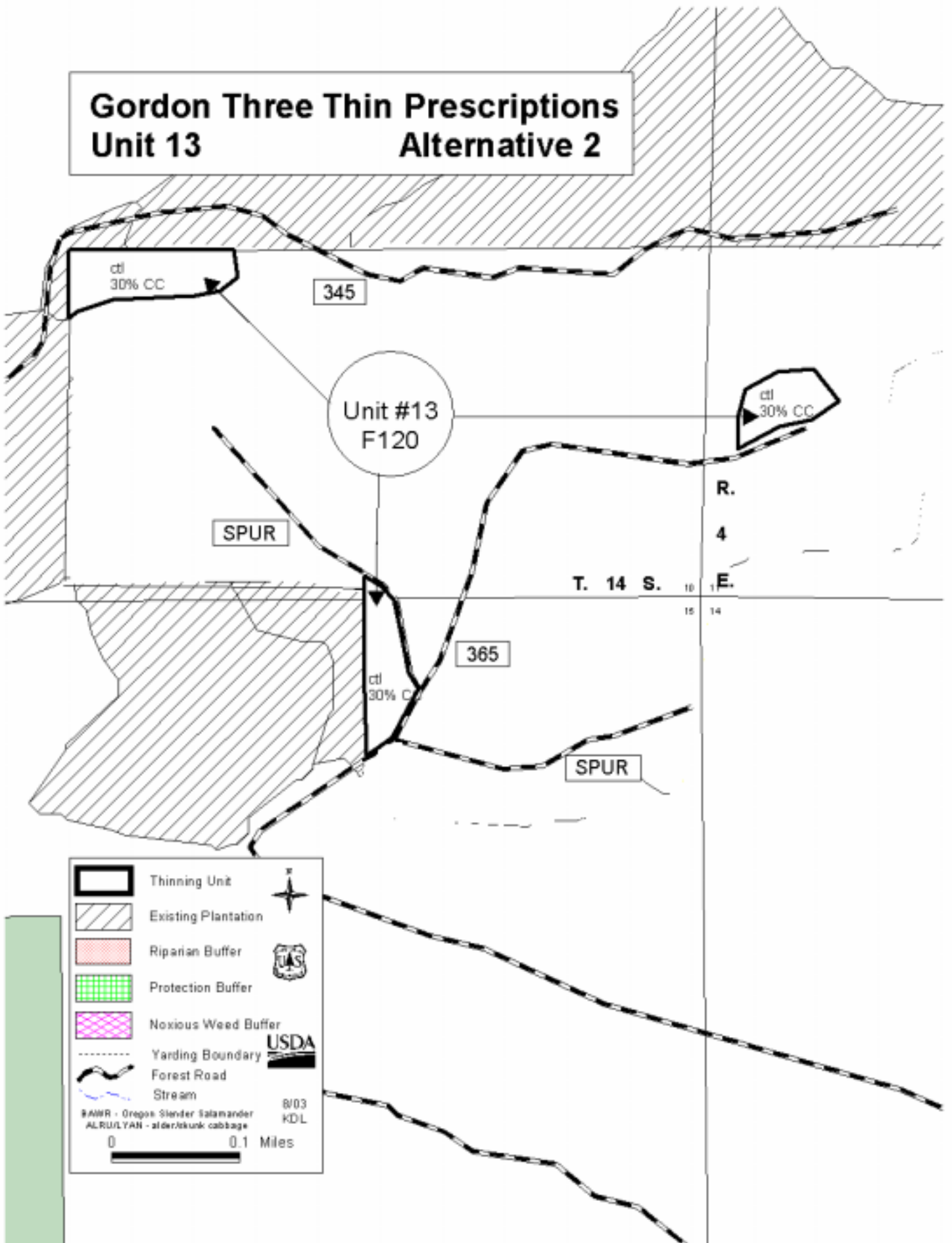
Gordon Three Thin Prescriptions Unit 12 Alternative 2



Unit #12 (Adaptive Management Area)

- **Canopy Closure:** 60%. This unit has a target canopy closure of 60% throughout.
- **% Retention/Release:** The unit will have 10% retention areas of ¼ acre in size, 66 feet slope distance and no dominant tree release areas. **Logging Method:** The unit is planned for a ground-based yarding.
- **Buffers:** The stream within the unit will have a 25' no-thin buffer on both sides for a total of 50 feet buffer width.
 - There are locations of two noxious weeds within the unit. Himalayan blackberry and false brome exist adjacent to road 418. The sites will have a no-thin buffer of 100' (see map). We need to locate any skid roads to miss the areas of noxious weeds to minimize spread.

**Ramalina thrausta* (RATH) was dropped as a Survey and Manage Species in January of 2004 because it was found to be more abundant than expected. The majority of the Gordon Three Thin Environmental Analysis was completed but not finalized. The general prescription for this unit will stay the same, however, only the Known Site Survey plot will have a buffer and be protected from thinning. This plot has individual thalli physically marked with tags on nails. This site is located just south of Road 418 and the first spur into Unit 12.



Unit #13

- **Canopy Closure:** 40%. This unit has a target canopy closure of 40% throughout.
- **% Retention/Release:** No retention areas and dominant tree release areas are planned. The prescription for this unit is to select noble fir to provide future large diameter trees as hosts for *Bridgeoporous nobilissimus*.
- **Logging Method:** The unit is planned for a ground-based yarding.
- **Buffers:** No buffers are planned.

Table 3: Alternative 3

Units	Tot. Ac.	Buffer Ac: RR, S&M LS, SH, Weeds	Thin Ac.	TPA Reten.	Target% Canopy Closure	RA/DTR Areas in % of Unit	Skl. Ac.	Grd Ac.	Hel. Ac.	Addl. CWD& Snags	Est MBF /Ac	Est.Total Remove MBF
1	27	RR; TORR; ALRU/LYAM -Total 6ac	17	70	40%	10%ea RA/DTR	7	10	0	10	12 Avg.	204
2	38	RR; Rock BAWR; -Total 10ac	15	70	40%	10%ea RA/DTR	14	1	0	10	11 Avg.	165
3	60	RR; LS; PSRA -Total 13ac	29	110	60%	10%ea RA/DTR	29	0	0	10	8 Avg.	232
4	51	RR; ALRU/LYAM; Rock/LS; Rock pit; -Total 3ac	48	90	50%	20%ea RA/DTR	30	18	0	10	10 Avg.	480
5	44	RR+ALRU/ LYAM; LS; BAWR -Total 7ac	37	70	40%	20%ea RA/DTR	18	19	0	10	10 Avg.	370
6	30	ALRU/LYAM; LS; Trees too small -Total 2ac	28	90	50%	None	18	10	0	10	8 Avg.	224
7	92	RR; LS; ALRU/LYAM; LECY -Total 16ac	76	90	50%	10%ea RA/DTR	60	16	0	10	12 Avg.	912
8	97	RR; LS; Rock LECY; ALRULYAM -Total 14ac	59	90	50%	10%ea RA/DTR	53	6	0	10	12 Avg.	708
9	17	LS; RR ALRU/LYAM -Total 1ac	16	90	50%	None	9	7	0	10	12 Avg.	192
10	55	RR; BRSY; LECY; -Total 17ac	38	90	50%	10% DTR only	6	32	0	10	13 Avg.	494
11	37	RR; LS; BRSY -Total 12ac	25	90	50%	10% DTR only	11	14	0	10	11 Avg.	275
12	48	RR; BRSY; -Total 7ac	41	110	60%	10% RA only	0	41	0	10	5 Avg.	205
13	50	BRNO -Total 42ac	8	70	40%	None	0	8	0	10	16 Avg.	128
<i>Total</i>	646		437				255	182	0		11 Avg.	4589

All acres are estimates. RR – Riparian areas w/in Riparian Reserves that have no-thinning; ALRU/LYAM – red alder/skunk cabbage; S&M – Survey and Manage; LS – Late-Successional; SH – Special Habitats; Grd., Skl., & Hel.= Ground, Skyline and Helicopter based logging systems; LECY-Leptogium cyanescens; BRSY=false brome; BAWR = Oregon Slender Salamander; TORR=Torrent Salamander; BRNO= Bridgeporus nobilissimus; PSRA=Pseudocypbellaria rainierensis; DTR=Dominant Tree Release; RA= Retention Areas.

Appendix B: Knutson-Vandenberg Collections

The Knutson-Vandenberg Act of June 9, 1930 (ch.416,46 Stat. 527, as Amended:16 U.S.C. 576-576b)

"...protecting and improving the future stand productivity of the renewable resources of the forest land on such sale area, including sale area improvement operation, maintenance and construction, reforestation and wildlife habitat management."

Timber Stand Improvement (TSI)

The following timber stand improvement treatments are prescribed for the units listed below in accordance with the Forest Plan.

Tree planting with native species is planned to improve structure and diversify stand age and species.

In the areas of dominant tree release planned within the thinning units western redcedar and western white pine will be planted. Western hemlock and Douglas-fir seed in are expected. All thinning units except 6, 9, 12 and 13 will have DTR areas.

In Units 10, 11 and 12; trees will be planted within 33 feet of road 2032 and road 2032418. There are areas of false brome and Himalayan blackberry along the road. To shade the noxious weed and prevent spread into the thinned unit another canopy layer will be planted. The units will not be thinned in these areas so only the first 33' should have enough diffused light from the road prism to promote understory development.

Precommercial thinning is prescribed to enhance species diversity, prolong early seral stage stand structure, increase growth rate of dominant trees, and reduce stand densities to Regional and Forest guidelines. See table and map below for managed stand information and location of precommercial thinning opportunities.

Pruning is prescribed on approximately 70 trees per acre of the future crop trees to increase stand structural diversity and increase value of clear wood on any pruned trees that are harvested in the future. See the following Table 1 and TSI map for managed stand information and location of pruning opportunities. No pruning will be completed on units that are of the right age and species composition within the LSR. No final removal is planned within the LSR so the investment would not be recaptured in the future.

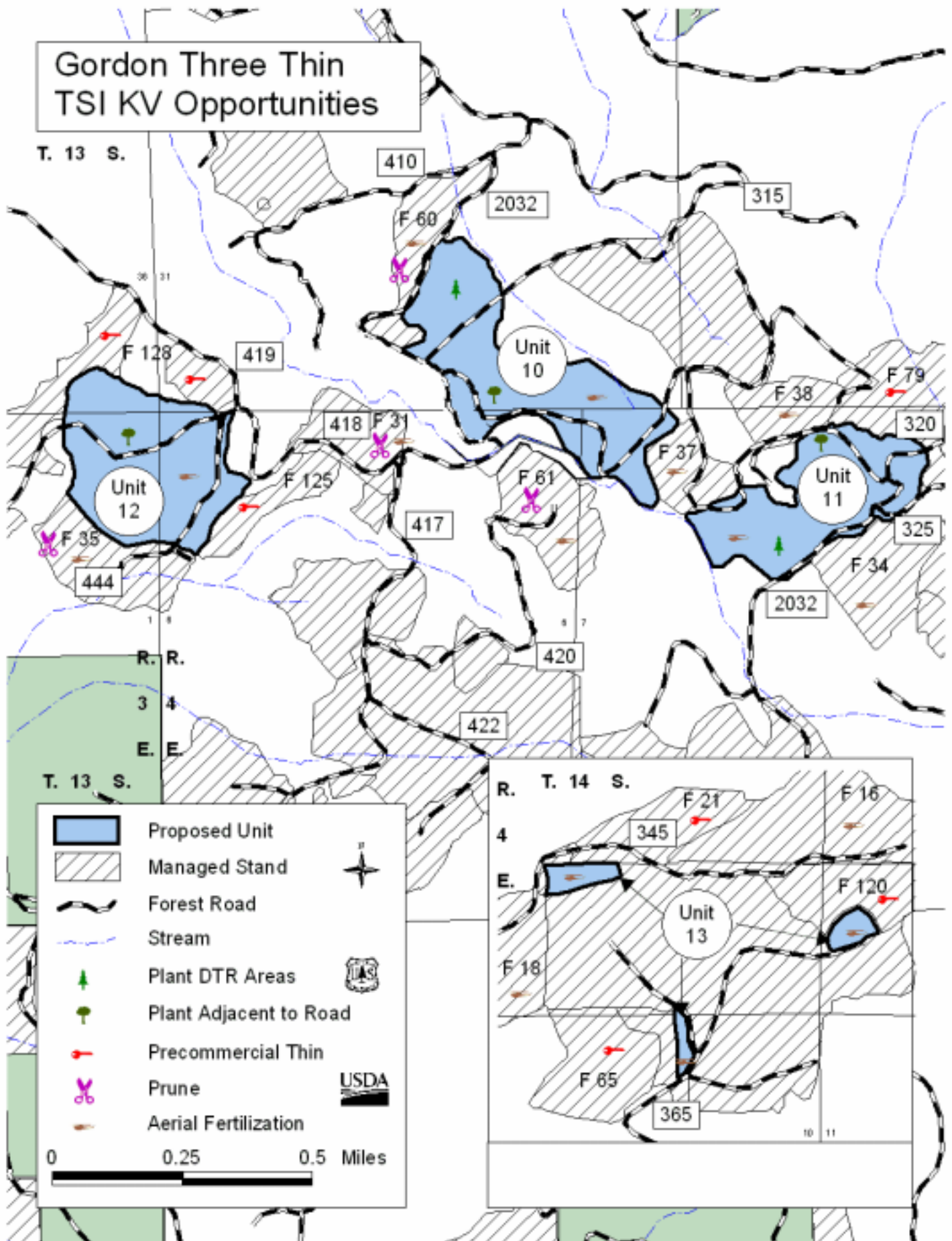
Aerial fertilization is prescribed at a rate of approximately 440 lbs. per acre, according to Regional and Forest guidelines. Fertilization will increase tree growth and improve forage conditions for wildlife. See the following Table 1 and TSI map for managed stand information and location of aerial fertilization opportunities. No fertilization is planned for units within the Three Creeks Old Growth Grove except those portions of proposed commercial thinning. Areas of fertilization above 3000 feet have been surveyed for *Bridgeoporus nobilissimus*.

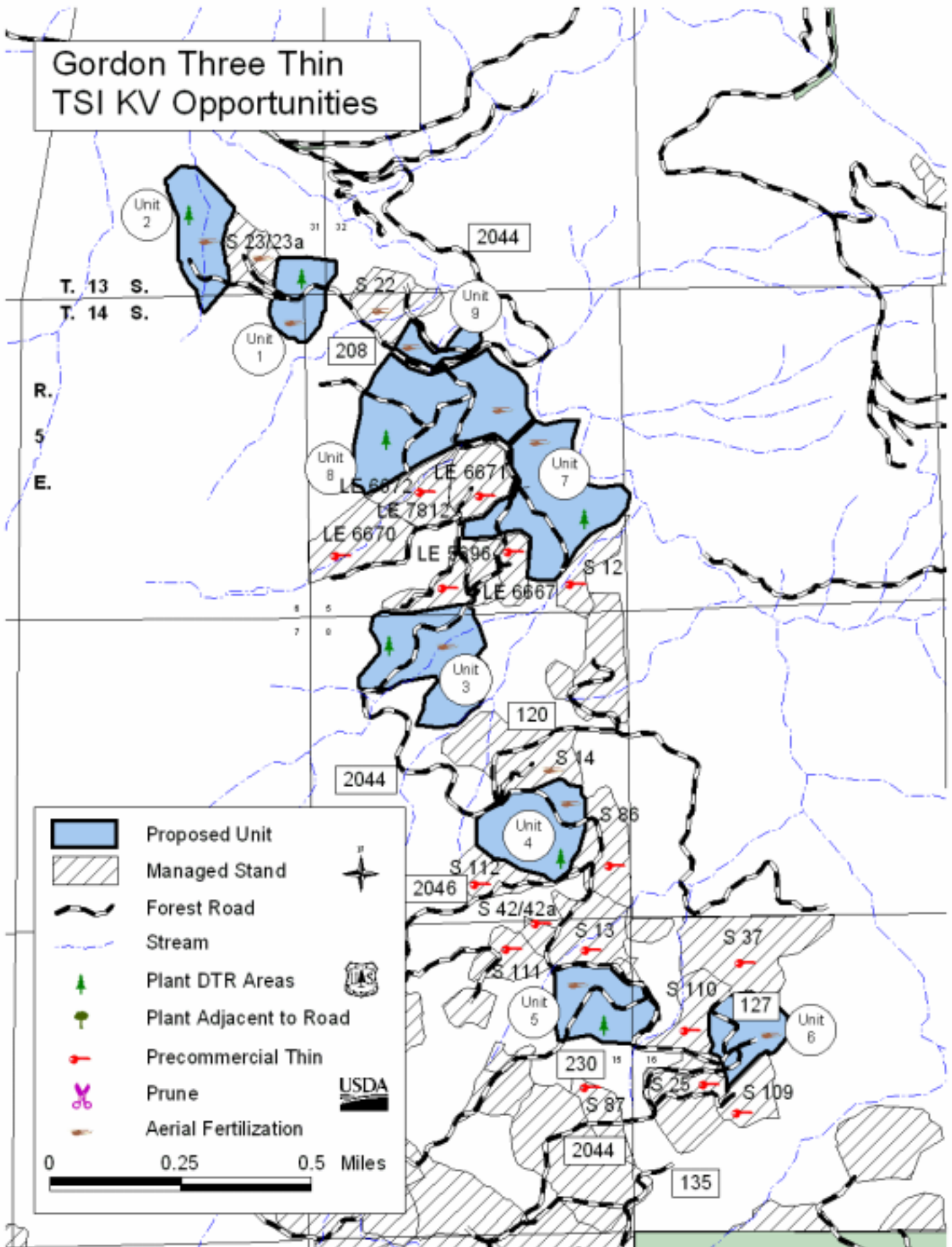
Treatment	Thinning Unit	Ref Number	Acres	Alternative
Tree Planting in DTR \$520 per acre	1	S1	Alt2 Alt3 2.4 1.8	50 acres of DTR in Alternative 2 \$26,000 41 acres of DTR in Alternative 3 \$21,320
	2	S2	2.8 1.3	
	3	S3	4.7 2.9	
	4	S4	9.2 9.2	
	5	S5	7.2 7.2	
	7	LE 6681	7.6 7.6	
	8	LE 6673	8.7 6.3	
	10	F1	3.4 3.7	
	11	F2	2.4 2.6	
Tree Planting Adjacent to Roads for noxious weed control \$520 per acre	10	F1	7	14 acres in Alternatives 2 and 3 \$7,280
	11	F2	4	
	12	F6	3	
Precommercial Thinning \$205 per acre	4	S86	27	483 acres in Alternatives 2 and 3 \$99,015
		S112	14	
	5	S13	25	
		S42/42a	6	
		S87	18	
		S111	18	
	6	S25	3	
		S37	52	
		S109	16	
S110		17		
7	S12	10		
	LE6667	12		
	LE5696	25		
8	LE6670	42		
	LE6671	30		
	LE7812	18		
11	F79	30		
12	F125	11		
	F128	35		
13	F21	16		
	F65	21		
	F120	37		
Pruning \$238 per acre	10	F31	14	91 acres in Alternatives 2 and 3 \$21,658
		F60	19	
		F61	24	
	12	F35	34	

Aerial Fertilization	1	S22	14	Alternative 2 491 acres at \$110/acre \$54,010
	2	S23/23a	31	
	4	S14	51	
	10	F31 F60 F61	14 19 24	Alternative 3 437 acres at \$110/acre \$48,070
	11	F34 F37 F38	18 11 12	314 acres of adjacent managed stands in Alternatives 2 and 3 \$34,540
	12	F35	34	
	13	F16 F18	39 47	Total Alt 2 \$88,550
				Total Alt 3 \$82,610

Table 2: TSI needs by Alternative

	Alternative 2	Alternative 3
Tree Planting	\$33,280	\$28,600
Precommercial Thinning	\$99,015	\$99,015
Pruning	\$21,658	\$21,658
Aerial Fertilization	\$88,550	\$82,610
Total	\$242,505	\$231,886





Soil

Processor/Forwarder (ctl) yarding is proposed for portions of all units except 2 and 3. 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 total acres in each unit with ctl yarding. There are 168 acres in Alternative 2 and 177 in Alternative 3 (see alternative chart). Sub-soiling will be completed soon after harvest.

Table 3: Total Soils needs by Alternative

	Alternative 2	Alternative 3
Sub-soiling at \$400 per acre	17 acres	18 acres
Total	\$6,800	\$7,200

Watershed

Structures will be placed in Falls Creek adjacent to Unit 10. Existing logs and boulders will be placed and cabled. Stability within the channel is critical to dissipate energy during peak flows. Structures will also be placed in Three Creek adjacent to Units 3 and 7. To aid in the stabilization of the South Santiam River channel; hardwood and conifer trees will be planted to provide root strength, litter fall, and future large woody material. The structures and riparian planting are not required to mitigate the effect of the planned timber harvest, but will accelerate the recovery of the area to a desired future condition.

Table 4: Total Watershed needs by Alternative

Treatment	Alternative 2	Alternative 3
Structures in Falls Creek adjacent to Unit 10	7 structures at \$600 each for a total of \$4,200	7 structures at \$600 each for a total of \$4,200
Structures in Three Creek adjacent to Units 3 and 7	6 structures at \$600 each for a total of \$3,600	6 structures at \$600 each for a total of \$3,600
Riparian Planting Adjacent to South Santiam River (Units 7 and 9)	10 Acres at \$520 per acre for a total of \$5,200	10 Acres at \$520 per acre for a total of \$5,200
Total	\$13,000	\$13,000

Wildlife

Snags will be created from retained leave trees after logging is completed in all action alternatives. Five trees per acre will be retained for future snag habitat. Topping the larger sized Douglas fir will create an average of five snags per acre. The cost of topping is \$50.00 per tree to be done the year logging will be completed, FY 2006. Topping will include all of the originally harvested acreage.

Five trees per acre will be retained to provide future down wood in areas currently deficient. Most units have sufficient levels of large down wood currently in decay classes 3 - 5. Additional decay class 1 - 2 down wood will be created. Even though it is small diameter, it will benefit species that use this habitat. An average of five trees per acre will be felled in all action alternatives. The cost of falling trees is \$26.00 per tree and should be delayed as long as possible to take advantage of any trees that blow down after logging in FY 2007. Falling for down wood will include all of the originally harvested acreage.

Roads 2044208 and 2044120 will be bermed after logging is complete at the junction with Road 2044 to reduce open road density in elk winter range. Cost of the berm will be \$750.00 each.

The gate at the junction of Roads 2044 and 2046 needs to be upgraded to improve the closure by restricting access. A new magnum gate will be installed. The cost of the gate and installation will be \$1,500, to be replaced after logging is completed.

Table 5: Total Wildlife needs by Alternative

Treatment	Alternative 2	Alternative 3
Tree Topping at \$50 per tree 5 per acre	654 acres \$163,500	654 acres \$163,500
Tree Falling at \$26 per tree 5 per acre	654 acres \$85,020	654 acres \$85,020
Road Berm	\$1,500	\$1,500
Gate Replacement	\$1,500	\$1,500
Total	\$251,520	\$251,520

Botany

Noble Fir Enhancement

Noble fir will be enhanced in a unit adjacent to Unit 13 to provide long-term habitat for *Bridgeoporus nobilissimus*. Existing noble fir in the adjacent managed stand will be individually released. A total of 100 trees will be individually released at a cost of \$20 per tree. In addition, the existing conks will be monitored for persistence.

Noxious Weeds

Ground-disturbing activities, including commercial thinning and road construction and reconstruction, encourage the spread of noxious weeds by increasing light, providing a mineral soil seedbed, and spreading weed seed. Vehicles and logging equipment can inadvertently spread weed seed by carrying it into the area on tires and caked on mud. KV 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).

The cost of noxious weed survey and control is \$6.00/acre for commercial thinning and \$20.00/acre for road construction and reconstruction. Surveys are completed each year for five years following implementation of the sale. In Alternative 2 and 3, 0.1 miles of road will be constructed in Unit 7 and in Alternative 3 an additional 0.2 miles will be constructed in Unit 4. One acre of noxious weed control for Unit 7 and 2 acres for Unit 4 will be needed for road construction. In addition there will be 0.3 miles of road reconstruction in both action alternatives, 3 acres of control needs. Total for Alternative 2 is 4 acres and Alternative 3 is 6 acres.

***Leptogium cyanescans* Monitoring**

Monitoring will be done to determine whether *Leptogium cyanescans* remains in Unit 10. Sampling will occur in the 1st and 5th years after harvest.

Table 6: Total Botany KV Collections by Alternative

	Alternative 2	Alternative 3
Acres Commercially Thinned \$6.00/acre	491 acres, for 5 years \$14,730	437 acres, for five years \$13,110
Acres of Road Reconstruction or Construction \$20.00/acre	4 acres, for 5 years \$400	6 acres for five years \$600
Leptogium cyanescans Monitoring	\$1,000	\$1,000
Noble Fir Enhancement	\$3,000	\$3,000
Totals	\$19,130	\$17,710

Recreation

Dispersed Site Development

Two berms will be created with KV money at the junctions of Roads 2044 and 2044208 and 2044120. Dispersed sites will be developed before the berm to mitigate the loss of sites that were available on the roads before closure. A dispersed site will also be created to mitigate the closure of road 2046. Dispersed sites offer recreational opportunities for less developed campsites. A collection of \$500 per site will be required for a total of \$1,500.

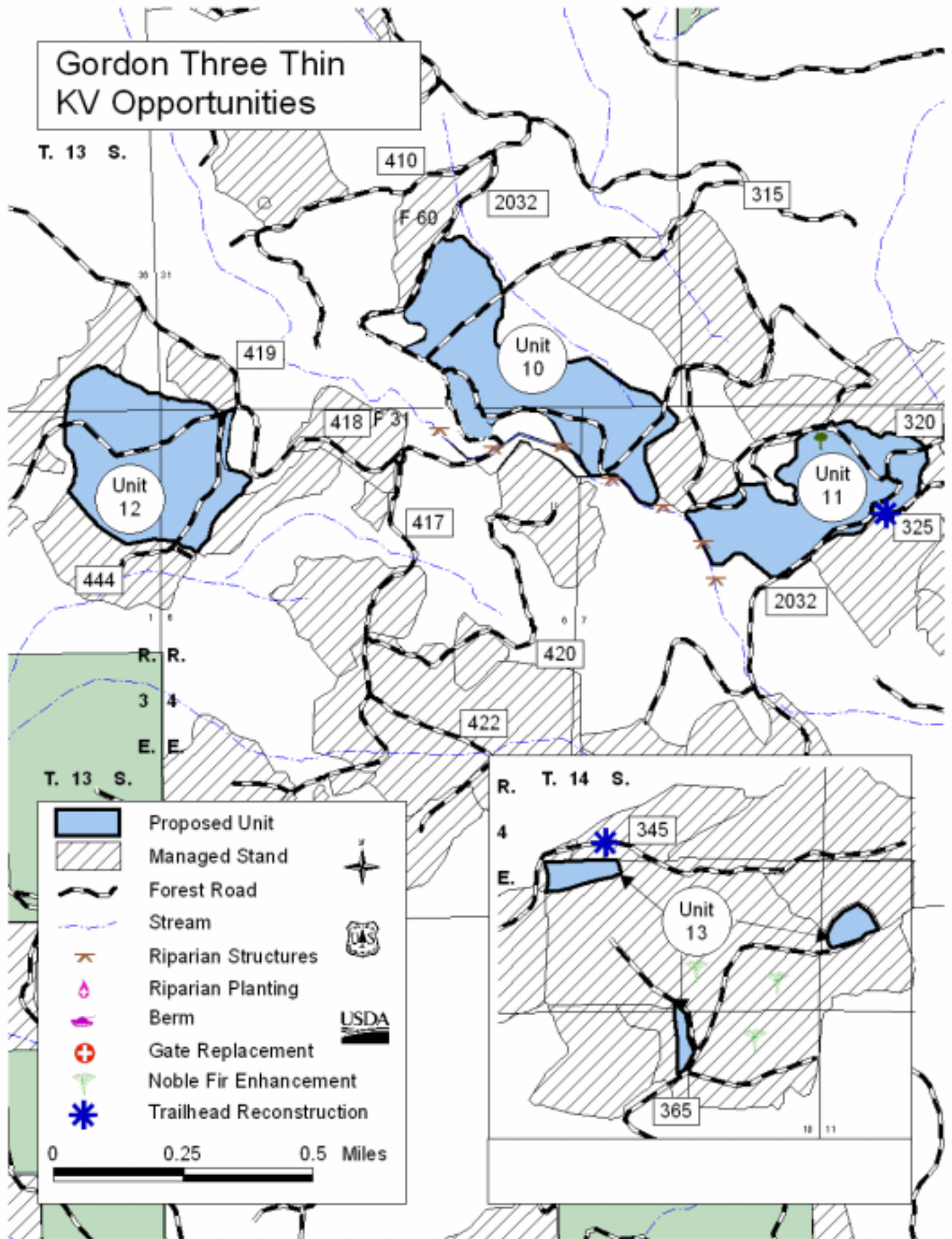
Trailhead Reconstruction

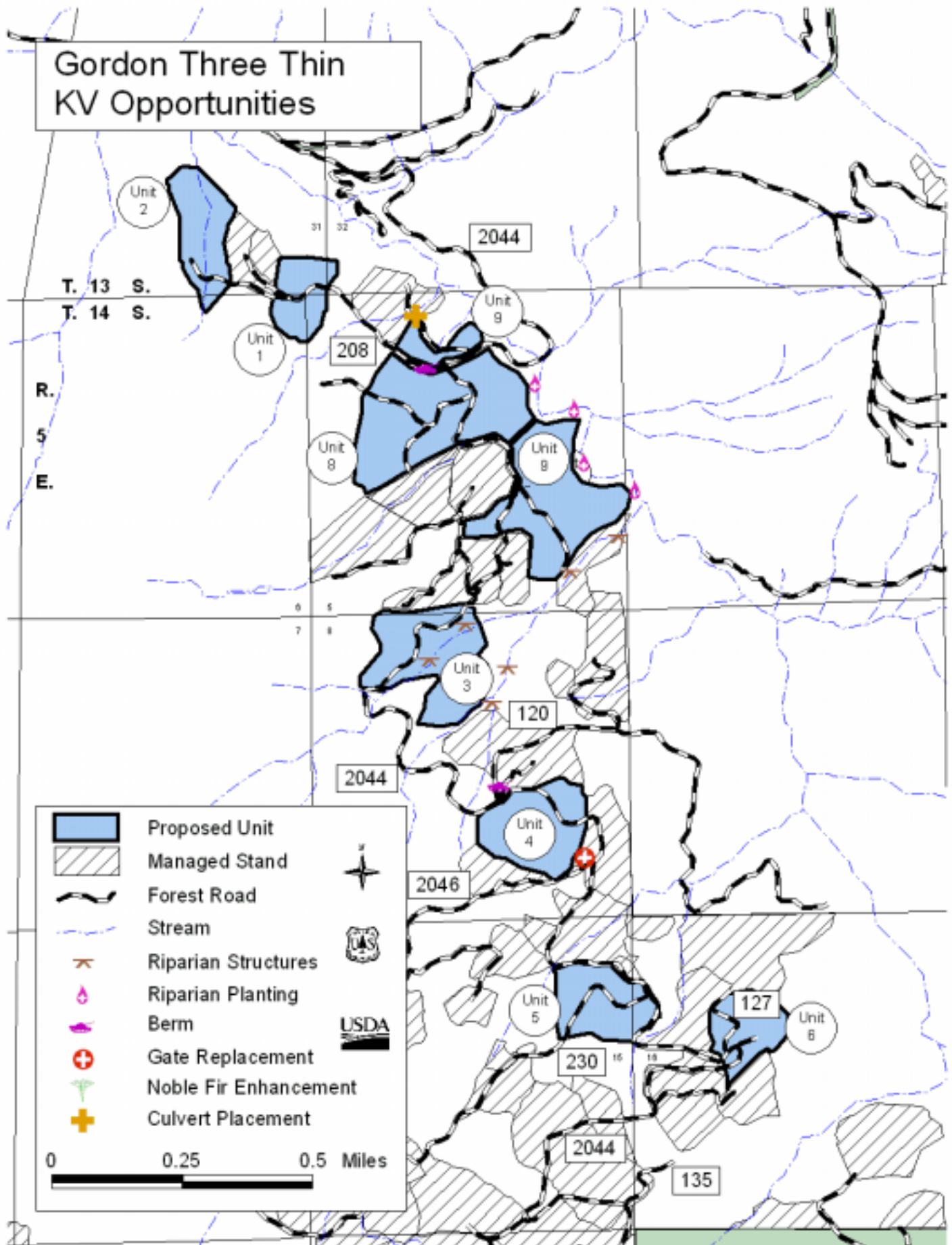
An existing trailhead for the Gordon Lakes trail will be reconstructed after logging is completed at the junction of Road 2032 and 2032325. Total cost for this project is \$1,000.

A collection of \$2,500 will be required for recreation opportunities in Alternative 2 and 3.

Firewood

A collection will be made to provide firewood for public use after the timber sale. The estimated the cost of the collection is \$4,000.





Summary**Table 14: Total KV Needs By Alternative**

	Alternative 2	Alternative 3
Timber Stand Improvement	\$242,505	\$231,886
Soil	\$6,800	\$7,200
Watershed	\$13,000	\$13,000
Wildlife	\$251,520	\$251,520
Botany	\$19,130	\$17,710
Recreation	\$2,500	\$2,500
Firewood	\$4,000	\$4,000
Total	\$542,455	\$530,816

In the event that the proposed timber sale does not generate sufficient funds to cover all the recommended KV projects, the projects will be funded in the following priority:

- 1) Noxious Weeds
- 2) Snag and Down Wood Creation
- 3) Precommercial Thinning of Other Managed Stands
- 4) Planting
- 5) Forage Seeding and Sub-soiling of Skid Roads
- 6) Trailhead Reconstruction
- 7) Berm Road
- 8) Dispersed Campsites Rehabilitation
- 9) Stream and Wetland Structures and Riparian Planting
- 10) Noble Fir Maintenance and Enhancement
- 11) *Leptogium cyanescans* Monitoring
- 12) Fertilize Commercial Thin Stands
- 13) Firewood
- 14) Fertilization of Other Managed Stands
- 15) Pruning of Managed Stands

Appendix C: Economic Analysis

All proposed action alternatives for the Gordon Three Thin 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

	Alternative 2	Alternative 3
Gross Value (\$500/MBF)	5146 MBF * \$500 = \$2,573,000	4589 MBF * \$500 = \$2,294,500
Associated Costs	\$1,368,112	\$1,223,809
Cost/Benefit Ratio	1:2	1:2
Present Value	\$1,204,888	\$1,070,691

Table 2: Logging Costs

	Alternative 2	Alternative 3
Ground-based Logging (\$100 / MBF)	1782 MBF * \$100 = \$178,200	1832 MBF * \$100 = \$183,200
Skyline Logging (\$120 / MBF)	2,327 MBF * \$120 = \$279,240	2757 MBF * \$120 = \$330,840
Helicopter Logging (\$200 / MBF)	1,037 MBF * \$200 = \$207,400	
Totals	\$664,840	\$514,040

Table 3: Road Costs

	Alternative 2	Alternative 3
*Road Maintenance (\$2000 / mile) 23.19 miles	\$46,380	\$46,380
**Road Reconstruction (\$20,000 / mile) 0.15 miles of the 365 spur 0.1 miles of the spur into Unit #4	\$5,000	\$5,000
Rock road 2032 adjacent to the South Santiam River 1.67 miles (\$33,000 / mile for a six inch lift)	\$55,110	\$55,110
Native Surface Operator's Spurs (\$15,000 / mile) 650' in Unit 7 in both alternatives and an additional 900' in Unit 4 in Alternative 3.	\$1,847	\$4,403
Total Road Costs	\$108,337	\$110,893

**Road Maintenance will consist mainly of spot rocking, brush cutback, blade road and clean ditches on gravel roads.*

***Road reconstruction consists of resurfacing the roadbed and adding about four inch lift of rock.*

Table 4: Fuels Treatment Costs

Hand Pile (\$820 / Acre) 2 chains from road				Alternative 2	Alternative 3
Unit 3	Road 2044	0.8 miles	13 acres	\$10,660	\$10,660
Unit 4	Road 2044	0.5 miles	8 acres	\$6,560	\$6,560
Unit 5	Road 2044, 2044230	1.0 miles	16 acres	\$13,120	\$13,120
Unit 6	Road 2044	0.3 miles	5 acres	\$4,100	\$4,100
Unit 7	Road 2044	0.4 miles	6 acres	\$4,920	\$4,920
Unit 8	Road 2044	0.7 miles	11 acres	\$9,020	\$9,020
Unit 9	Road 2044	0.3 miles	5 acres	\$4,100	\$4,100
Unit 10	Road 2032	0.5 miles	8 acres	(100' no cut buffer)	\$6,560
Unit 11	Road 2032	0.7 miles	11 acres	(100' no cut buffer)	\$9,020
Totals				64 acres	83 acres
				\$52,480	\$68,060

Table 5: Total Associated Costs

	Alternative 2	Alternative 3
Logging Costs	\$664,840	\$514,040
Road Costs	\$108,337	\$110,893
Fuels Treatment Costs	\$52,480	\$68,060
Total KV Costs *	\$542,455	\$530,816
Total Costs	\$1,368,112	\$1,223,809

* See Appendix B: KV Collections Table 14

Appendix D: Biological Evaluation

Gordon Three Thinning Timber Sale Biological Evaluation

Sweet Home Ranger District, Willamette National Forest

Wildlife Biological Evaluation

**Prepared By: /s/ Virgil Morris
Virgil Morris
District Wildlife Biologist**

**11/25/03
Date**

INTRODUCTION

Proposed management activities addressed in Gordon Three Thinning Timber Sale Biological Evaluation may disturb individuals or alter habitat for Proposed (P), Endangered (E), Threatened (T) and Sensitive (S) species (PETS). A Biological Evaluation (BE) is required to determine possible impacts each alternative may have on:

- 1) Species listed as proposed for listing or currently listed as endangered or threatened. This includes Canada lynx, Northern spotted owl, and Northern bald eagle. All three species are threatened (USDA Forest Service, Pacific Northwest Region, 8/17/2000). The Gordon Three Thinning planning area also contains designated critical habitat for Northern spotted owls (USDI, 1992).
- 2) Species listed as sensitive that are documented or suspected to occur on the Willamette National Forest (Regional Forester's Sensitive Animal List, 11/15/00). This includes California wolverine, Pacific fisher, Baird's shrew, Pacific shrew, Pacific fringe-tailed bat, least bittern, bufflehead, harlequin duck, yellow rail, tricolored blackbird, peregrine falcon, black swift, foothill yellow-legged frog, Oregon spotted frog, Northwestern pond turtle, Oregon slender salamander, Cascade torrent salamander, and Mardon skipper.

ALTERNATIVES

One no-action (Alt. 1) and two action (Alt. 2 & 3) Alternatives have been identified. Activities that may affect PETS species through disturbance or habitat modification are listed below. All acreage and mileage figures are estimates.

- 1) Commercial thinning on 491 acres in Alternative 2 and commercial thinning on 437 acres in Alternative 3.
- 2) Precommercial thinning on 483 acres in Alternatives 2 and 3.
- 3) Aerial fertilization on 314 acres in Alternatives 2 and 3.
- 4) Snag creation on 646 acres for 3,230 trees in Alternatives 2 and 3.
- 5) Tree falling for down wood on 646 acres for 3,230 trees in Alternatives 2 and 3.

Table 1 identifies each of the PETS species and the affect this project will have on them. Only those species that may be disturbed or habitat affected are discussed in greater detail.

There is no habitat within the project area for Canada lynx, Northern bald eagle, California wolverine, least bittern, bufflehead, harlequin duck, yellow rail, tricolored blackbird, black swift, foothill yellow-legged frog, Oregon spotted frog, and Northwestern pond turtle.

Table 1: PETS Species List

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-NLAA
Bald Eagle	HNP			
Peregrine Falcon	HP	Surveyed	Potential	No Impact
Least Bittern	HNP			
Bufflehead	HNP			
Yellow Rail	HNP			
Tricolored blackbird	HNP			
Black Swift	HNP			
Harlequin Duck	HNP			
Mammals				
Canada Lynx	HNP			
Baird's Shrew	HP		Potential	May Impact
Pacific Shrew	HP		Potential	May Impact
Pacific Fringe-tailed Bat	HP		Potential	May 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	May Impact
Oregon Spotted Frog	HNP			
Northwestern Pond Turtle	HNP			
Insects				
Mardon skipper	HP		Potential	No Impact

HP = Habitat present

HNP = Habitat not present

MA-LAA = May Affect, Likely to Adversely Affect

MA-NLAA = May Affect, 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 known to occur in the Gordon Three Thinning planning area. A critical habitat unit (CHU) has been identified within the planning area.

Existing Condition

The Northern spotted owl occurs primarily within older 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 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).

Habitat that only provides for dispersal generally consists of forested stands 40 to 80 years old, canopy closure of 40 to 60%, and average tree diameter of 11 inches or greater. This habitat may also provide for some minimal foraging. Dispersal habitat is used by spotted owls to navigate between stands of suitable habitat and by juveniles to disperse from natal cores.

Timber harvest and road construction can affect spotted owls by modifying habitat within their home range. Habitat modification may occur in three different ways: (1) Degrade habitat – affect the quality of suitable owl habitat or dispersal 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 habitat to such an extent that the habitat no longer supports nesting, roosting, foraging, or dispersal.

Timber harvest and road construction may affect spotted owls by creating noise disturbance above ambient levels during the spotted owl 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.

Timber harvest and road construction may also affect spotted owls by fragmenting the remaining habitat thereby creating more favorable conditions for great horned owls, which prey on spotted owls, and barred owls, which compete with spotted owls for territories.

The proposed units are located within the median home range radii (1.2 miles) of 7 owl pairs and within 0.25 miles of the activity core of 3 of these pairs.

The units and surrounding areas (out to 0.5 miles) were surveyed for spotted owls (R6 Survey Protocol) in 2001- 2003. No additional spotted owls were located.

Canopy closure within the units (Table 2) is high (>80%) with tree diameters of the dominant and co-dominant trees exceeding 11 inches over portions of each unit. Down wood in the units is large and well decayed but of low amounts. Snags are more numerous but small, less than 10 inches diameter. The stands currently provide for spotted owl dispersal but are not suitable spotted owl habitat.

Unit	Acres of *NRF Habitat	Acres of Dispersal Habitat	Total Unit Acres
1	0	27	27
2	0	38	38
3	0	60	60
4	0	51	51
5	0	44	44
6	0	30	30
7	0	92	92
8	0	97	97
9	0	17	17
10	0	55	55
11	0	37	37
12	0	48	48
13	0	50	50
Total		646	646
*Nesting, roosting, foraging habitat			

Late-Successional Habitat

The proposed units, with the exception of Unit 12, are located in the South Santiam Late-Successional Reserve (RO-215). Unit 12 is within an Adaptive Management Area.

Critical Habitat

The U.S. Fish and Wildlife Service have designated Critical Habitat Units (CHU) across the range of the northern spotted owl. The physical and biological features (referred to as the primary constituent elements) that support nesting, roosting, foraging, and dispersal are essential to the conservation of the species (Depart. of Interior, 1992). Units 1–9 are located within CHU OR-16.

Direct/Indirect Effects

Alternative 1- No Action

There will be no direct or indirect effects to spotted owls, spotted owl habitat, or spotted owl critical habitat. Habitat within the proposed units will continue to function as dispersal habitat.

Alternatives 2 and 3

Treatment of 491 acres in Alternative 2 and 437 acres in Alternative 3 will degrade the existing dispersal habitat by removing part of the overstory. Quality of this dispersal habitat will be affected but the functionality will not since all treated areas will maintain a minimum 40 percent canopy closure to maintain dispersal capability of the habitat. The creation of ¼ acre gaps (Dominant Tree Release) in each alternative will not fragment habitat or create areas of non-dispersal habitat.

Many of the existing snags within the treated areas will be felled for safety concerns during thinning operations, which may impact spotted owl prey species utilizing this habitat. These small snags will be retained as down wood. Thinning will also result in the loss of future snag and down wood habitat. Most of the trees removed would have eventually died from suppression creating snags or down wood. This loss of habitat will be mitigated for by the creation of up to five snags by topping and falling five trees for down wood for each acre thinned plus equal amounts in those portions of the units not thinned due to no-cut buffers. Snags and down wood will be created based on 646 acres in each alternative and distributed throughout the units. The created snags and down wood will be selected from the larger size diameters within the stands.

This project *may affect* dispersal habitat by removing up to 60 percent of the existing canopy but will have long-term benefits in the development of larger, more structurally diverse trees and through the creation of snags and down wood. These treatments will encourage the development of late-successional conditions to provide for a wide range of wildlife, including spotted owls.

Units 1-9 are located within Spotted Owl Critical Habitat OR-16. Removing up to 60 percent of the existing canopy within these units *may affect* critical habitat by degrading the habitat but dispersal capability of the habitat will be maintained. Thinning these dense stands, along with the creation of snags and down wood throughout the units, will benefit the CHU in the long-term.

There will be a seasonal restriction of March 1 – September 30 on all timber harvest operations that may disturb spotted owls. There will be *no effect* to spotted owls from disturbance within the LSR. There will be a *may effect* to spotted owls outside the LSR. Unit 12 will have a seasonal restriction of March 1 – July 15, allowing timber harvest to occur within the latter part of the nesting season.

Cumulative Effects

Cumulative effects result from the incremental impacts of past, present, and foreseeable future actions that remove spotted owl habitat. The Gordon Three Thinning planning area has a long history of timber harvest and road building on both private and public lands. These actions have removed suitable spotted owl habitat in the past, which also reduces the amount of interior forest habitat available to spotted owls due to edge effect of the openings. This has allowed both great horned and barred owls to increase within the planning area. Both species can impact spotted owl numbers, either through predation by great horned owls or competition by barred owls for home ranges.

There are no known additional habitat altering projects on public lands currently being planned in this planning area at this time.

PEREGRINE FALCON

The Peregrine falcon (*Falcon peregrinus anatum*) is a Region 6 Sensitive Species.

Existing Condition

Peregrine falcons require nest sites of sheer cliffs, usually exceeding 75 feet in height and overlooking open areas with adequate prey. One known active site is located east of the project area and potential nest sites are located west and south of the project area.

Potential nest sites were surveyed (R6 Survey Protocol) in 2002 and 2003. No falcons were detected.

Direct/Indirect/Cumulative Effects

Planned harvest activities will not impact potential nest sites. The light to moderate thinning along with snag and down wood creation will increase habitat diversity for Peregrine falcon prey species. Additional surveys around potential nest sites will be completed prior to timber harvest activities to ensure nesting falcons are not disturbed. For the Peregrine falcon and its habitat, a *no impact* determination for all alternatives was made.

BAIRD'S SHREW

The Baird's shrew (*Sorex bairdi permiliensis*) is a Region 6 Sensitive Species.

Existing Condition

The Baird's shrew is found in cool, moist areas, usually within coniferous or deciduous forests (Csuti et al. 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 Gordon Three Thinning planning area.

Direct Effects

Some individuals may be lost or disturbed during the implementation of this project.

Indirect Effects

Some habitat may be impacted by ground disturbance.

Cumulative Effects

It is undetermined what specific impact this project will have on individuals or the species population, but retention of no harvest stream buffers, reduction in intense slash burns, and retention and creation of down wood and debris in this and future projects on public land will improve habitat conditions for this species.

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 and 3. This impact should be of short duration.

PACIFIC SHREW

The Pacific shrew (*Sorex pacificus cascadensis*) is a Region 6 Sensitive Species.

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 planning area, but they have not been documented.

Direct Effects

Some individuals may be lost or disturbed during the implementation of this project.

Indirect Effects

Some habitat may be impacted by ground disturbance.

Cumulative Effects

It is undetermined what specific impact this project will have on individuals or the species population, but retention of no-harvest stream buffers, reduction in intense slash burns, and retention and creation of down wood and debris in this and future projects on public land will improve habitat conditions for this species.

For the Pacific 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 and 3. This impact should be of short duration.

PACIFIC FRINGE-TAILED BAT

The Pacific fringe-tailed Bat (*Myotis thysanodes respertinu*) 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 unknown if they occur on the Sweet Home Ranger District.

Direct Effects

Some individuals may be disturbed during the implementation of this project. Most of the existing snags that need to be felled are small but could receive some use.

Indirect Effects

Some habitat may be impacted by ground disturbance.

Cumulative Effects

It is undetermined what specific impact this project will have on individuals or the species population, but retention and creation of snag habitat in this and future projects on public land will improve habitat conditions for this species.

For the Pacific fringe-tailed bat 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 and 3. This impact should be of short duration.

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.

One sighting of Pacific fisher was recorded on the Sweet Home Ranger District with additional sightings on adjacent Districts.

Direct Effects

Some individuals may be disturbed during the implementation of this project.

Indirect Effects

Some habitat may be impacted by ground disturbance.

Cumulative Effects

It is undetermined what specific impact this project will have on individuals or the species population, but retention of no-harvest stream buffers, reduction in intense slash burns, and retention and creation of down wood and debris in this and future projects on public land will improve habitat conditions for this species.

For the Pacific fisher 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 and 3. This impact should be of short duration.

OREGON SLENDER SALAMANDER

The Oregon slender salamander (*Batrachoseps wrighti*) is a Region 6 Sensitive Species.

Existing Condition

The Oregon slender salamander typically occurs under tree bark and moss on the ground in mature and second-growth Douglas-fir forests (Csuti et al.1997). Bark heaps at the base of snags and down wood appears to be very important. This species was documented in Unit 2.

Direct Effects

The known site in Unit 2 will be protected with a 50 foot no-cut buffer. In addition, accumulations of down wood in all units will be designated as retention areas, as part of the silviculture prescription, to the extent possible. Outside of these protected areas, some individuals may be disturbed during the implementation of this project.

Indirect Effects

Some habitat may be impacted by ground disturbance.

Cumulative Effects

It is undetermined what specific impact this project will have on individuals or the species population, but retention of no-harvest stream buffers, reduction in intense slash burns, and retention and creation of down wood and debris in this and future projects on public land will improve habitat conditions for this species.

For the Oregon slender salamander 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 and 3. This impact should be of short duration

CASCADE TORRENT SALAMANDER

The Cascade torrent salamander (*Rhyacotriton cascadae*) is a Region 6 Sensitive Species.

Existing Condition

The Cascade torrent salamander occurs in the Cascade Range in rocks bathed in a constant flow of cold water, in cool rocky streams, lakes and seeps, usually within conifer or alder forests (Csuti et al. 1997). They are dependent on nearly continuous access to cold water and can be found moving about in forests during wet weather. This species was documented in Unit 1 adjacent to a wet seep area.

Direct Effects

The known site in Unit 1 will be protected with a 50 foot no-cut buffer. In addition, all streams and wet areas will have a minimum 25 foot no-cut buffer. Outside of these protected areas, some individuals may be disturbed during the implementation of this project

Indirect Effects

Some habitat may be impacted by ground disturbance.

Cumulative Effects

It is undetermined what specific impact this project will have on individuals or the species population, but retention of no-harvest stream buffers, reduction in intense slash burns, and retention and creation of down wood and debris in this and future projects on public land will improve habitat conditions for this species.

For the Cascade torrent salamander 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 and 3. This impact should be of short duration.

Mardon Skipper

The Mardon Skipper (*Polites mardon*) is a Region 6 Sensitive Species.

Existing Condition

The Mardon Skipper is a small butterfly less than one inch in length that occurs in open grasslands in the Cascade Range. Adults depend on flowering plants for food and native bunchgrass for egg laying. Caterpillars feed on the grass after hatching and chrysalids (pupa) hibernate in the grass crowns during the winter. It is unknown if this species occurs on the Sweet Home Range District.

Direct Effects

Thinning around openings in Unit 13 should benefit this species if they occur there. Reducing shade within and adjacent to the openings will help maintain the habitat

Indirect/Cumulative Effects

There should be not indirect or cumulative effects from this project.

This project will have *no impact* on the Mardon Skipper or its habitat.

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File Code: 2670
Route To:

Date: 17 November 2003

Subject: Botanical Biological Evaluation for Gordon Three Thinning Timber Sale

To: Suzanne Schindler/Project Files

Alice Smith, Botanist /s/ Alice Smith _____ Date 17 Nov. 2003 _____

Introduction

Forest management activities that may alter habitat for PETS (proposed, endangered, threatened, or sensitive) species require a Biological Evaluation (FSM 2671.44) to be completed. The Biological Evaluation process (FSM 2672.43) is used to assist in determining the possible effects the proposed management activities have on:

- A. Species listed or proposed to be listed as endangered (E) or threatened (T) by the U.S. Fish and Wildlife Service (FWS).
- B. Species listed as sensitive (S) by the USDA Forest Service, Region 6. There are 32 plants listed on the Regional Forester's Sensitive Plant List that are documented or suspected to occur on the Willamette National Forest (Attachment 1).

Project Location and Description

This project proposes the commercial thinning of approximately 500 acres of young managed stands in the South Santiam watershed, specifically in the Canyon Creek, Trout Creek, Sevenmile Creek and Soda Fork subwatersheds. Most of the area is allocated as Late Successional Reserve (LSR). The proposed units of the planning area consist primarily of Douglas-fir with scattered hardwoods; they are generally between 35 and 50 year-old. Most of the units are in the western hemlock series, with a variety of plant associations and site indices. Three of the highest elevation units are in the Pacific silver fir series. The units have abundant riparian habitat and several have rocky openings, wetlands, or other special habitats.

The no-action and two action alternatives have been identified. Alternative 2 will result in the harvest of approximately 490 acres in 13 units. Alternative 3 will result in the harvest of approximately 430 acres in 13 units.

Biological Evaluation Process

Under the suggested procedure for conducting and documenting findings of a biological evaluation in the Forest Service Manual, section 2672.43, the Biological Evaluation is a 5 step process to evaluate possible effects to Proposed, Endangered, Threatened, and Sensitive (PETS) species. The five steps are as follows:



1. Review of existing documented information.
2. Field reconnaissance of the project area.
3. Evaluation of impacts of the project to local populations of PETS species.
4. Consultation with US Fish and Wildlife Service is necessary when the proposed project is likely to affect Proposed, Endangered, or Threatened species. Performance of analysis of the significance of the project's effects on local and entire populations is needed if the proposed project is likely to affect sensitive species.
5. If step 4 cannot be completed due to lack of information, a biological investigation is required.

Evaluation of effects for each species may be complete at the end of step #1 or may extend through step #5, depending on project details.

Evaluation and Survey of the Planning Area

Prefield review was performed for the Gordon Three planning area in order to determine the presence of known sites or habitat for PETS species. Using the Willamette National Forest list of potential PETS species (compiled from current USFWS listings, Oregon Natural Heritage Program listings, Oregon Department of Agriculture listings, and the Regional Forester's sensitive species list), maps of known sensitive plant populations were checked for previously reported sites and aerial photos and topographical maps were scrutinized for potential habitat.

In areas where pre-field review identified potential habitat, field reconnaissance was done in accordance with established protocols and appropriate level of detail (see attachment 2). Surveys were done in the in the summers of 2001 and 2002. All units in the planning area were field surveyed at level B intensity.

Table 1 displays the results of pre-field review, the level of field surveys performed (if applicable), and the results of the surveys:

Table 1: Summary of Evaluation Process for PETS Plant Species in Gordon Three Thin Timber Sale

Species	Prefield Review	Field Recon.	Species Presence
<i>Agoseris elata</i>	habitat not present		
<i>Arabis hastatula</i>	habitat not present		
<i>Arnica viscosa</i>	habitat not present		
<i>Asplenium septentrionale</i>	habitat present	level B, high	
<i>Aster gormanii</i>	habitat not present		
<i>Botrychium minganense</i>	habitat present	level B, high	
<i>Botrychium montanum</i>	habitat present	level B, high	
<i>Botrychium pumicola</i>	habitat not present		
<i>Calamagrostis breweri</i>	habitat not present		
<i>Carex livida</i>	habitat not present		
<i>Carex scirpoidea</i> var. <i>stenochlaena</i>	habitat not present		
<i>Castilleja rupicola</i>	habitat not present		
<i>Cimicifuga elata</i>	habitat present	level B, high	
<i>Coptis trifolia</i>	habitat not present		
<i>Corydalis aqua-gelidae</i>	habitat present	level B, high	
<i>Eucephalis(Aster) vialis</i>	habitat present	level B, high	
<i>Frasera umpquaensis</i>	habitat not present		
<i>Gentiana newberryi</i>	habitat not present		
<i>Iliamna latibracteata</i>	habitat present	level B, high	
<i>Lewisia columbiana</i> var. <i>columbiana</i>	habitat not present		
<i>Lycopodiella inundata</i>	habitat not present		
<i>Montia howellii</i>	habitat not present		
<i>Ophioglossum pusillum</i>	habitat not present		
<i>Pellaea andromedaefolia</i>	habitat present	level B, high	
<i>Polystichum californicum</i>	habitat not present		
<i>Potentilla villosa</i>	habitat not present		
<i>Romanzoffia thompsonii</i>	habitat not present		
<i>Scheuchzeria palustris</i> var. <i>americana</i>	habitat not present		
<i>Sisyrinchium sarmentosum</i>	habitat not present		
<i>Utricularia minor</i>	habitat not present		
<i>Wolffia borealis</i>	habitat not present		
<i>Wolffia columbiana</i>	habitat not present		

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. The rationale for the conclusion of effects is contained in the NEPA document.

Table 2: Summary of Conclusion of Effects

Species	Alt. 1	Alt. 2	Alt. 3
<i>Asplenium septentrionale</i>	NI	NI	NI
<i>Botrychium minganense</i>	NI	BI	BI
<i>Botrychium montanum</i>	NI	BI	BI
<i>Cimicifuga elata</i>	NI	BI	BI
<i>Corydalis aqua-gelidae</i>	NI	NI	NI
<i>Eucephalis(Aster) vialis</i>	NI	BI	BI
<i>Iliamna latibracteata</i>	NI	BI	BI
<i>Pellaea andromedaefolia</i>	NI	NI	NI

Key to Abbreviations in Table 2 (See attachment 4).

NI = No Impact

MIH = 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

Discussion of PETS Species

This section of the Biological Evaluation addresses only those plant species for which suitable habitat is present or for which sites were found, as presented in Table 1. Surveys were conducted using the intuitive-controlled method. Suitable habitat for eight sensitive plant species occurs in the Gordon Three Thin Timber Sale area. No sensitive plant populations were located during field reconnaissance.

Descriptions and other relevant information for species for which habitat was present are detailed below:

Grass Fern (*Asplenium septentrionale*)

Status: Oregon Heritage- List 2; R-6 Sensitive

A. Range and Habitat

The grass fern has a circumboreal distribution; in Oregon it is found on the Umpqua NF. This plant inhabits moist cliff crevices and talus slopes, and is recognizable throughout the growing season.

B. Pre-field Review

Suitable habitat does exist within the Gordon Three Thin planning area.

C. Field Reconnaissance

A level B survey was completed. Surveys were conducted in the summers of 2001 and 2002.

D. Analysis of Effects

Evidence of this species was not found, therefore no effects are anticipated.

Gray Moonwort (*Botrychium minganense*)

Status: Oregon Heritage- List 2; R-6 Sensitive

A. Range and Habitat

The gray moonwort is a North American species; its distribution is patchy, being found in Canada, from the Great Lakes to Colorado and from California north to Oregon. This plant is found on Mt. Hood NF and the Sweet Home RD of Willamette NF. Its habitat is moist, flat, western redcedar-dominated forests at middle elevations. It can be found from June through August.

B. Pre-field Review

Suitable habitat does exist within the Gordon Three Thin planning area.

C. Field Reconnaissance

A level B survey was completed. Surveys were conducted in the summers of 2001 and 2002.

D. Analysis of Effects

Evidence of this species was not found, therefore no effects are anticipated. Thinning may enhance the long-term habitat for this species because western redcedar will be released and will make up a greater proportion of the stands.

Mountain Moonwort (*Botrychium montanum*)

Status: Oregon Heritage- List 2; R-6 Sensitive

A. Range and Habitat

The mountain moonwort is a western North American species, found in British Columbia, Washington, Oregon and Montana. In western Oregon it has been found on the Mt. Hood NF and the Sweet Home RD of the Willamette NF. It has been found in moist flats dominated by western redcedar at middle elevations. It has also been found beneath incense cedar on dry slopes. The mountain moonwort can be found from June through August.

B. Pre-field Review

Suitable habitat does exist within the Gordon Three Thin planning area.

C. Field Reconnaissance

A level B survey was completed. Surveys were conducted in the summers of 2001 and 2002.

D. Analysis of Effects

Evidence of this species was not found, therefore no effects are anticipated. Thinning may enhance the long-term habitat for this species because western redcedar will be released and will make up a greater proportion of the stands.

Tall Bugbane (*Cimicifuga elata*)

Status: Federal Species of Concern; State Candidate;
Oregon Heritage- List 1; R-6 Sensitive

A. Range and Habitat

Tall bugbane is a Pacific Northwest endemic found west of the Cascade crest. On the Willamette National Forest it has been found on the Sweet Home, McKenzie River, and portions of the Middle Fork Ranger Districts. This species grows on moist and generally steep north slopes, usually below 2500 feet in elevation. Tall bugbane generally grows beneath a mixed conifer and hardwood overstory. Tall bugbane sends up a spike of small white flowers in June, July or August.

B. Pre-field Review

Suitable habitat does exist within the Gordon Three Thin planning area. Several populations of tall bugbane are documented in the planning area. The closest population to a proposed unit is located about ¼ mile north of Unit 2.

C. Field Reconnaissance

A level B survey was completed. Surveys were conducted in the summers of 2001 and 2002. No

additional populations were detected.

D. Analysis of Effects

Evidence of this species was not found in or adjacent to the proposed units, therefore no direct effects are anticipated. Thinning the stands will enhance habitat for this species by opening up the dense canopy and retaining the hardwood component.

Cold-water Corydalis (*Corydalis aqua-gelidae*)

Status: Federal Species of Concern; State Candidate;
Oregon Heritage - List 1; R-6 Sensitive

A. Range and Habitat

Cold-water corydalis is a local endemic found on the west slope of the Cascades in southern Washington to central Oregon. Its habitat is seeps, headwalls, and streamside under a coniferous canopy. This species can be recognized during the summer months.

B. Pre-field Review

Suitable habitat does exist within the Gordon Three Thin planning area.

C. Field Reconnaissance

A level B survey was completed. Surveys were conducted in the summers of 2001 and 2002.

D. Analysis of Effects

Evidence of this species was not found, therefore no effects are anticipated.

Wayside Aster (*Eucephalis (Aster) vialis*)

Status: Oregon Heritage- List 1; R-6 Sensitive

A. Range and Habitat

Wayside aster is a local endemic, found only in the foothills surrounding the southern Willamette Valley in Oregon. It inhabits roadside corridor and forest edge environments, or dry open woods with canopy gaps. It is found in stands with frequent fire intervals of 5-25 years at elevations of 500 to 3150 feet. Flowering occurs from July through September.

B. Pre-field Review

Suitable habitat does exist within the Gordon Three Thin planning area.

C. Field Reconnaissance

A level B survey was completed. Surveys were conducted in the summers of 2001 and 2002.

D. Analysis of Effects

Evidence of this species was not found, therefore no effects are anticipated. Thinning may enhance the habitat for this species by opening up the dense canopy.

California globe mallow (*Iliamna latibracteata*)

Status: Oregon Heritage- List 2; R-6 Sensitive

A. Range and Habitat

California globe mallow is endemic to the Pacific Northwest, from Humboldt County, California north and through southern Oregon. A small population is located on private land near the Sweet Home RD. It prefers moist, open forest and streams at low to middle elevations. Globe mallow flowers from June to August.

B. Pre-field Review

Suitable habitat does exist within the Gordon Three Thin planning area.

C. Field Reconnaissance

A level B survey was completed. Surveys were conducted in the summers of 2001 and 2002.

D. Analysis of Effects

Evidence of this species was not found therefore no effects are anticipated. Thinning may enhance the habitat for this species by opening up the dense canopy.

Coffee Fern (*Pellaea andromedaefolia*)

Status: Oregon Heritage- List 2; R-6 Sensitive

A. Range and Habitat

The coffee fern ranges from the middle of Oregon through southern California. It is a rock dweller, preferring non-calcareous substrate at low to middle elevations. This species is recognizable throughout the growing season.

B. Pre-field Review

Suitable habitat does exist within the Gordon Three Thin planning area.

C. Field Reconnaissance

A level B survey was completed. Surveys were conducted in the summers of 2001 and 2002.

D. Analysis of Effects

Evidence of this species was not found, therefore no effects are anticipated.

ATTACHMENT 1: **Regional Forester's Sensitive Plant List for the Willamette National Forest (Revised 2001)**. 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>Botrychium minganense</i>	D	2			RZ,CF
<i>Botrychium montanum</i>	D	2			RZ,CF
<i>Botrychium pumicola</i>	S	1	LT		HV
<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>Cimicifuga elata</i>	D	1	C		CF
<i>Coptis trifolia</i>	S	2			WM,CF
<i>Corydalis aqua-gelidae</i>	D	1	C		RZ,CF
<i>Eucephalis (Aster) vialis</i>	S	1	LT	SofC	CF
<i>Frasera umpquaensis</i>	D	1	C		MM
<i>Gentiana newberryi</i>	D	2			MM
<i>Iliamna latibracteata</i>	S	2			CF,RZ
<i>Lewisia columbiana</i>	D	2			RS
<i>var. columbiana</i>					
<i>Lycopodiella inundata</i>	D	2			WM
<i>Montia howellii</i>	D	4	C		RZ
<i>Ophioglossum pusillum</i>	D	2			WM
<i>Pellaea andromedaefolia</i>	S	2			RO
<i>Polystichum californicum</i>	D	2			RO
<i>Potentilla villosa</i>	D	2			RS, RO
<i>Romanzoffia thompsonii</i>	D	1			RS
<i>Scheuchzeria palustris</i>	D	2			WM
<i>var. americana</i>					
<i>Sisyrinchium sarmentosum</i>	S	1	C	SofC	MM,DM
<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 = Candidate

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, floodplains | 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:
Conclusions Of Effects For Use In Biological Evaluations 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 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 not likely to adversely affect listed species or critical habitat, 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 NMFS.

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 or 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 populations or adversely affecting “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 NMFS 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 effects 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 (MIH)

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 or habitat can be considered significant when the potential effect may be:

1. Contributing to a trend toward Federal listing (C-1 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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Appendix E: Gordon Three Thin Soils

I. COVER INFORMATION

Reply to: 2550 Soil Management
2520 Watershed Protection and Management

Subject: **Gordon Thin Timber Sale**, Soil and Watershed Report

To: District Ranger, Sweet Home Ranger District
ATTN: Suzanne Schindler, Silviculturist and Planner

By: Douglas C. Shank, District Geologist

Date: March 24, 2003

II. INTRODUCTION

A. Summary

The Sweet Home Ranger District of the Willamette National Forest has determined that a need exists to manage older plantations within and immediately adjacent to the Falls Creek subwatershed for the purpose of:

- 1) Reducing current stocking levels to lessen competition for nutrients, sunlight, and growing space;
- 2) 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;
- 3) Accelerating the attainment of late-successional stand characteristics (larger diameter trees) and to enhance the development of habitat diversity for wildlife;
- 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 approximately 150 acres within various management allocations. The project includes the following proposed actions:

- Four older plantations of varying size from 8 to 55 acres, could be treated with a thinning removal in order to improve the growth and vigor of the remaining trees.
- Harvested trees would be removed under a timber sale contract with ground based or skyline 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. Most piles would be burned.

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 landtype, 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 have not been met due to 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 (BMP) (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 includes 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 landtypes; 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 several days throughout 2002 and into the 2003 field season, I conducted an intensive field reconnaissance of the possible units for the Gordon Thin project, at the request of Suzanne Schindler, Silviculturist and Planner.

The primary purpose of this field investigation was to:

- 1) verify the SRI land type boundaries in each unit.
- 2) determine appropriate logging systems;
- 3) evaluate the potential soil and watershed effects of the proposal; and if needed,
- 4) propose additional mitigation efforts to protect the soil and water resource.

Unsuited and unmanageable land types have been delineated within the project area as part of the land type mapping process (FW-180). Unsuited and unmanageable land types occur in two basic categories - those acres that are unregenerable and those where harvest will cause irreversible impacts. Land types considered unsuited because harvest will result in irreversible resource damage are primarily those that are actively unstable or potentially highly unstable (FW-105, BMP T-6).

This project contains no unsuited land. All the proposed units are located on Soil Resource Inventory (SRI) Landtypes that are stable and productive. The SRI, 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. The 1973 text and descriptions are used here. A copy is on file at the Sweet Home R. D.

III. EXISTING CONDITION and AFFECTED ENVIRONMENT

The units for Gordon Thin are located predominately within or immediately adjacent to Falls Creek drainage, the most distinguishing feature of which is the fact that it is a separate stream system at all. Sandwiched between Menagerie on the north and Lower Canyon on the south, Fall Creek is a short, thin drainage that straddles what amounts to a broad divide between two of the three arms of the South Santiam system (Canyon Creek and the upper South Santiam River). Just north of Falls Creek, the majestic headlands of the Gordon plateau plunge headlong to the glacial outwash terraces along the South Santiam River, and just south the rocky scarps and benches of Canyon Creek rise and fall for several hundreds of feet. The upper watershed for Falls Creek begins in the broad and undulating uplands of Gordon Meadows. The lower reaches descend in a series of rocky cascades and small waterfalls to join the South Santiam River about three miles up stream of the confluence with Canyon Creek.

The low elevation of around 1200 feet is found at its mouth at the most northwesterly extent of this subwatershed. In a like but opposite manner, the highest point share a common spot with both Menagerie and Lower Canyon on Soapgrass Mountain at around 5200 feet elevation at the most southeasterly extent of the drainage. The distance from high point to low point is about six miles, but the width at its maximum is barely more than one mile and the narrowest point is hardly one-quarter mile wide. With an elevation drop of about 4000 feet, some short stretches of Fall Creek are quite steep and rocky. However, as a whole, the topography within the drainage can be characterized as relatively gentle and rolling with deep stable soils of glacial or volcanic origin.

The Gordon Thin project area lies well within the Western Cascades physiographic region. Rocks are primarily tuffs and breccias of volcanic origin and are generally Eocene or Oligocene in age (around 32 to 17 million years). Falls Creek owes its unique topographic position to its glacial roots. Likely in early Pleistocene time, the main South Santiam canyon was filled with glacial ice at least as far west as Canyon Creek. It is likely, though evidence is scant, that glacial ice also occupied Canyon Creek at this same time. Melt water, moraine and outwash spilled off the glacial margins along their common boundary, and a drainage developed between the arms of the valley glaciers. After the ice melted, the stream was left perched on the divide between the two much greater canyons. Since that time, stream down cutting of the glacial deposits, and minor slumping have been the principal active erosional processes. The principal sediment delivery system now in operation is the down slope movement of the soil mantle by creep or colluvial processes.

In general soils on these side slopes have been stable and productive for many thousands of years. Soils formed either directly on the underlying volcanic bedrock or on the extensive glacial deposits. Both types have similar size gradations that range from silt loams to gravelly or cobbly sandy loams. Depth to bedrock ranges from 3 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 gentle side slopes.

Much of this drainage was burnt in an extensive stand replacement fire approximately one hundred and forty 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 much more extensive than adjacent areas, especially considering the small size of this drainage. This results because of its elevated position on the landscape and the usually gentle sideslopes. Both factors provide

excellent access opportunities to areas on the north and south that have much more difficult terrain to road. Even with this more extensive road network, most roads have been constructed 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 managed plantations that originated as clear cuts, which were harvested with ground-based or cable logging systems. The ground based logging occurred prior to the establishment of Regional Guidelines for compaction.. Considerable brush and regeneration now cover these units, and almost no exposed soil remains. Disturbance and erosion are no longer a concern. Except in a very few cases, skyline or cable corridors are no longer visible. Numerous heavily used skid roads are for the most part still present, though many now have large alder or conifer regeneration. Because of the compaction, a few now contain wet seeps, small wetlands, or intermittent streams that provide riparian habitat where none previously existed. Old landings often contain piles of decomposing logs that provide habitat for a host of species. Slash was either piled and burned or broadcast burnt. Consequently, compaction from the ground-based equipment in some portions of some units may have been at the upper limit or exceeded Regional and current Forest standards. Some of that compaction has been naturally ameliorated over time by root growth, animal borrowing, and freeze/thaw; some likely remains, although finding it is difficult.

For this project, transects were walked across the proposed units in order to quantify past impacts. Estimated compaction is given in percent and correlated with the presence of locatable skid roads or landings. The percentage is the amount compacted within the activity area. For this analysis, visible skid roads were considered fully, adversely compacted, though, from the previous discussion, this is not the case.

Unit F1 – CTL portion, north of FS Rd. 2032: 11 to 13%.

Unit F2 - CTL portion, east and southeast of rock pit: 10 to 12%. Skid roads were very difficult to find and much of this portion of the unit may have been cable logged.

Unit F6 – CTL portion, north of FS Rd. 2032418: 13 to 21%.

Unit F6 – CTL portion, south of FS Rd. 2031418: 5 to 7%. Some of this area may have been in part cable yarded because old skid roads area difficult to find.

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. Potentially or actively unstable areas generally are not found within the Falls Creek drainage. Given the retention of a live intact root mat with thinning, the potential for management-induced instability with this proposal is very low and not a concern. All units show considerable 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 are present. There is a potential for cumulative significant adverse effect from ground-based systems with the proposed entry. Evidence of adverse impacts from previous cable and skyline yarding was not apparent. The potential for cumulative significant adverse impact from additional skyline yarding, since it affects less than 1% of the ground, is not a concern.

This entry will also provide the opportunity to rehabilitate areas adversely affected by the previous yarding activities.

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. The actual thinning or harvest of these units is not as much concern for long term soil productivity as the concomitant slash accumulation and the potential for wild fire. 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. Activities, which 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 soil productivity. The following sections discuss in more detail (1) how the proposed action may effect 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. The only concern from a cumulative effect standpoint is excessive compaction, and mitigations are in place to ensure that that does not 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. With bio-turbation and freeze/thaw, compaction would slowly be reduced. Short-term impacts from harvest, such as soil disturbance, dust, noise and slash accumulation, would not occur.

Action Alternatives:

These alternatives were designed to reduce stem density and encourage growth on the leave trees. On a per acre basis, where an activity is proposed, any action alternative requires the use of same existing skid road system. The volume removed in any alternative is sufficient to compact the ground, and the effects to the soils are considered nearly identical. Since the skid road system is for the most part already in place, the difference in net effect between the options is minor. In all cases, the existing skid road system will be utilized as much as possible.

A. Displacement

To maintain long-term soil productivity, Willamette National Forest Land and Resource Management Plan (LRMP) Standards and Guidelines require that the total acreage of all detrimental soil conditions not exceed 20% of the total land within each harvest unit, including 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). Because of the abundance of gentle sideslopes, the primary yarding objective for all units will be ground-based processor / forwarder operations. Skyline with partial suspension is required on the steeper portions of Units 11, 12, and 13 (F2, F6, and F120 respectively) (generally greater than 30% sideslopes). 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, will 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.

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 usually impact much less than 1% of the unit area. Residual compaction from the original harvest of these plantations needs to be considered. The evident skid roads will be re-utilized in those units that have ground-based logging. Almost no new spur road will be required. Consequently, compaction is not considered a cumulative concern.

Finally, at the completion of harvest activities, heavily used tractor skid roads and landings (existing or created) that are not part of the dedicated transportation system, may be subsoiled with a "Forest cultivator" or an equivalent winged ripper in order to reduce compaction and return the site to near original productivity. Subsoiling is intended to lift and separate the compacted layers, while minimizing the disruption to the soil horizons or burying organic material. Compacted skid roads often show overland flow during periods of high rainfall and snowmelt. Subsoiling greatly enhances water infiltration into the soil, and reduces the potential for overland flow and subsequent erosion. Subsoiling may be curtailed in areas of 1) heavy regeneration in order to prevent excessive root pruning, or 2) in areas with extensive slash and brush to reduce unnecessary disturbance.

C. Nutrient Loss:

One aspect of long-term nutrient availability and ectomycorrhizal formation is the amount of larger woody material retained on site. These stands were harvested 30 to 40 years ago when utilization requirements were much less intense than in

more recent decades. Extensive concentrations of down logs are present in numerous areas. Management activities will be planned to 1) minimize disturbance to the existing concentrations of large down woody material, and 2) maintain recruitment of large woody debris (dead and down) to provide for a healthy forest ecosystem and ensure adequate nutrient cycling (FW-085) over time. Site-specific needs will be considered commensurate with wildlife objectives as outlined in FW-212a and FW-213a (as amended).

Another aspect of nutrient availability is the amount of duff and litter present. After the original clear cuts were harvested, broadcast burning was utilized in these units to remove logging slash, and it is likely that little ground cover (duff and litter) remained. In the several decades since the original harvest and broadcast burn, an extensive layer of duff and litter has redeveloped across almost all parts of all units. Duff Retention is the percent of effective ground cover (generally considered the duff and litter layer and based on the existing pre-management 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). Duff retention standards will be set for each unit.

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.

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. Grapple piles are larger in size than hand piles, but correspondingly there are fewer of them. As with hand piles, they would occupy about 1 to 2% of the area, and their burning is not considered cumulatively significant. Extensive monitoring of both processor and grapple operations has shown that excessive compaction is limited. Consequently, this is not considered a cumulative concern.

D. Instability

The Gordon Thin project area, located in the West Cascades physiographic province, lies on either steep, stable, shallow-soiled side slopes or deeper stable gently sloping uplands of eroded Tertiary volcanic strata generally covered with a thick veneer of glacial soils. Rotational soil failures or slump type earth flow terrain is not common, and that which is

present is relatively old and long stabilized. Debris chute type slope instability has not been an active agent in the down slope movement of soil in most of the analysis area in the last several hundred years or so. Recent intense rainstorms from 1996 to 2000 did not produce any additional soil failures within or around the proposed units in this study area.

Thinning promotes tree growth. Crowns increase in size; root systems expand; and evapotranspiration rates increase. 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. Thinning within and through riparian reserves improves long-term slope stability as stand conditions change with release and increased tree growth. Thinning should emphasize the retention of a well-distributed stand of larger trees, both conifer and hardwood. These larger trees also provide the stream the opportunity to better withstand the assaults of windstorms and floods over time. Consequently, the potential for management-induced instability with this proposal is very low and not a concern.

E. Transportation System

Existing, rocked 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 access roads. At the completion of logging activities, these roads should be storm proofed with water bars as appropriate to control seepage or storm runoff. In summary, development of the transportation system for this sale will maintain slope stability, will produce little or no off-site erosion, and will provide opportunity to rehabilitate a few old road courses.

This project will also provide the opportunity to review the status of drainage relief pipes and ditches along the entire haul system. Where possible water should be dispersed instead of concentrated, and allowed to pass freely under the road way.

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 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 changes and long-term productivity is not fully 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 Guidelines (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).

UNIT	SRI	SUSPENSION	DUFF RETENION	COMMENT
F1	23, 233	CTL	40-60%	
F2	13, 212,	CTL, SKL	40-60%	skyline on steeper slopes
F6	132-233, 213	CTL, SKL	40-60%	skyline on steeper slopes
F120	19, 441	CTL, SKL	50-70%	skyline on steeper slopes

NOTES: CTL – ground based cut-to-length processor / forwarder system.
 SKL – skyline cable yarding system with one end suspension.

The following mitigation measures are common to all Action Alternatives:

1. Ground-based equipment should generally operate in the dry season, usually considered May through October, unless otherwise restricted by other resource concerns or agreed to by Forest Service personnel.
2. Harvested trees should usually be topped and limbed in the units in order to provide for nutrient recycling and to reduce soil ravel on steeper side slopes. This recommendation needs to be coordinated with slash disposal objectives. On some skyline and helicopter units, this may be waived in order to reduce fuel loading.
3. Ground -based equipment shall generally be limited to slopes less than 30%, unless otherwise directed by Forest Service personnel.

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 generally be about 10 feet wide and should not usually 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.
6. 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.
7. Unless otherwise approved, the reopening of temporary, unclassified roads should occur in the dry season, usually June through October to avoid surface erosion from exposed soil. Open roads should be storm proofed if they have to sit through extended periods of wet weather.
8. 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.
9. Unclassified or temporary haul roads used outside the standard operating season, should generally be rocked to reduce erosion.
10. Cable corridors spacing should be set to both minimize damage to vegetation as well as the under lying soil.
11. 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.
12. Avoid disturbance to the existing down woody debris concentrations from the initial entry as much as practical.
13. At the completion of harvest activities, heavily used tractor skid roads (existing or created) that are not part of the dedicated transportation system, 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 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 soil 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).

VIII. MONITORING REQUIREMENTS

Other applicable Standards and Guidelines 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.

IX. 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.

X. 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.

XI. CONSULTATION WITH OTHERS - None occurred with this project.

/s/ DOUGLAS C. SHANK
District Geologist

I. COVER INFORMATION

Reply To: 2550 Soil Management
2520 Watershed Protection and Management

Subject: **Three Thin Timber Sale**, Soil And Watershed Report

To: District Ranger, Sweet Home Ranger District
ATTN: Suzanne Schindler, Silviculturist and Planner

By: Douglas C. Shank, District Geologist

Date: March 24, 2003

II. INTRODUCTION

A. Summary

The District Ranger of the Sweet Home Ranger District of the Willamette National Forest has determined that a need exists to manage older plantations within the Sheep Creek and Sevenmile Subwatersheds in Linn County, OR, for the purpose of:

- 1) Reducing current stocking levels to lessen competition for nutrients, sunlight, and growing space;
- 2) 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;
- 3) Accelerating the attainment of late-successional stand characteristics (larger diameter trees) and to enhance the development of habitat diversity for wildlife;
- 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 or achieved.

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 approximately 450 acres within various management allocations. The Project includes the following proposed actions:

- Ten older plantations of varying size from 17 to 97 acres, could be treated with a thinning removal in order to improve the growth and vigor of the remaining trees.
- Harvested trees would be removed under a timber sale contract with 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. Most piles would be burned.

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 landtype, 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 have not been met due to 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 includes 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 landtypes; 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 several days throughout 2002 and into the 2003 field season, I conducted an intensive field reconnaissance of the possible units for the Three Thin project, at the request of Suzanne Schindler, Silviculturist and Planner.

The primary purpose of this field investigation was to:

- 1) verify the SRI land type boundaries in each unit.
- 2) determine appropriate logging systems;
- 3) evaluate the potential soil and watershed effects of the proposal; and if needed,
- 4) propose additional mitigation efforts to protect the soil and water resource.

Unsuited and unmanageable land types have been delineated within the project area as part of the land type mapping process (FW-180). Unsuited and unmanageable land types occur in two basic categories - those acres that are un-regenerable and those where harvest will cause irreversible impacts. Land types considered unsuited because harvest will result in irreversible resource damage are primarily those that are actively unstable or potentially highly unstable (FW-105, BMP T-6).

This project contains no unsuited land. All the proposed units are located on Soil Resource Inventory (SRI) Landtypes that are stable and productive. The SRI, 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. The 1973 text and descriptions are used here. A copy is on file at the Sweet Home R. D.

III. EXISTING CONDITON and EFFECTED ENVIRONMENT

The Three Thin project area lies well within the Western Cascades physiographic region. Rocks are primarily tuffs and breccias of volcanic in origin and are generally Eocene or Oligocene in age (around 32 to 17 million years). Much of the project area was likely glaciated in the early to mid Pleistocene. Most soils formed directly from the volcanic bedrock, are very productive, and range from silt loams to gravelly or cobbly sandy loams. Depth to bedrock is usually around 3 to greater than 6 feet. Occasional remnants of glacial soils, either moraines or outwash, can be found in several areas.

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, sideslopes range from near zero to about 80%. Off-site erosion is generally not a concern because of the extensive vegetative ground cover.

All the proposed units are managed plantations that originated as clear cuts, which were harvested with ground-based or cable logging systems. Considerable brush and regeneration now cover these units, and almost no exposed soil remains. Disturbance and erosion are no longer a concern. Except in a very few cases, skyline or cable corridors are no longer visible. Numerous heavily used skid roads are for the most part,

still present, though many now have large alder or conifer regeneration. Because of the compaction, a few now contain wet seeps, small wetlands, or intermittent streams that provide riparian habitat where none previously existed. Old landings often contain piles of decomposing logs that provide habitat for a host of species. Slash was either piled and burned or broadcast burnt. Consequently, compaction from the ground-based equipment in some portions of some units may have been at the upper limit or exceeded Regional and current Forest standards. Some of that compaction has been naturally ameliorated over time by root growth, animal borrowing, and freeze/thaw; some likely remains, although finding it is difficult.

For this project, transects were walked across the proposed units in order to quantify past impacts. Given that ground-based logging occurred in portions of some of these units prior to the establishment of Regional Guidelines, compaction at the completion of harvest activities may have once exceeded the regional and forest standards. With the current level of regeneration and growth at this time, it is very difficult if not impossible to quantify that assumption at this point in time. Consequently, estimated compaction is given in percent and correlated with the presence of locatable skid roads or landings. The percentage is the amount compacted within the activity area. For this analysis, visible skid roads were considered fully, adversely compacted, though, from the previous discussion, this is not the case.

Unit 6 (S6) – CTL portion, south of FS Rd. 2044230: 10 to 11%.

Unit 4 (S4) - CTL portion, south third: 3 to 6%. Skid roads were very difficult to find and much of this portion of the unit may have been cable logged.

Unit 7 (LE 6681) – CTL portion, west of FS Rd. 2044: 13 to 15%.

Unit 9 (LE6675) – CTL portion, northwest of FS Rd. 2044: 13%

Unit 1 (S1) – CTL portion, southeast quarter: 10 to 11%.

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. Potentially or actively unstable areas have been avoided with these units. Given the retention of a live intact root mat with thinning, the potential for management-

induced instability with this proposal is very low and not a concern. All units show considerable 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 are present. There is a potential for cumulative significant adverse effect from ground-based systems with the proposed entry. Evidence of adverse impacts from previous cable and skyline yarding was not apparent. The potential for cumulative significant adverse impact from additional skyline yarding, since it affects less than 1% of the ground, is not a concern.

This entry will also provide the opportunity to rehabilitate areas adversely affected by the previous yarding activities.

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. The actual thinning or harvest of these units is not as much concern for long term soil productivity as the concomitant slash accumulation and the potential for wild fire. 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. Activities, which reduce stocking levels, improve stand vigor, and eliminate excessive fuel loading 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 soil productivity. The following sections discuss in more detail (1) how the proposed action may effect the soil resource or (2) mitigations that can be utilized to avoid potentially undesirable effects. In summary, the direct effects by any action alternative on the soils resource are very limited in scope. The only concern from a cumulative effect standpoint is excessive compaction, and mitigations are in place to ensure that that does not 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. In general, plant diversity would diminish as well as soil biota because of the lack of sunlight. With bio-turbation and freeze/thaw, compaction would

slowly be reduced. Short-term impacts from harvest, such as soil disturbance, dust, noise and slash accumulation, would not occur.

Action Alternatives:

These alternatives were designed to reduce stem density and encourage growth on the leave trees. On a per acre basis, where an activity is proposed, any action alternative requires the use of same existing skid road system. The volume removed in any action alternative is sufficient to compact the ground, and the effects to the soils are considered nearly identical. Since the skid road system is for the most part already in place, the difference in net effect between the options is minor. In all cases, the existing skid road system will be utilized as much as possible.

A. Displacement

The logging suspension requirement for a proposed unit is mandated in the LMRP (1990) to protect the soil from excessive disturbance or displacement (FW-081 and BMP T-12). The yarding objectives will be a mixture of ground-based, skyline and helicopter, depending of sideslope and access. Helicopters will be utilized in order to avoid an expansion of the transportation system, NOT to provide a required, increased level of soil protection. For all units with ground-based yarding, LTSR (Located Tractor Skid Road), and/or line pulling and directional falling will be required, as appropriate.

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.

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 usually impact much less than 1% of the unit area. Residual compaction from the original harvest of these plantations needs to be considered. The evident skid roads will be re-utilized in those units that have ground-

based logging. Almost no new spur road will be required. Reducing the effective weight of the tractors and reducing the number of trips over a piece of ground are other means to reduce the risk of soil compaction. Yarding over frozen ground, or over a deep, solid snow pack (24 inches of dense snow or equivalent) also reduces soil disturbance and compaction (BMP VM-4). Consequently, with the implementation of the above-mentioned mitigations, compaction is not considered a cumulative concern.

Finally, at the completion of harvest activities, heavily used tractor skid roads (existing or created) that are not part of the dedicated transportation system, may be subsoiled with a "Forest cultivator" or an equivalent winged ripper in order to reduce compaction and return the site to near original productivity. Subsoiling is intended to lift and separate the compacted layers, while minimizing the disruption to the soil horizons or burying organic material. Compacted skid roads often show overland flow during periods of high rainfall and snowmelt. Subsoiling greatly enhances water infiltration into the soil, and reduces the potential for overland flow and subsequent erosion. Subsoiling may be curtailed in areas of 1) heavy regeneration in order to prevent excessive root pruning, or 2) in areas with extensive slash and brush to reduce unnecessary disturbance.

C. Nutrient Loss:

One aspect of long-term nutrient availability and ectomycorrhizal formation is the amount of larger woody material retained on site. These stands were harvested 30 to 40 years ago when utilization less intense than in more recent decades.

Extensive concentrations of down logs are present in numerous areas. Management activities will be planned to 1) minimize disturbance to the existing concentrations of large down woody material, and 2) maintain recruitment of large woody debris (dead and down) to provide for a healthy forest ecosystem and ensure adequate nutrient cycling (FW-085) over time. Site-specific needs will be considered commensurate with wildlife objectives as outlined in FW-212a and FW-213a (as amended).

Another aspect of nutrient availability is the amount of duff and litter present. After the original clear cuts, broadcast burning was utilized in these units to remove logging slash, and it is likely that little ground cover (duff and litter) remained. In the several decades since the original harvest and broadcast burn, an extensive layer of duff and litter has redeveloped across almost all parts of all units. Duff Retention is the percent of effective ground cover (generally considered the duff and litter layer and based on the existing pre-management 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).

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.

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. Grapple piles are larger in size than hand piles, but correspondingly there are fewer of them. As with hand piles, they would occupy about 1 to 2% of the area, and their burning is not considered cumulatively significant. Extensive monitoring of both processor and grapple operations has shown that excessive compaction is limited. Consequently, this is not considered a cumulative concern.

D. Instability

Almost all the proposed units are located in least in part on landtypes that were once actively unstable terrain. Most of these landflows stabilized hundreds to thousands of years ago. Some areas of actively unstable earth flows or potentially highly unstable debris chute terrain are present in this planning area. However, the proposed units avoid these sites and are located on stable, productive sideslopes. The 1996 storm event generated no new failures in any of the proposed units.

Thinning promotes tree growth. Crowns increase in size and root systems expand. With thinning, an intact live root mat will remain throughout all units. Evapotranspiration rates increase. 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. Thinning within and through riparian reserves improves long-term slope stability as stand conditions change with release and increased tree growth. Thinning should emphasize the retention of a well-distributed stand of larger trees, both conifer and hardwood. These larger trees also provide the stream the opportunity to better withstand the assaults of windstorms and floods over time. Consequently, the potential for management-induced instability with this proposal is very low and not a concern.

E. Transportation System

Existing, rocked 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 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, development of the transportation system

for this sale will maintain slope stability, will produce little or no off site erosion, and will provide opportunity to rehabilitate a few old road courses.

This project will also provide the opportunity to review the status of drainage relief pipes and ditches along the entire haul system. Where possible water should be dispersed instead of concentrated, and allowed to pass freely under the road way.

VI. INDIRECT AND CUMULATIVE EFFECTS ASSESSMENT

At this time, no single unit of measure of long-term 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 of short-term changes to long-term productivity is not fully 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 reviewed, 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 of the action alternatives (BMP W-5). 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 a 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 Guidelines (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).

UNIT	SRI	SUSPENSION	DUFF RETENION	COMMENTS
S1	13, 201	CTL, HELI	40-60%	Unit 1
S2	201-204, 132-162	SKL, HELI	40-60%	Unit 2
S3	212-213, 201, 13	SKL, HELI	40-60%	Unit 3
S4	13	CTL, SKL	40-60%	Unit 4
S5	135-195	CTL, SKL	40-60%	Unit 5

S6	135, 201 212	CTL, SKL	40-60%	Unit 6
LE 6673	13, 441, 212	SKL, HELI	40-60%	Unit 8
LE 6675	13, 16	SKL, CTL	40-60%	Unit 9
LE 6681	13-16, 13, 212	SKL	40-60%	Unit 7

CTL – ground based, cut-to-length, processor / forwarder system

SKL – skyline cable system with one end suspension.

HELI – helicopter, to minimize or eliminate an expanded transportation system.

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.

The following mitigation measures are common to all Action Alternatives:

1. Ground-based equipment should generally operate in the dry season, usually considered May through October, unless otherwise restricted by other resource concerns or agreed to by Forest Service personnel.
2. Harvested trees should usually be topped and limbed in the units in order to provide for nutrient recycling and to reduce soil ravel on steeper side slopes. This recommendation needs to be coordinated with slash disposal objectives. On some skyline and helicopter units, this may be waived in order to reduce fuel loading.
3. Ground -based equipment shall generally be limited to slopes less than 30%, unless otherwise directed by Forest Service personnel.
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 generally be about 10 feet wide and should not usually 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.
6. 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 ridgelines or benches.

7. Unless otherwise approved, the reopening of temporary, unclassified roads should occur in the dry season, usually June through October to avoid surface erosion from exposed soil. Open roads should be storm proofed if they have to sit through extended periods of wet weather.
8. 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.
9. Unclassified or temporary haul roads used outside the standard operating season, should generally be rocked to reduce erosion.
10. Cable corridors spacing should be set to both minimize damage to vegetation as well as the underlying soil.
11. 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.
12. Avoid disturbance to the existing down woody debris concentrations from the initial entry as much as practical.
13. At the completion of harvest activities, heavily used tractor skid roads (existing or created) that are not part of the dedicated transportation system, 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 contractor or through the KV process.

Prescriptions for soil protection take into account past and predicted future land management activities. The soils mitigation measures 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 (1990). 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 seed mix (BMP T-14, T-15, and T-16).

VIII. MONITORING REQUIREMENTS

Other applicable Standards and Guidelines 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 1990 Willamette National Forest Land and Resource Management Plan and Final Environmental Impact Statement. As the proposed project is implemented, 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 primary 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.

IX. 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.

X. REFERENCES

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XI. CONSULTATION WITH OTHERS - None occurred with this project.

/s/ DOUGLAS C. SHANK
District Geologist

Appendix F: Aquatic Conservation Strategy Objectives (ACSO)

The objectives surrounding the attainment of the Aquatic Conservation strategy are discussed below. This discussion relates to all Gordon Three Thin action alternatives.

ACSO 1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to insure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Under Alternative 2 or 3, approximately 124 to 140 acres of riparian reserve land allocation will be commercially thinned. This project's focus is to restore and maintain, through time, diversity and complexity of the watershed and the aquatic systems to which species, populations, and communities have adapted. The South Santiam Watershed Analysis recommends various management techniques or processes to accomplish long range, (>50 yrs.), landscape level conditions. Due to the diversity of the stands within the project area, different on-the-ground designation of buffers within reserves will be established. Silvicultural prescriptions will be utilized to insure diversity is maintained and old-growth characteristics created.

ACSO 2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections including floodplains, wetlands, up slope areas, headwater tributaries and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Spatial and temporal connectivity within and between watersheds will be maintained through the implementation of Forest Plan riparian reserve widths. All streams were identified and site potential tree height width, 150-344 feet, reserve was placed on either side of the channel. These areas allow for connectivity between ridge tops and valley bottoms when ephemeral and perennial stream are considered part of the riparian network.

Treated acres within these riparian reserves will prevent further mortality from occurring in the riparian reserve and adjacent stands. Chemically and physically unobstructed routes critical to life history requirements will remain intact as a result of this prescription. Spatial connectivity may be restored for some plant and animal species that cannot survive deep shade and dense slash build-up.

Proposed removal of material would be expected to reduce the fuel loading of the site and assist in maintaining connectivity through time. Lower risk of fire will result from this activity. Excessive amount of slash material would not be generated

by this project. Slash accumulations are being targeted to reduce the fuel loading and breeding sites for bark beetles. Material would be felled away from ponds, seeps, or other standing or slow moving water. This would allow for the maintenance of water chemistry of the area.

ACSO 3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Physical integrity of the aquatic system will be maintained through the utilization of Best Management Practices (BMP's). Specific BMP's utilized for physical integrity are T-2 (Timber Harvest Unit Design); T-7 (Stream side Management Unit Designation); T-8 (Stream course Protection); and T-12 (Suspended Log Yarding in Timber Harvesting). These practices maintain the physical integrity of the aquatic system through designation of parameters in the prescriptions (i.e. maintenance of root strength, shade canopy, and large woody material).

Harvest systems are designed to yard away from all streams in accordance with BMPs T-8 and T-12 (helicopter and other yarding). Decisions to remove riparian leave trees may occur with interdisciplinary team consultation on occasion. Material may not meet the long-term objectives or pose a health and safety risk to those on the site. Retention of riparian reserve widths will maintain channel bank stability. Management within these reserves further aids long-term stability by reducing fire effects.

ACSO 4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the systems and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Water quality parameters of interest for this objective relate to this project's affect on temperature, chemistry and suspended loads. All action alternatives within the riparian reserves are expected, with riparian reserve management prescriptions, to provide adequate shading and maintain stream temperatures within state standards (Compliance with Forest Plan MA-15-06). This project will take canopy closure within the riparian reserves below the 65 percent level. Those areas that provide shade to the channel will be maintained at or above the 65 percent level. Adequate wood will be maintained to support a healthy riparian and aquatic ecosystem.

Biological, physical, and chemical integrity of water quality will be maintained through utilization of BMP's. Examples of recommendations utilized to protect biological, physical, and chemical integrity include avoiding cutting trees contributing to bank stability, pulling slash away from slow moving water and buffering of live streams during post treatment activities (e.g. fertilization).

ACSO 5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transportation.

Fire and early management heavily influenced the aquatic ecosystems that occur in the proposed harvest units. The diversity of historic locations of large down wood and large diameter standing trees, (North facing slopes) are the result of isolated pockets that fire missed. Sediment input into the stream would be episodic following fire activities. Vegetative slopes have reduced sediment input and reduced effects of peak flows on channel bank erosion by reducing the snow accumulation typically found on hillsides following fire. The aquatic ecosystems have evolved under this scenario and will be maintained through the maintenance of the riparian reserves.

The episodic pattern of sediment pulses that would have occurred due to the frequency of fire will retard slightly (10-40 yrs.) due to maintenance of riparian reserves. This would eventually be reestablished when a catastrophic fire occurs. Until such time, prudent measures will be taken to reduce the effect of fire through maintenance and management of the components of the riparian reserve (fuel loading; tree density).

ACSO 6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

In stream flows are addressed in the Forest Plan and the South Santiam Watershed Analysis (1995) for this area. Documentation within the watershed analysis limited its discussion to Hydrology of the area and doesn't respond directly to the in-stream flow portions of this question. The Willamette National Forest Plan bridges this limitation through; FW-113; FW-111; FW-093; FW-089. These forest-wide standards and guidelines are required (shall's), in the plan. Upon implementing these Standards it is anticipated that the In-stream flows will be maintained and restored sufficiently to create and sustain riparian, aquatic and wetland habitats, and to retain patterns of sediment, nutrient, and wood routing.

ACSO 7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

There are minor wetlands in or adjacent to the proposed stands. This project's affect on downstream floodplains or wetlands is negligible due to the thinning prescriptions proposed. The wetlands are associated with the riparian network and will be buffered and protected. No jurisdictional floodplains are found within the proposed units/stands.

There are several small (less than 1/4 acre) wetlands within the proposed project area. Topography of the area that allows these are associated with colluvial deposits adjacent to stream channels and Gordon Meadow. Short-term impacts may occur to the water-table elevation of these wetlands. These impacts are anticipated to be negligible due to the increase in transpiration that follows increased stand growth.

ACSO 8. Maintain and restore species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability

Selective thinning will help shift the tree species composition and create a diverse plant community. Western redcedar and hardwoods will be retained and will benefit from the removal of surrounding fir. Plant diversity and abundance should generally increase along thinned riparian areas. Thinning dense stands of fir is expected to result in suitable conditions for a number of understory species. The abundance of existing herbs and shrubs is expected to increase, and the increased light and nutrients may lead to establishment of additional species. Species adapted to survival under a dense overstory, however, may be displaced.

ACSO 9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

BMP's and mitigation measures designed to address in-stream and riparian habitats (i.e. seasonal restrictions, canopy closures requirements, and soil protection requirements), should help minimize impacts to riparian-dependent invertebrate and vertebrate species. Individual species may experience short-term impacts through canopy opening and yarding of material from riparian reserves. These short-term affects are not anticipated to effect the distribution of populations of these riparian-dependent species. This anticipation is based on past disturbances within the area and the plant, invertebrate, vertebrate, and riparian dependent species populations' response.

The proposed activity is expected to increase the abundance of native herbs and shrubs because more light and nutrients will be available for growth. The increase in plant biomass is expected to lead to increased prey base (insects and arthropods) for animals associated with riparian areas.

Epiphytic lichens and mosses will benefit from the retention of hardwoods and Pacific yew, as well as the larger trees that will result from the thinning. Species requiring down wood, including fungi, lichens, mosses, and a variety of mollusks, bryophytes and animals, may suffer a short term (1-50 years) loss of habitat as material is removed that otherwise would have provided habitat. This was weighed against the risk associated with retaining this material on site.

Appendix G: Three Creeks Old-Growth Grove Implementation Guide

12/3/03

The 1990 Willamette National Forest Land and Resource Management Plan (LRMP) directs Districts to prepare an Implementation Guide for all designated Old-Growth Groves, in order to establish site-specific management objectives, enhancement programs, and other acceptable uses and activities for these areas (LRMP, p.158-160). These guides augment the existing amended Forest Plan Standards and Guidelines (1994) for all Old-Growth Groves (MA-7).



Managed Stand & Old-Growth off Road 2046

I. Background

The Three Creeks Old-Growth Grove was established by the 1990 Willamette LRMP and based on recommendations by the Three Creeks Task Force, which was formed in 1985 to settle the controversy that surrounded the harvest of 56 acres of old-growth in the Squaw Three Timber Sale. The task force was initiated by the Forest Service and had many representatives from environmental groups, scientists and Forest Service personnel.

A “Synopsis of the Old Trees Controversy” is in the Sweet Home Ranger District Three Creeks project files. This chronology of significant events starts in 1975 with the PNW Research Station scientist research paper with very old tree ages in the Three Creeks area and includes history of tree sitters, area closure, arrests, an oversight hearing by then Congressman Jim Weaver, press conferences by Lane County Commissioner Jerry Rust, failed negotiations between the Forest Service and Willamette Industries to trade out of the controversial units, editorials by all major Oregon newspaper editors and more.

Stated in the synopsis a “Summation of Issue: The controversy surrounding the Squaw III timber sale in Sweet Home Oregon goes right to the heart of the continuing wilderness battle that is still a hot issue in western Oregon. In 1984 Congress passed the Oregon Wilderness Bill adding more National Forest acres in Oregon to the Wilderness ledger. The area containing the Squaw III timber sale was proposed by environmentalist (area known to them as Old Cascades Wilderness) for wilderness designation but was not included in the final Act signed by President Reagan. Congress hoped this bill would end the debate surrounding which lands should and should not be managed as Wildernesses, but instead it just diverted the controversy to the Forest Service planning process.”

With the arrival of the 1994 *Record of Decision (ROD) and Standards and Guidelines on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl*, also referred to as Northwest Forest Plan, the Three Creeks area was included in the South Santiam-RO215 Late-Successional Reserve allocation. However, the ROD (A-6) states, “... where overlaps occur, the standards and guidelines of both allocations apply.”

II. Present Condition

Location

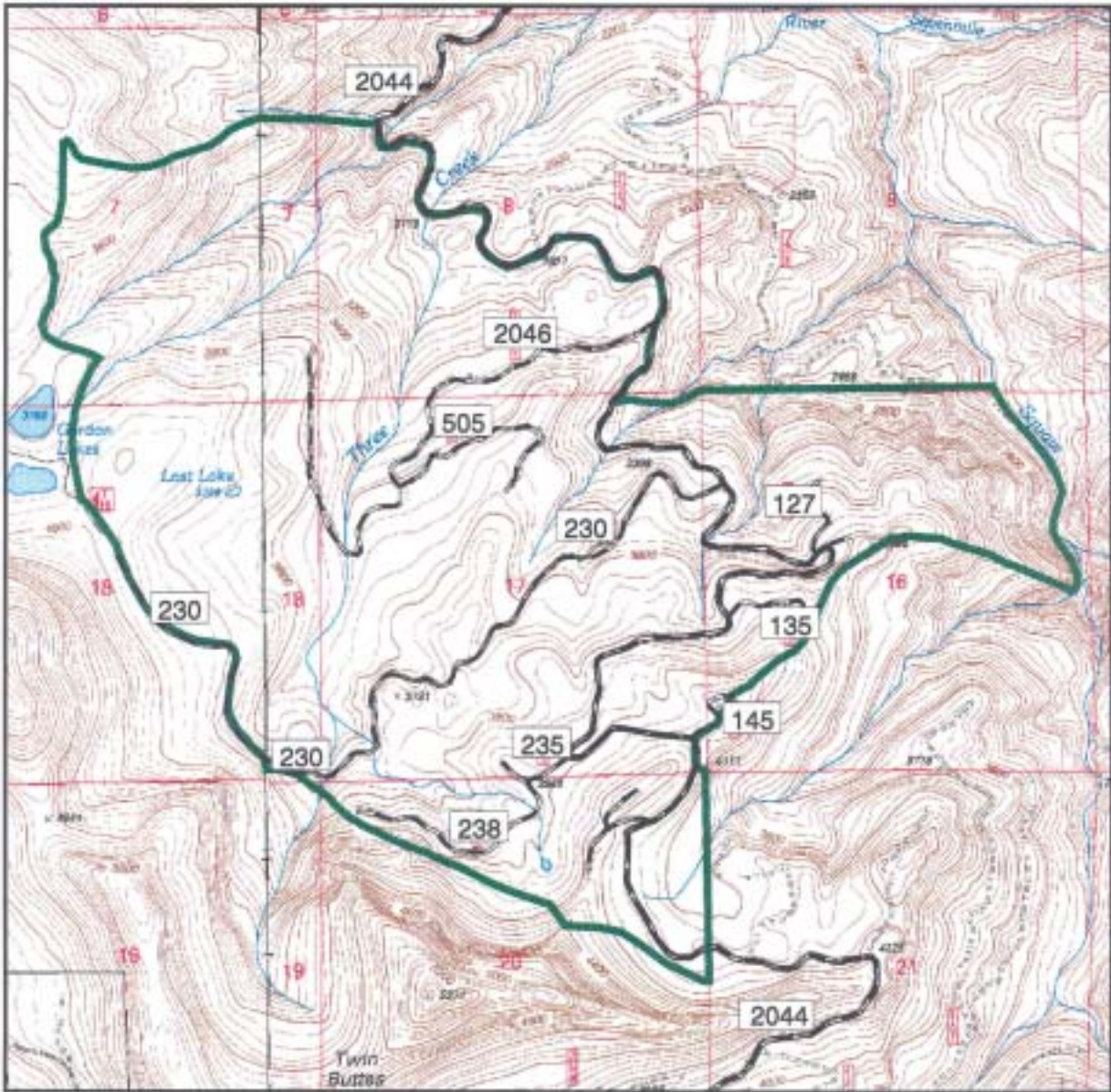
The Three Creeks Old-Growth Grove is located in the Sweet Home Ranger District of the Willamette National Forest. It is in the South Santiam Watershed near the headwaters of Three Creeks. It lies just north of the Three Creeks Research Natural Area (RNA) and is situated between Latiwi Creek (formerly Squaw Creek) on the east side and Gordon Lakes on the west side. The legal location is: T.14S., R.5E., portions of Sections 7, 8, 17, 18, and 20. See Figure 1: Vicinity Map and Figure 2: Three Creeks Old-Growth Grove.

The Three Creeks Old-Growth Grove is accessed by taking Highway 20 east of Sweet Home 25.2 miles to Forest Road 2044 (Latiwi Creek Road). Take Rd. 2044 south approximately four miles to the northern edge of the Old-Growth Grove. Road 2044 is the boundary for approximately 1.5 miles and then becomes surrounded by the Grove. Several roads are completely within the Old-Growth Grove; these include Road 2046 (gated) and 2044-230, 2044-235, and 2044-238.



Three Creeks Old-Growth Grove

Figure 2



Scale: 2.64 inches = 1 mile



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Description of the Environment

The Three Creeks Old-Growth Grove contains a mosaic of forest stands ranging from young plantations to super old-growth greater than 850 years of age. This extreme old age is the distinctive ecological feature of the Old-Growth Grove. The generally northeast aspect combined with the cool, moist upper-slope conditions and the presence of topographic wind and fire-breaks have spared this area from major disturbance since about 1100 AD (Three Creeks Task Force 1986). Present GIS mapping calculates the Old-Growth Grove size as 1,965 acres, however, the Willamette Forest Plan 1990 (LRMP, III-166) states the size of the Grove as 1,792 acres.

Elevations range from 2200 feet on the east boundary to 4300 feet on the south boundary. The area contains forests in the Pacific silver fir zone at upper elevations and western hemlock zone at lower elevations. Special habitats, such as wet meadows, rock outcrops, and cliffs are present but they are not the prominent feature in the Three Creeks Old-Growth Grove and are a scattered 68 acres.

The intact forest stands exhibit a variety of ages. There are approximately 400 acres of 170 year old forest, mostly in the western portion of the Grove, and 330 acres of 400-500 years old stands, primarily in the eastern portion. The remainder of the intact forest is mosaics of stand ages, which include 150, 400-500 and 650-850 year old trees (Three Creeks Task Force 1986). Many of the oldest stands are fragmented and surrounded by plantations (see Figure 3).

There are no trails in this Three Creeks Old-Growth Grove. Currently recreation use is limited to dispersed camping, mostly by hunters, and sightseeing traffic en route to Gordon Lakes, which is just outside of the management area.

The flora and fauna inhabiting the Three Creeks Old-Growth Grove are typical of those found in the forests of the west Cascades. The federally listed northern spotted owl is found in the area as well a number of survey and manage species, including the old-growth specklebelly (*Pseudocyphellaria rainierensis*), a foliose lichen that inhabits tree canopies. Habitat for a number of rare species occurs in the area, including the noble polypore (*Bridgeoporus nobillissimus*), a species that inhabits large diameter noble fir stumps and snags.

Non-native plants are found along the roads but are limited in extent. The most serious weeds known to occur in the Grove are reed canarygrass (*Phalaris arundinacea*) and Himalaya blackberry (*Rubus discolor*).

There are approximately 10 miles of roads, 36 managed stands and associated landings, and two rock quarries in the Three Creeks Old-Growth Grove.

Three Creeks Research Natural Area

Directly adjacent and to the south is the Three Creeks Research Natural Area (RNA) consisting of 445 acres of old-growth out of 692 acres total (see Figure 4). Within the RNA are 165 acres of special habitats of avalanche chutes, shrub talus/scree slopes, cliffs, dry and moist rock gardens; see ortho photo - Figure 5. The remaining 82 acres are fire-regenerated second growth (seral 3) and harvested acres (seral 2). RNAs are part of a federal system of tracts established for biotic preserves, research and educational purposes (LRMP, III-167).

Managed Stands

There are 796 acres of managed stands (seral 1 & 2) within the Three Creeks Old-Growth Grove (see Figure 4 and Table 2 at end of document). These plantations range in age from approximately 10-45 years old. Most of these even-aged stands were broadcast burned and planted primarily to Douglas-fir; however, Noble fir is believed to have been planted in the highest elevation plantations. A portion of the plantations has been pre-commercially thinned, see Table 3 at the end of this document. Aerial fertilization has been documented to occur on 56 acres and regeneration by natural seeding on 131 acres. Natural seed in has occurred throughout the managed stands in addition to planted seedlings and they contain an average of 250 trees/acre greater than 7" diameter breast height (dbh).

Table 1 summarizes forest seral stage acres by the following Geographical Information System (GIS) and Chad Oliver definitions.

GIS Definition:

Seral Stage 1: Harvest clear-cut (HCC) or HCC w/ Reserves; Managed Stands ≤ 20 years or Natural Stands with Size Class 1 or 2 (0 to 4.9"dbh);

Seral Stage 2: HCC or HCC w/ Reserves Managed Stands > 20 years or Natural Stands with Size Class 2.5 or 3 (5 to 8.9"dbh);

Seral Stage 3: Anything that **doesn't** meet Seral Stages 1, 2, or 4; Second Growth, Salvaged, Shelterwoods (overstory remaining), Prelogs and Miscellaneous (Generally 9 to 20.9"dbh - but if shelterwood or Prelog the overstory could be larger); and

Seral Stage 4: Old-Growth Natural Stands with Size Class 4.5 and larger (≥ 21"dbh).

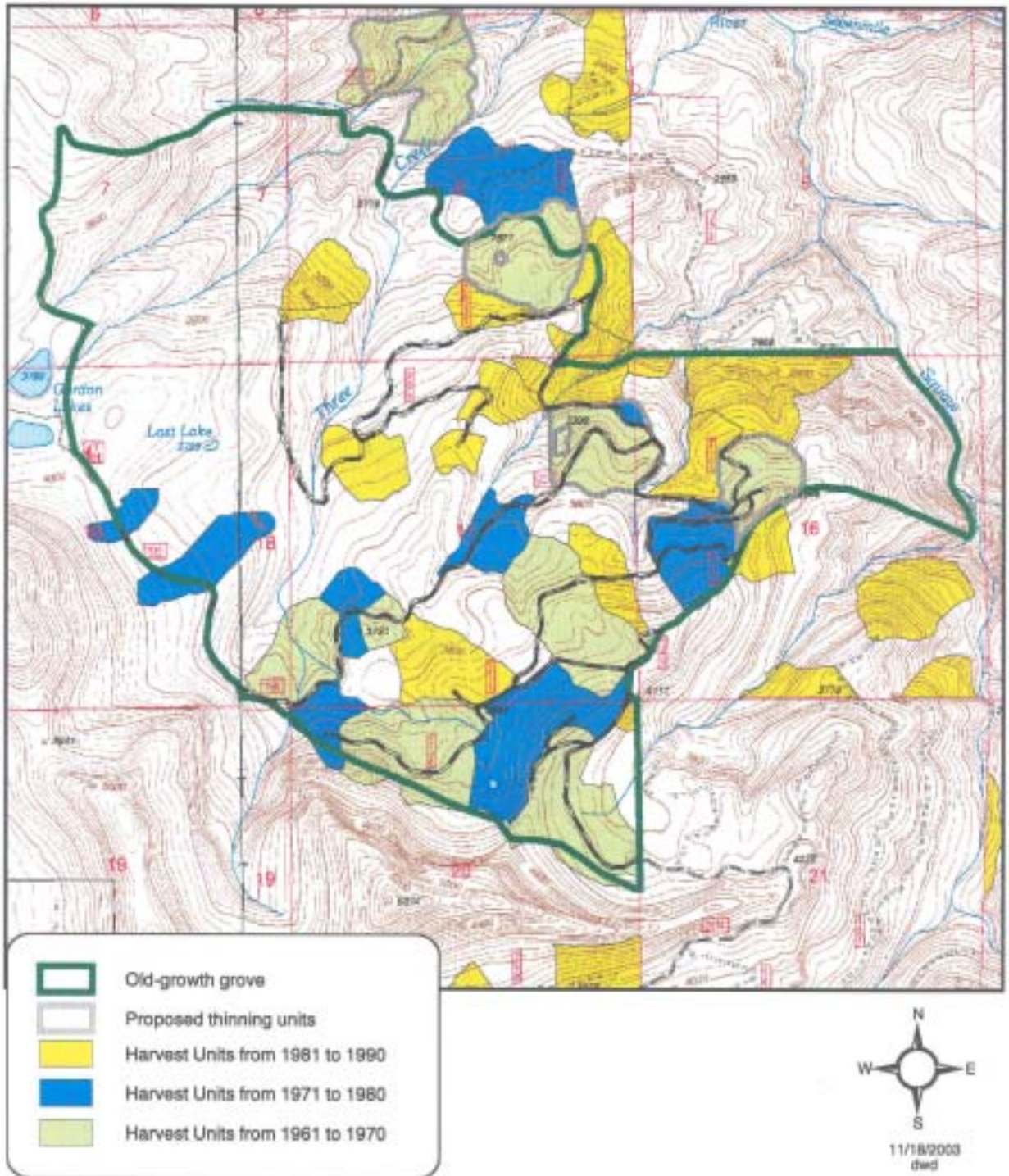
Seral Stages	Three Creeks Old-Growth Grove
Seral 1- Stand Initiation	264
Seral 2 -Stem Exclusion	561
Seral 3-Understory Reinitiation	691
Seral 4 -Late-Succ./Old-Growth	381
Special Habitats/Non-forested	68
<i>Total Acres</i>	1,965

Seral Stage definition in “Forest Stand Dynamics” written by Chad Oliver (1990, pgs. 148-159):

- **Stand Initiation stage** - After a disturbance, new individuals and species continue to appear for several years.
- **Stem Exclusion stage** - After several years, new individuals do not appear and some of the existing ones die. The surviving ones grow larger and express differences in height and diameter; first one species and then another may appear to dominate the stand.
- **Understory Reinitiation stage** - Later, forest floor herbs and shrubs and advance regeneration again appear and survive in the understory, although they grow very little.
- **Old-Growth stage** - Much later, overstory trees die in an irregular fashion, and some of the understory trees begin growing to the overstory.

Three Creeks Old-Growth Grove

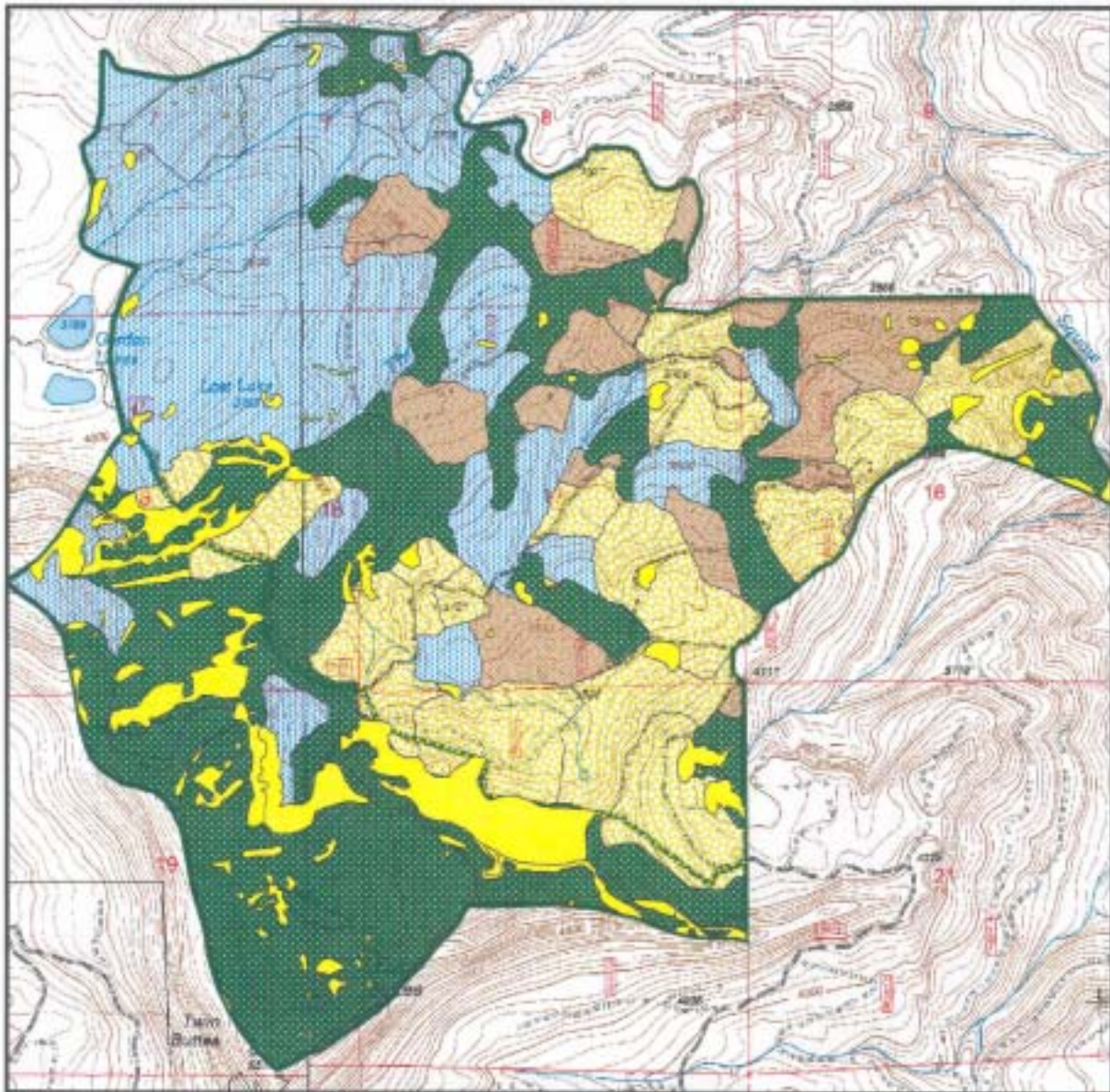
Figure 3



Scale: 2.64 inches = 1 mile

Seral Stages in Three Creeks OGG and RNA

Figure 4



Seral Stages

	1 Stand Initiation
	2 Stem Exclusion
	3 Understory Reinitiation
	4 Late Successional/Old-Growth
	Special Habitats



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Scale: 2.64 inches = 1 mile

III. Management Direction

There are four broad-scale planning documents for the area:

- Willamette National Forest LRMP-1990
- Northwest Forest Plan-1994
- South Santiam Watershed Analysis-1995
- The Mid-Willamette Late-Successional Reserve Assessment -1998

The Willamette National Forest Land and Resource Management Plan (LRMP, 1990) as amended by the *Record of Decision (ROD) and Standards and Guidelines on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (April 1994), after this referred to as either the Forest Plan or ROD, designates the Three Creeks Old-Growth Grove as part of a “Late-Successional Reserve (LSR).”

The ROD identifies thinning of young managed stands within LSR’s as a useful tool for accelerating the development of late-successional habitat features (ROD B-6). Such features include large trees, rich species composition in the over- and understory, shade tolerant tree species, large standing snags and coarse woody debris. Most of these features contribute a multi-layered composition of structure and habitat for old-growth species.

As directed from Forest Plan, the Mid-Willamette Late-Successional Reserve Assessment (1998) was developed for 11 designated LSRs. The objective of forest management in LSRs is to protect and enhance conditions of late-successional forest ecosystems for the benefit of associated species (IV, p. 111). This assessment is to be used to establish criteria and guidelines in reaching prudent site-specific decisions.

The South Santiam Watershed Analysis (1995) recommends the continuance of growth enhancement of young stands to meet objectives of the different land allocations (C2, p. 60).

Desired Future Condition

“The desired future condition is a network of outstanding, highly accessible examples of old-growth timber type of the Western Cascades.”(LRMP, IV p.158)

Management Objectives

General management goals for Old-Growth Groves are provided in the Forest Plan (page 158). These are as follows:

- Preserve representative ecosystems of old-growth forest of the Western Cascades.
- Provide opportunities for the public to enjoy the educational, aesthetic and spiritual values associated with the old-growth timber successional stage.

Site-specific management objectives for the Three Creeks Old-Growth Grove are:

- Maintain old-growth stands by protecting them from disturbance and provide refugia for old-growth related species.
- Enhance structural and species diversity in the existing managed stands to facilitate development of old-growth forests; by accelerating rapid growth of the existing plantations they will better buffer the old-growth stands from wind.
- Protect the area from fire, both natural and human caused.
- Transportation management is to minimize and reduce road density while providing administrative use and recreational access.

IV. Enhancement Opportunities, Uses and Activities

Vegetation Management

Silvicultural Activities in Managed Stands

Silvicultural activities will be limited to the existing managed stands (see Table 2 and 3) and should be done only to enhance late-successional characteristics. Precommercial and commercial thinning may be appropriate in these stands.

- Pruning will not occur. Pruning is not desirable when promoting diverse structure for old-growth and its associated wildlife habitat. Fertilization will only occur under careful analysis. Fertilization will generally only occur in conjunction with commercial thinning to replace nutrient loss.
- Silvicultural prescriptions shall be written to promote tree species diversity and stand complexity.
- Minimize or avoid impacting residual old-growth stands during silvicultural activities.

Other Silvicultural Activities

- Salvage in the case of a catastrophic event needs to follow LSR guidelines (ROD, C-13 to 16) such as:
 - Salvage only in disturbed sites greater than 10 acres and canopy closures of less than 40 percent.

Hazard Trees

- Any hazard trees that need to be felled will be left on site.

Invasive Plants

- Aggressive control of invasive non-native plants should be done to maintain the integrity of native plant communities.

Special Forest Products

- Permits for firewood gathering, for commercial or personal use, will not be issued outside of the road prism.

- Bough sales in managed stands will continue until plantations grow out of bough availability which is estimated to be in 2010. No removal of boughs is to occur in natural stands or beyond 2010.
- Commercial harvest of special forest products, including but not limited to beargrass, yew, ferns, and mushrooms, is prohibited. Personal use is limited to fruits, such as mushrooms, berries, seeds and cones. Personal collection of live plants is prohibited. Refer to the Special Forest Product EA (USDA 1993) for more specific direction.

Road Management

The Three Creeks Old-Growth Grove has 10.7 miles of road and has an average road density of about 3.8 miles/square mile. Roads 2044-235 and 2046-505 are proposed for closure and Road 2046 will have its existing gate replaced with an extra heavy duty magnum gate to improve closure. These closures are listed along with other road closure proposals in Table 4.

- Reduce road density as appropriate.
- Road maintenance of existing Level 2 and 3 roads is expected to occur as needed.
- Prioritize roads necessary for fire suppression and recreation access.
- Rip and plant with native species small spur roads, skid roads and landings that are no longer necessary for management activity.

Fire Management

Fire suppression

- Fire suppression may be necessary to protect the near climax forest stands. Human-caused and natural fires will be suppressed as soon as possible by methods that will minimize damage to the very old stands.

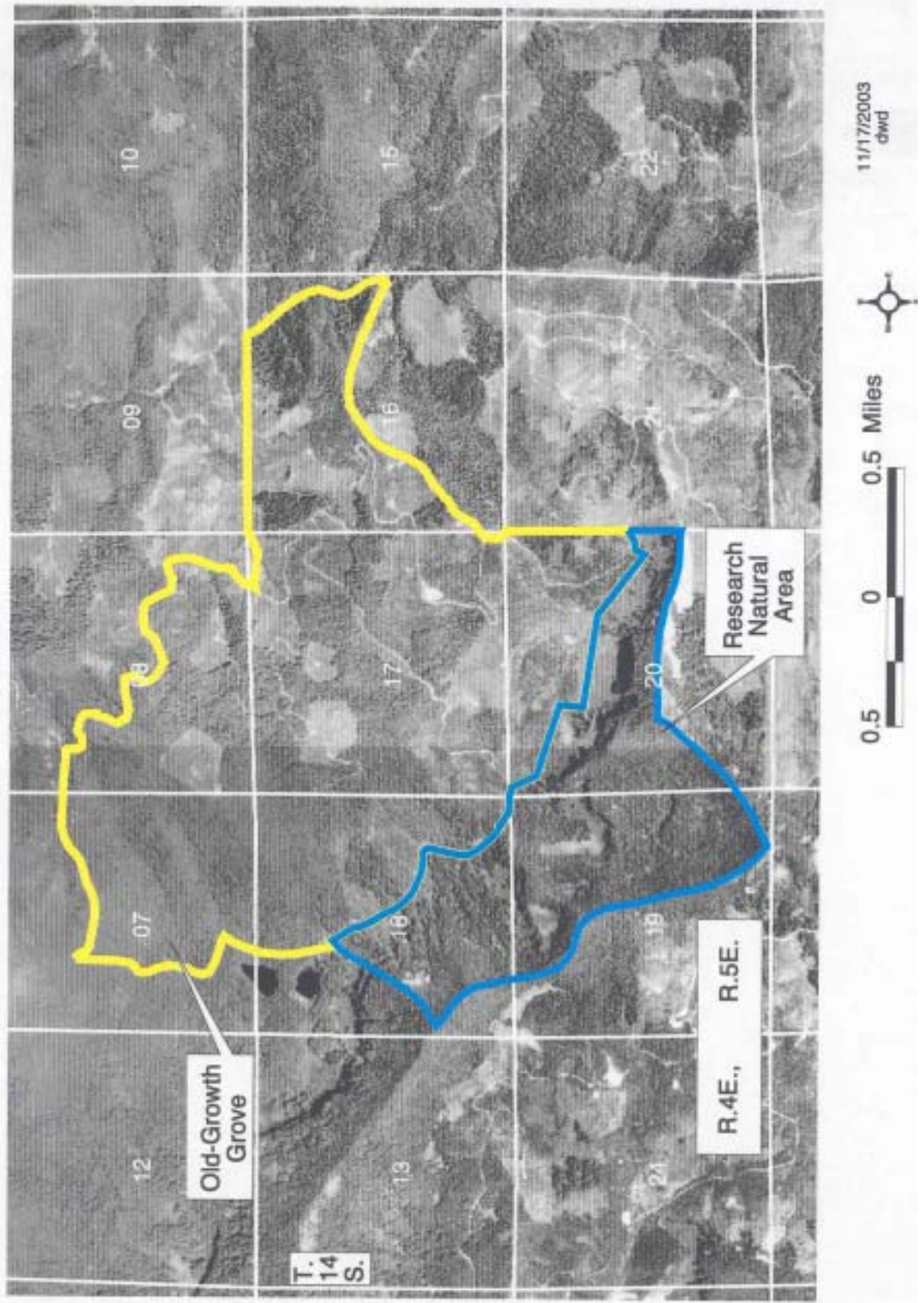
Fuels Management

- Treatment of fuels should be emphasized to reduce fire hazard to the old-growth trees.
- Burning of hand-piles or any fuel treatment will require a burn plan.
- Use of low intensity prescribed fire should be considered on a limited basis (refer to Mid-Willamette Late-Successional Reserve guidelines).

Recreation

- Maintain access to Gordon Lakes Trail via Road 2044-230.
- Campfires at Gordon Lakes represent a fire threat to the Old-Growth Grove, therefore, popular camping /picnicking sites will be fire-proofed.
- Review roads for potential conversion to trails so the public can access the large old trees remaining between the managed stands. Interpretive signing on the ecological importance of the area may be included.
- Off Road Vehicle (ORV) use is prohibited on closed roads.
- Manage dispersed camping so as to reduce potential risk of fire starts.

Three Creeks RNA and OGG - Ortho Photo - Figure 5



V. References

Hemstrom, M., et al. 1986. *Three Creeks Old-growth Area Task Force Proposed Management Plan*.

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USDA Forest Service. 1995. *South Santiam Watershed Analysis*. Eugene, OR.

Table 2: Managed Stands in the Three Creeks Old-Growth Grove

Ref #	Stand	Year of Harvest	Harvest Acres	GIS Acres	% in OGG*
S 004	3002950	1963	56	39.6	71%
S 006	3003116	1964	30	30.3	100%
S 005	3003045	1965	41	40.7	100%
S 008	3003255	1965	60	57.0	95%
S 007	3003158	1967	69	69.1	100%
S 009	3004037	1968	10	10.1	100%
S 011	3003175	1969	35	35.6	100%
S 010	3003218	1969	60	57.4	95%
<i>Subtotal of Acres from Harvest Units from 1960 to 1969</i>				339.8	
S 016	3003136	1976	17	17.0	100%
S 019	3003138	1977	10	7.2	70%
S 015	3003142	1977	31	31.1	100%
S 018	3003149	1977	30	22.4	73%
S 021	3003227	1977	63	62.5	100%
S 020	3003231	1977	20	15.0	75%
S 017	3004036	1977	15	15.2	100%
<i>Subtotal of Acres from Harvest Units from 1970 to 1979</i>				170.4	
S 025	3004031	1980	7	6.5	100%
S 024	3004032	1980	3	3.0	100%
S 026	3004035	1980	4	3.9	100%
S 027	3004243	1980	1	1.2	100%
S 013	3003026	1982	25	18.6	76%
S 086	3002959	1984	27	6.2	22%
S 087	3003153	1984	18	16.4	100%
S 036	3004038	1984	2	2.4	100%
S 042A	3004030	1986	3	2.5	100%
S 042	3004033	1986	5	5.2	100%
S 088	3003197	1987	37	37.9	100%
S 115	3002974	1988	20	20.3	100%
S 112	3002991	1988	17	16.8	100%
S 038	3003042	1988	6	6.2	100%
S 037	3003052	1988	53	53.4	100%
S 111	3003054	1988	18	17.5	100%
S 110	3003092	1988	22	22.0	100%
S 113	3003106	1988	28	27.9	100%
S 114	3003112	1988	10	9.6	100%
S 109	3003143	1988	16	2.0	10%
S 120	3004034	1989	6	6.2	100%
<i>Subtotal of Acres from Harvest Units from 1980 to 1989</i>				285.7	
Totals	37 units		875 acres	795.9 ac.	

* % in OGG= some units extend beyond the Old-Growth Grove boundary.

Table 3: Past Management Activity

Ref #	Sale Name	BCB	RNS	RPL	SPC	SFL
S 004	Squaw Creek #1	1962		1970	1981	1993
S 005	Squaw Creek #2	1965	1974		1984	
S 006	Squaw Creek #2	1964	1971		1985	
S 007	Squaw Creek #2	1965		1974	1989	
S 008	Squaw Creek #2	1964	1974			
S 009	Squaw Creek #3	1967		1974		
S 010	Squaw Creek #3	1968		1974	1988	
S 011	Squaw Creek #3	1968		1974	1989	
S 013	Three Creeks Basin	1973		1986	1991	
S 015	Three Creeks Basin	1976		1982	1991	
S 016	Three Creeks Basin			1980	1991	
S 017	Three Creeks Basin	1976		1982	1989	
S 018	Sheep Ram	1976		1982		
S 019	Three Creeks Basin	1976		1982		
S 020	Three Creeks Basin	1976		1982		
S 021	Three Creeks Basin	1976		1982	1990	
S 024	Squaw #5	1979		1983		
S 025	Squaw #5	1979		1983		
S 026	Squaw #5	1979		1983		
S 027	Squaw #5	1979		1983		
S 036	Squaw Joe			1986		
S 037	Squaw Fire	1987		1990		
S 038	Squaw Fire	1987		1990		
S 042	Three Creeks Fire Salvage			1988		
S 042A	Three Creeks Fire Salvage			1988		
S 086	Squaw #2	1983		1986		
S 087	Squaw #2	1983		1986		
S 088	Squaw #2	1985		1989		
S 109	Squaw Three	1987		1982		
S 110	Squaw Three	1987		1990		
S 111	Squaw Three	1987		1990		
S 112	Squaw Three	1987		1990		
S 113	Squaw Three	1987		1990		
S 114	Squaw Three	1987		1990		
S 115	Squaw Three	1987		1990		
S 120	Squaw Burn Salvage			1997		

BCB – Broadcast Burn – 842 acres in the TCOGG were burned.

RNS – Regeneration by Natural Seeding – 131 acres were left to seed in.

RPL – Regeneration by Planting – 744 acres were planted.

SPC – Precommercial Thinning – 379 acres have been precommercially thinned, 426 need SPC.

SFL – Aerial Fertilization – 56 acres have been fertilized.

Table 4: Proposed Road Closures

Map #	Road # And Locater	Road Designation ML, OL, D	Closure Type	New or Existing Closure	Closure Funding Source	Cost Share	Closure Road Miles	New Road Closure Miles	Comments
1	2032 365	2, 2, S15	Berm	New	Wildlife	No	1.86	1.86	
2	2044 208	2, 2, S15	Berm	New	KV	Yes	.93	.93	
3	2044 120	2, 2, S15	Berm	New	KV	Yes	1.05	1.05	
4	2044 235	2, 1, S15	Berm	New	Wildlife	No	.76	.76	In Old-Growth Grove
5	2046	2, 2, S15	Gate	*Existing	KV	No	1.88	0	Entering Old-Growth Grove
6	2046 505	2, 1, S15	Rip and Plant	Existing	Wildlife	No	.65	0	In Old-Growth Grove
7	2032 315	2, 2, S15	Berm	New	Wildlife	No	.78	.78	
<i>Totals</i>							7.91	5.38	

**Replace existing gate with an extra heavy duty magnum gate to improve closure success.*

Appendix H: Gordon Three *Leptogium cyanescens* Monitoring

Leptogium cyanescens is an epiphytic lichen that is currently a Survey and Manage Species in Category A. The objective of this designation is to manage all known sites and minimize inadvertent loss of undiscovered sites (USDA, USDI 2001). The lichen was found in Units 7, 8 and 10 in the Gordon Three Thinning. A 172 foot buffer was retained around each of the four sites. It is unclear how sensitive this lichen is to adjacent thinning.

Monitoring will be done to determine whether *Leptogium cyanescens* remains in the units. Sampling will occur in the 1st and 5th years after harvest. Microclimatic features, such as light, wind, and humidity, are expected to change in response to thinning and the effects of these changes may not be apparent in the first year. Sampling five years after harvest may illustrate changes in the population that will not be detected in the first year.

Appendix I: FVS Model Thinning Analysis 12/1/03

/s/ Suzanne Schindler, Region 6 Certified Silviculturist

Stand growth and treatments were modeled using the updated Forest Vegetation Simulation (FVS) Model 6.21, Suppose Version 1.14, Westside Cascades Geographic Variant (Wykoff, et al. 1982). This model simulates the growth and yield of stands over time. Treatments were modeled for ten-year increments to a 200-year time period; model runs are available in the project files. A subprogram Stan Visualization System (SVS) graphically displays the modeled stand. The model uses data from stand exam plots taken to the Pacific Northwest Forest Service Region 6 specifications. A summary of Unit 10 stand exam data is on page 6.

Growth projections and modeling of future stand conditions were more fully analyzed by the FVS model for three thinning density reductions to 70, 90 and 110 trees per acre (TPA); other reduced densities were considered in Table 1. Trees per acre reflect the net tree numbers to be retained on each stand after snag and coarse wood prescriptions are met. The sample stand used (Unit 10) is somewhat better than average with respect to growth than the other Gordon Three units but is representative in species composition, aspect, slope and general attributes of the stand. Table 2 has all the Gordon Three units and some attributes such as their silviculture stand reference number, TPA and acres. On page 7 is Table 7 that has the history of all the different silvicultural treatments done to the stand and at what year, such as when they were planted.

The results of this growth model are displayed in EA Figures 12a,b,c for the stand when thinned in year 2003 to 70, 90, and 110 TPA (respectively) and grown to age 80 at 2043. The most notable result is increased small tree regeneration with thinning; allowing more light to the ground for seedling and understory development as compared to Figure 5b No Action Model grown out to age 80. Figure 5a is the existing stand condition modeled at age 40, year 2002

Diameter growth rates will increase, as a direct effect of thinning. The resulting stand, freed from inter-tree competition, will have large-diameter trees sooner thus accelerating the development of late-successional structure. At age 80 the quadratic mean diameter greater than seven inches (at Diameter Breast Height –DBH) will be three to four inches larger than if left un-thinned (EA Table 18); thinning to 70 TPA results in 22.48 inch diameter at age 80 versus no thinning of trees results in 18.42 inch diameter at age 80. The trees if left un-thinned still continue to grow but at a slower pace.

EA Table 18: Diameter Growth

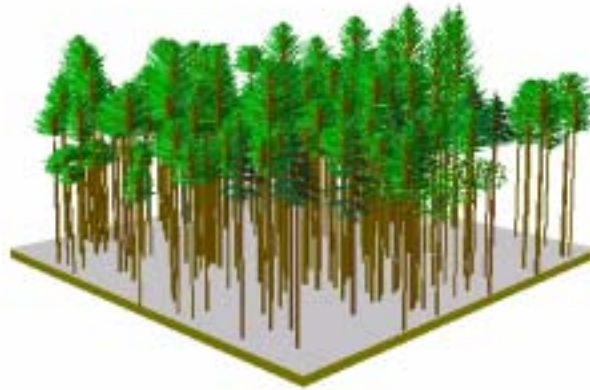
Age 40 @ 2003	Age 80 @ 2043
Existing 225 TPA	18.42 DBH
Thin to 70 TPA	22.48 DBH
Thin to 90 TPA	22.05 DBH
Thin to 110 TPA	21.55 DBH

A second thinning entry is likely to occur in the next 20 or 30 years due to retaining a relatively moderate level of trees per acre at these initial thins and their location near main roads. Benefits to further accelerating late-successional structure from the second thinning density reduction will result in long-term increased diameter growth along with other late-successional characteristics such as multiple canopy enhancements. FVS multiple entry thinning results are displayed in Tables 3, 4, & 5. These tables model 1st & 2nd thinning entries with initial Thinning of **70, 90, and 110** TPA and a second entry reduction to 30 TPA either 20 or 30 yrs later. Compare to Table 6 with one commercial thin to 70 TPA and is grown out to year 2163.

Stand Visualization System (SVS):

Stand=gordon1 Year=2002 Inventory conditions

Alternative 1 Existing Stand Condition Model Age 40 at year 2002 Figure 5a



Stand=gordon1 Year=2043 Beginning of cycle

Alternative 1 No Action Growth Model Age 80 at year 2043 Figure 5b



EA Figures

12 a, b, c

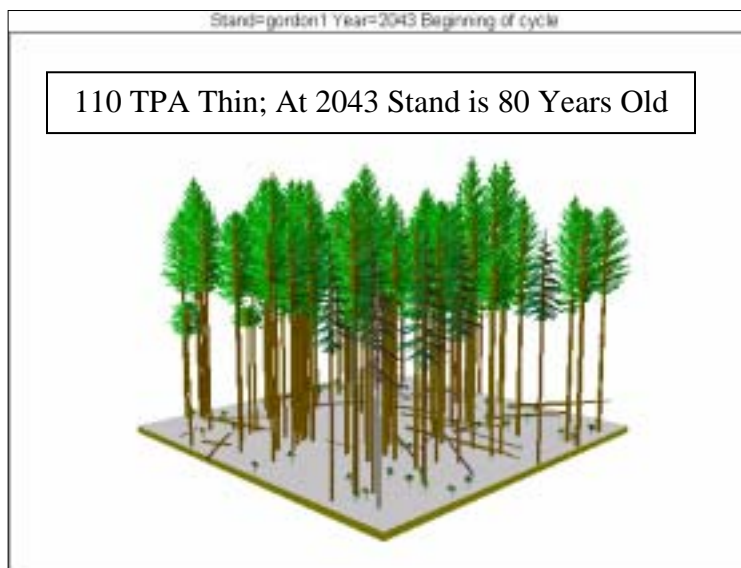
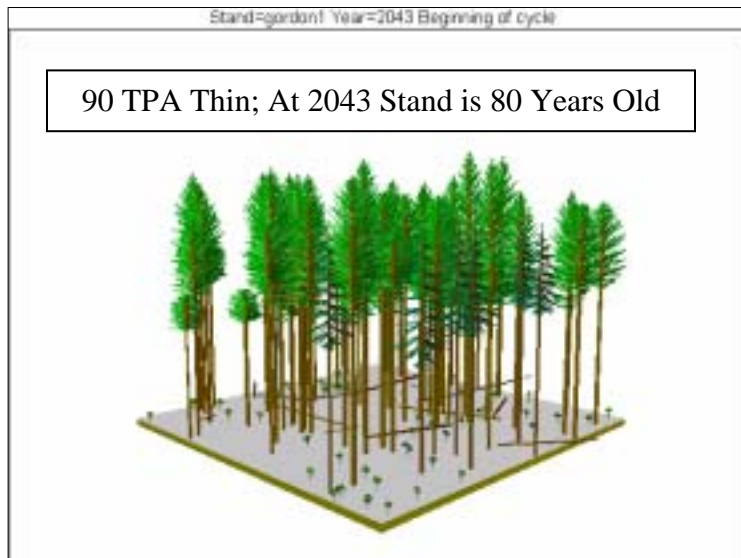


Table 1: Unit 10 Stand Attributes of Existing Condition and at Reduced Densities by Year

	RD% >7"	CC%>7"	BA >7"	MBF/ac.	QMD>7"	QMD>16"	QMD>7"	QMD>7"
Year 2002 Existing 225 TPA	51	73	183	28,755	12	18.2	Age of 80 Stand DBH is 18.42	Reaches 30"@ Year 2153
Year 2003	Year 2013					Year 2163		
Thin to 120 TPA	42.2	59	168	6.5 Removed	16.4	35.7		
Thin to 110 TPA	39.5	56	158	7.8 Removed	16.6	36.0	21.55	30"@ Yr2113
Thin to 100 TPA	36.6	53	147	9.5 Removed	16.7	36.5		
Thin to 90 TPA	33.5	50	135	11.3 Removed	16.9	37.0	22.05	30"@ Yr2103
Thin to 80 TPA	30.3	46	123	13.2 Removed	16.9	37.5		
Thin to 70 TPA	26.6	42	108	15.5 Removed	17.0	38.0	22.48	30"@ Yr2103
Thin to 66 TPA by Leave Tree Marking best	26.0	44	105	15.9 Removed	17.1	37.7		
Thin to 60 TPA	22.5	36.6	91.1	17.9 Removed	16.8	37.1		
Thin to 50 TPA	17.7	31.1	70.4	21.1 Removed	16.2	35.3		
Thin to 40 TPA	14.3	27.2	54.8	23.7 Removed	15.1	34.0		

Table 2: Gordon Three Thin Units

Units	Ref.#	Acres	Average TPA
1	S1	27	250
2	S2	38	200
3	S3	60	200
4	S4	51	250
5	S5	44	300
6	S6	30	200
7	S12 & LE6681	92	250
8	LE6673	97	300
9	LE6675	17	250
10	F1	55	250
11	F2	37	250
12	F6	48	300
13	F120	50	350
<i>Total acres: 646</i>		250 TPA Average	

Forest Vegetation Simulator (FVS) Growth and Yield Model:

Table 3: 1st & 2nd Entry; Initial Thin 70 TPA; FVS Thinning Results

Action	Year	TPA≥7"	BA ≥7"	QMD≥7"	QMD≥16"	MBF/Ac
	2002	225	183	12	18	Existing 28,757
1 st Thin @	2003	223	188	12	18	Removes 15,505
<i>Results in:</i>	2013	70	108	17	20	
2 nd Thin @	2023	66	130	19	21	Removes 9,083
<i>Results in:</i>	2033	30	96	24	25	
(or)						
2 nd Thin @	2033	64	151	21	23	Removes 9,048
<i>Results in:</i>	2034	30	119	26	26	
	2163	34	253	37	40	97,385

Table 4: 1st & 2nd Entry; Initial Thin 90 TPA; FVS Thinning Results

Action	Year	TPA≥7"	BA ≥7"	QMD≥7"	QMD≥16"	MBF/Ac
	2002	225	183	12	18	Existing 28,757
1 st Thin @	2003	223	188	12	18	Removes 11,296
<i>Results in:</i>	2013	90	135	17	19	
2 nd Thin @	2023	83	160	19	21	Removes 15,777
<i>Results in:</i>	2033	30	92	24	25	
(or)						
2 nd Thin @	2033	80	181	20	22	Removes 16,504
<i>Results in:</i>	2034	30	130	25	26	
	2163	34	250	37	41	96,905

Table 5: 1st & 2nd Entry; Initial Thin 110 TPA; FVS Thinning Results

Action	Year	TPA≥7"	BA ≥7"	QMD≥7"	QMD≥16"	MBF/Ac
	2002	225	183	12	18	Existing 28,757
1 st Thin @	2003	223	188	12	18	Removes 7,783
<i>Results in:</i>	2013	110	158	17	19	
2 nd Thin @	2023	100	184	18	20	Removes 21,036
<i>Results in:</i>	2033	30	88	23	24	
(or)						
2 nd Thin @	2033	94	206	20	21	Removes 22,870
<i>Results in:</i>	2034	30	109	25	25	
	2163	34	246	36	40	94,028

Table 6: 1 Entry Thin 70 TPA; FVS Thinning Results

Action	Year	TPA≥7"	BA ≥7"	QMD≥7"	QMD≥16"	MBF/Ac
	2002	225	183	12	18	Existing 28,757
Thin @	2003	223	188	12	18	Removes 15,505
<i>Results in:</i>	2013	70	108	17	20	
Let Grow after One Commercial Thin						
	2023	66	130	19	21	26,985
	2033	64	150	21	23	33,952
	2063	56	202	26	27	55,983
	2103	51	249	30	31	82,623
	2163	41	283	36	38	108,493

Stand Exam Summary Sheet

Project Gordon/Three **Stand** 3002588 **Ref Unit** F1 **Exam Date** 12/2/2003
Acres 55 **Slope** 1500% **Elevation** 2200 **Aspect** Northwest
Plant Association TSHE/POMU - WILL **Topo Site** Convex Slope
Fixed Plot Radius 1/50TH ACRE **BAF** 28 **Plots** 13
Breakpoint DBH 7 **Radial Growth Period** 5 **Age** 43

Understory (Trees < 7" DBH)

DBH Group	DF	RC	WH	PY	HRDWD	All Species	Basal Area
0.1 - 0.9 TPA	3.8	15.4	100	3.8		123	0.1
1.0 - 2.9 TPA			11.5		3.8	15.3	0.3
3.0 - 4.9 TPA			7.7		3.8	11.5	1
5.0 - 6.9 TPA	15.4		11.5		7.6	34.5	7.7
Totals	19.2	15.4	130.7	3.8	15.2	184.3	9.1

Overstory (Trees > 7" DBH)

Species	TPA	BA	SDI	RD	MDBH (in)	BFV	CFV	CD (ft)
DF	180.4	134	595	0.38	12.35	11917	3757	18.2
WH	32.0	30	700	0.07	13.15	3753	1137	18.2
HRDWD	35.2	22	500	0.11	10.61		137	
Totals	228	185	542.8	0.58	12.22	15670	5031	18.2
SE %	16.5%	8.7%				11.3%	10.4%	136%

SDI
225.17
48.69
54.66
313.90

% TPA by classes

1-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	800+
7.7%	7.7%	23.1%	23.1%	7.7%	7.7%	15.4%		7.7%

% Basal area by classes

21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-180	181+
				23.1%			30.8%	46.2%

Brush and Forb Information

Species	Average Height	% cover
Sword Fern	2.6	23%
Oregon Oxalis	0.1	7%
Oregon Grape	1	6%
Vine Maple	11.6	5%
Salal	1	2%
Twinflower	0.2	1%
Red Huckleberry	6	1%

Damaging Agents

DF	WH	RA
Forks	Sweep	None
0% volume loss due to defect.		

Down Woody Debris

Class	1	2	3	4	5
Average Diameter	24	14	43	33	27
Average Length	20	10	37	29	24
Linear Feet per acre	15	8	57	222	111

Snag Information

No Snags Greater Than 20" in the Stand

1/7/2003 0:00

USDA, PNW, FS Region 6, 1991, *Stand Examination Program Field Procedures Guide* used in taking the 13 plots loaded into the Super Stand software program to evaluate the Stand Exams of Unit 10 which produced this Summary sheet.

Gordon Three Thin Stand Treatment History

Table 7: Stand Treatment History

Ref #	Unit	Stand	HCC	BCB	RNS	*RPL	PCT	SPR	SFL		
S1	1	3002633	1961	1961		1969	1975		1985		
S2	2	3002555	1961	1961		1969	1975		1985		
S3	3	3002848	1962	1966		1969	1980		1985		
S4	4	3002950	1962	1962		1970	1981		1985		
S5	5	3003045	1965	1965	1974		1984				
S6	6	3003116	1964	1964	1971		1985				
LE	7	3006781	No Info In Vegis Database For These Land Exchange Units								
LE	8	3006773									
LE	9	3006775									
F1	10	3002588	1959	1959		1969	**	1994	1987		
F2	11	3002678	1958	1948		1969			1985		
F6	12	3002656	1963	1964		1973	1987	1992	1993		
F120	13	3002986	1958	1959		1963					

HCC – Harvest Clear Cut

BCB – Broadcast Burn

RNS – Regeneration by Natural Seeding

*RPL – Regeneration Planting -when regeneration was certified, actually planted after broadcast burned.

PCT- Precommercial Thinning

SPR – Pruning

SFL – Aerial Fertilization

**From field review stand appears to have been precommercial thinned; database may be in error.

Biological Assessment for Spring Chinook Salmon and Winter Steelhead

Gordon Three Thin Project

**South Santiam Watershed
Willamette National Forest
Sweet Home Ranger District**

January 15, 2004

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Zone Fisheries Biologist
Sweet Home Ranger District

Reviewed By: Wade Sims
ESA Consultation Biologist (Fisheries)
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I. Introduction

This Biological Assessment (BA) was prepared pursuant to the Endangered Species Act of 1973, as amended, to evaluate and describe the effects of land management projects on spring chinook salmon (*Onchorhynchus tshawytscha*) and winter steelhead (*Onchorhynchus mykiss*). The BA was prepared in accordance with the National Marine Fisheries Service (NMFS) guidelines found in their 1996 publication: *Making Endangered Species Act Determinations of Effects for Individual or Grouped Actions at the Watershed Scale*. The project assessed with this BA includes all activities associated with the Gordon Three Thinning Project. This project is described in detail in Chapter III of this BA. All components of the project have been evaluated under the NEPA process, under the Environmental Assessment for the Gordon Three Thinning Project.

II. Watershed Description

The Gordon Three Thinning project occurs within the South Santiam River 5th Field watershed, and within the Trout Creek, Canyon Creek, Sevenmile Creek, and Sheep Creek 6th Field watersheds. An assessment of watershed baseline condition for these watersheds is described in Table 1. None of the streams within this project area were designated as Key Watersheds in the Northwest Forest Plan. The Sweet Home Ranger District completed a Watershed Analysis for the South Santiam River watershed in 1995. The watershed analysis, and stream and field surveys conducted periodically since its completion, provided the majority of the data utilized for this assessment of condition. The data was then compared to the established matrix indicator criteria to categorize the baseline condition as properly functioning, at risk, or not properly functioning. Baseline condition was assessed utilizing the NMFS matrix values.

Table 1. Baseline Condition Ratings for the South Santiam, Canyon Creek, Trout Creek, Sevenmile Creek and Sheep Creek.

Indicator	5 th Field Watershed	6 th Field Watershed	6 th Field Watershed	6 th Field Watershed	6 th Field Watershed
	South Santiam	Canyon Creek	Trout Creek*	Sevenmile Creek	Sheep Creek
Water Temperature	AR	PF	AR	PF	AR
Sediment	AR	AR	PF	AR	AR
Chemical Contaminants/Nutrients	PF	PF	PF	PF	PF
Physical Barriers	NPF	PF	PF	PF	PF
Substrate Embeddedness	AR	AR	AR	AR	AR
Large Woody Debris	AR	AR	AR	PF	NPF
Pool Quality	NPF	NPF	PF	PF	AR
Pool Frequency	NPF	AR	AR	PF	NPF
Off-Channel Habitat	PF	AR	PF	AR	AR
Refugia	PF	AR	PF	AR	AR
Wetted Width/Max Depth Ratio	AR	NPF	PF	AR	AR
Streambank Condition	AR	PF	PF	PF	PF
Floodplain Connectivity	AR	AR	AR	AR	AR
Change in Peak Base Flow	AR	AR	AR	AR	AR
Drainage Network	AR	AR	AR	AR	AR
Road Density and Location	AR	AR	AR	AR	AR
Riparian Reserves	AR	AR	AR	AR	AR
Disturbance History	NPF	NPF	AR	AR	NPF

PF = Properly Functioning, AR = Functioning At Risk, NPF = Not Properly Functioning

*Trout Creek 6th field is a combination of two 6th Field Watersheds in the watershed analysis (Menagerie and Falls Creek)

Habitat important to spring chinook salmon and winter steelhead exists adjacent to and downstream of the project area. See Fish Distribution, Figure 2. Currently spring chinook salmon and winter steelhead adults are transported above Foster Dam to utilize historically accessible habitat located upstream of the dam. At present there is a fish ladder that leads fish to a trap where they are sorted with winter steelhead and unmarked spring chinook salmon being trucked above the dam to spawn in historical habitat in the South Santiam system. Suitable spawning habitat for spring chinook salmon is primarily found in the main stem of the South Santiam River, while winter steelhead spawn in the main stem, and in Canyon and Moose Creeks. The winter steelhead population is considered at high risk of extinction (Buchanan, et. al 1997).

Steelhead tend to use more of the South Santiam Drainage than spring chinook. This is probably due somewhat to the timing of when fish are put over Foster Dam and when they spawn. Steelhead are moved above the Dam in the spring during higher water and primarily spawn before June 1st. Spring chinook are put over the Dam in the summer time and generally spawn in September and October. Much of the drainage is not accessible by spring Chinook when they are ready to spawn in September and October, compared to what's accessible in May for steelhead.

Winter Steelhead

Winter steelhead are anadromous rainbow trout and are closely related to the Pacific salmon. However, unlike the Pacific salmon, steelhead do not necessarily die after spawning. Winter steelhead adults in the upper Willamette system generally enter the river after the middle of February and spawn from late March through the end of May. Spawning sites require enough current to ventilate eggs during incubation, with redds located where substrate, depth, and velocity (0.3-3.0m/s) requirements are met. Redds are often constructed at the downstream area of a pool, where transition to a riffle occurs.

Winter steelhead juveniles become territorial soon after emergence and drive other individuals away from feeding stations. Fry inhabit shallow gravel areas and gradually move into deeper, swifter water with coarser substrate as they grow. In riffles and runs, rainbow trout of all age classes prefer large substrate. Preferred habitats relate to the presence of overhead and instream cover, velocity refuge with access to swifter current, appropriate substrate size and visual isolation from other fish. Juveniles that overwinter in freshwater require large boulder habitat for winter refuge. Adults require large, deep pools for resting during their migration to spawning grounds.

The life history pattern for winter steelhead in the Willamette system is heavily weighted to 4-year-old fish with 2 years rearing in fresh water and 2 years in the ocean (Howell et al. 1985).

Winter steelhead are native to the Santiam and Calapooia subbasins and have historically provided the majority of the winter steelhead production in the Willamette Basin (Table 2). Loss of natural production due to dams in the Santiam basin has been partially compensated for by releases of mainly Willamette hatchery stock since 1952. Hatchery summer steelhead are released below Foster Dam in the South Santiam system as mitigation for the loss of winter steelhead due to dam construction.

The average number of winter steelhead over Foster Dam in the last three years has been about three times the yearly average for the previous 28 years but only a third of the return for the first six years after the dams were built.

Table 2: Winter Steelhead Over Willamette Falls and Winter Steelhead over Foster Dam.

Year	Upper Willamette River Winter Steelhead over Willamette Falls*	Wild Winter Steelhead over Foster Dam (% of total) over Willamette Falls
1967	N/A	2,735 (N/A)
1968	N/A	1,102 (N/A)
1969	N/A	1,417 (N/A)
1970	N/A	1,413 (N/A)
1971	18,495	4,254 (23%)
1972	16,685	2,135 (13%)
1973	11,511	755 (7%)
1974	9,091	695 (8%)
1975	3,034	354 (12%)
1976	5,194	302 (6%)
1977	8,277	503 (6%)
1978	8,270	488 (6%)
1979	5,865	149 (3%)
1980	16,097	515 (3%)
1981	9,004	317 (4%)
1982	6,894	234 (3%)
1983	4,702	134 (3%)
1984	10,720	504 (5%)
1985	16,043	355 (2%)
1986	12,776	326 (3%)
1987	8,220	214 (3%)
1988	15,007	656 (4%)
1989	5,361	222 (4%)
1990	9,229	272 (3%)
1991	2,722	139 (5%)
1992	3,679	361 (10%)
1993	2,725	256 (9%)
1994	4,275	234 (5%)
1995	2,702	297 (11%)
1996	1,322	131 (10%)
1997	3,925	336 (9%)
1998	3,924	359 (9%)
1999	5,697	328 (6%)
2000	3,359	326 (10%)
2001	10,752	783 (7%)
2002	11,092	1,002 (9%)
2003	6,665	857 (13%)

* No counts done at Willamette Falls prior to 1971.

Spring Chinook Salmon

Three major populations of spring chinook salmon are recognized as making up the Upper Willamette River run (North Santiam, South Santiam, and McKenzie rivers) (Kostow 1995). Adults enter the Columbia River in March and April, and ascend Willamette Falls in May and June. Migration past the falls generally coincides with a rise in river temperatures above 10° C (53° F) (Howell et al. 1985, Nicholas 1995). The majority of Willamette spring chinook salmon mature in their fourth and fifth year. Historically, 5-year old fish comprised the dominant portion of the run, with a significant number of 6-year old fish.

The freshwater phase of Willamette spring chinook salmon is categorized as a Columbia River "ocean-type" (migration to the ocean occurs within their first year vs. the "stream-type" which reside in freshwater for a year or more following emergence). Spawning begins in late August and continues into early October, with peak spawning in September.

Currently, hatchery production dominates in sustaining the Willamette spring chinook salmon. Multiple broodstocks have been the basis of hatchery production, primarily from the Clackamas, Santiam, McKenzie and Middle Fork Willamette (Kostow 1995). This has probably resulted in a reduction in local genetic diversity (NFMS draft 1996), but may have retained some of the unique characteristics of the spring chinook salmon that ascend Willamette Falls before spawning in the upper tributaries.

Historically spring chinook salmon spawned and reared throughout the 5th field drainages of the South Santiam River system. When Foster Dam was constructed in the mid 1960,s, the spring chinook salmon lost free access to the upper South Santiam River including Moose Creek, Canyon Creek and Soda Fork. A hatchery was funded by the Corp of Engineers and constructed just downstream of the Dam. The hatchery was to mitigate for loss of fish production due to construction of the Dam.

Currently, ODFW transports spring chinook salmon adults above Foster Reservoir to increase production and restore nutrient sources in habitat above Foster Dam (Table 3).

Table 3. Spring Chinook Salmon Adults & Smolts Transported above Foster Dam by ODFW.

Transport Year	Chinook Smolts above Foster Dam	Adult Male Chinook Above Foster Dam	Adult Female Chinook Above Foster Dam	Chinook over Willamette Falls	Total Adult Chinook Above Foster Dam (%of Chinook Over Willamette Falls)
1994	71,126	N/A	N/A	N/A	N/A
1995	75,954	N/A	N/A	N/A	N/A
1996	71,126	Not Available	Not Available	20,394	120 (1%)
1997	0	Not Available	Not Available	26,248	431 (2%)
1998	0	374	318	32,869	699 (2%)
1999	0	287	227	38,948	517 (1%)
2000	0	367	237	37,594	611 (2%)
2001	0	667	281	52,865	980 (2%)
2002	0	437	325	82,111	762 (1%)
2003	0	Not Available	Not Available	85,899	447 (1%)

III. Description of the Federal Actions

Location of The Gordon Three Thinning Project

The Gordon Three Thinning project area location is depicted in Figure 1 and listed fish distribution in Figure 2. This Biological Assessment will analyze the Gordon Three Thinning project currently planned for implementation in the Trout Creek, Canyon Creek, Sevenmile Creek and Sheep Creek subwatersheds in the Upper South Santiam 5th Field Watershed. Twelve of the 13 units, comprising 598 acres, drain into the South Santiam River above the mouth of Canyon Creek and, one unit, comprising 48 acres, drains into Canyon Creek (Figure 3 and 4); total acres are 646. The units range in elevation from 2000 feet to 4500 feet. All of the units are within the transient snow Zone.

Timber Harvest and Yarding

Timber harvest and yarding will take place using helicopter, skyline and ground based (processor forwarder) logging systems. In skyline logging, full suspension will be required across streams. The ground based system will only be allowed to work on ground that is generally 20% or less. The harvest prescriptions for the 13 units are 40%, 50% and 60% canopy retention post treatment; approximating thinning to 70, 90 or 110 trees per acre, respectively (Table 7). These units are 40 year old managed stands that are about 80 feet tall and range from 200 to 350 trees per acre. Mean tree diameter for the 13 units is approximately 12 inches. No trees over 20 inches will be cut within the units that are in LSR allocation (Unit 12 is the only unit outside of LSR). See Table 7 and Unit prescription in the Appendix for details.

Riparian

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. Units 5, 6, and 13 fall within the Pacific silver fir series. The width of the riparian reserve is 150 feet on each side of a class III and IV stream, (perennial flowing or intermittently flowing), and 300 feet for fish bearing streams. The other ten units are within the Western hemlock series and contain a 172-foot reserve for class III and IV streams and 344 feet for fish bearing streams. Falls Creek, Three Creek, West fork of Three Creeks and the South Santiam River are known fish-bearing streams associated with this project. The fish in the three creeks and those in the South Santiam River above House Rock Falls are not listed species. No harvest will take place within 2 site potential tree heights of listed fish habitat.

The objective for riparian areas is to design thinning treatments to reduce vegetation density to promote diameter growth for future large wood recruitment and improve riparian condition while maintaining riparian integrity. To protect stream temperatures, the stream shade zone as defined by the Northwest Forest Plan and the Sufficiency Analysis for Stream Temperature has a target canopy closure of 65 -70%. Other non-shade producing areas out side of riparian buffers will be managed to the unit's prescription. See Table 6 for specific details of riparian reserve acres treated by Unit.

Stream buffer widths in Table 6 are for each side of the stream. Those small streams that are separated by roads or distance from the South Santiam will have 25' no thin buffers for a total of 50'. Those small streams that flow directly into the South Santiam will generally have a 50' no thin buffer for a total of 100'. Three Creek, the forks of Three Creek and the South Santiam River will have 100' no thin buffers on each side. All other perennial streams will have a 50' no thin buffer on each side.

The South Santiam Watershed Analysis recognized that some management actions may be helpful within the riparian Reserves if they are to attain desirable late successional vegetative structure.

Timber Transport

Timber will be transported from the project area on the roads described in Table 5. The potential for increases in turbidity through colloidal suspension of clay particles associated with hauling activity will be mitigated through dry weather hauling restrictions. Where hauling occurs on road surfaces that become dusty during dry weather hauling, particularly in those areas adjacent to winter steelhead and spring chinook salmon spawning habitat (Rd 2032), dust abatement with water will occur. Roads used for transport cross 14 perennial streams. All of the perennial stream crossings are via aggregate surfaced roads. No crossings are over habitat occupied by listed species. Of the 22.61 miles of road to be used for haul approximately 4.0 miles are located within Riparian Reserves associated with perennially flowing streams Table 5.

Erosion control straw bales and mulch may be used and maintained at specific sites along the 2032 Road to further reduce the potential for sediment production.

Roads

The timber management also includes road reconstruction activity (Table 5). Roads are reconstructed prior to being used to transport timber from project units to ensure that the roads meet safety and structural integrity requirements, as well as environmental requirements. For example, road surfacing must be adequate to support the weight of loaded commercial haul vehicles without causing road rutting, slumping, or damage to the road base. Roadside vegetation must be removed to provide clearance and safe viewing distances. Road reconstruction activities include cutting roadside vegetation, removing trees that have fallen across the road, reconditioning the roadbed (grading) and limited application of new aggregate surfacing. Existing roads currently open to vehicle traffic are brought up to a higher standard so they are then able to withstand the additional impacts caused by travel by heavier vehicles, such as log trucks and yarding equipment.

Timber sales provide a source of funding which is used to improve these roads; non-timber road maintenance funding is limited and these road improvements may not occur if timber sale projects are not implemented. The general result of road maintenance is a road system that causes less sedimentation, and poses reduced risk to listed fish and water quality.

This project does not propose any new permanent roads. There is a short (650 foot), temporary spur from an existing road in Unit 7. It is on a ridge, away from water and no culverts will be needed. It will be closed after use. Approximately 1.7 miles of Road 2032 along the South Santiam River will undergo reconstruction. The resurfacing of this section with fresh rock will minimize erosion from the existing road bed. This project will install no new or replacement culverts.

Road Closures

At present there are 2.53 miles of closed roads within the Gordon Three Thin Analysis area. With the implementation of this project there will be an additional 5.38 miles of roads closed within the analysis area. These closures will stabilize the roads and reduce the potential for future erosion and delivery of sediment to waterways. These roads will not be obliterated or decommissioned. They will be closed with a berm at the beginning of the road. See Table 4 for details. These roads were closed primarily for wildlife reasons but will also benefit water quality as well. The closing of these roads with berms will not change the miles per square of roads in Table 9 as they will not be obliterated or decommissioned.

Table 4: Road closures in the Gordon Three area.

Road #	Closure Type	New or Existing	Funding Source	Already Closed Road Miles	New Road Closure Miles	Comments
2032 – 365	Berm	New	Wildlife	N/A	1.86	Near Unit 13
2044 - 208	Berm	New	KV	N/A	.93	In Units 1, 2, 8
2044 – 120	Berm	New	KV	N/A	1.05	Just North of Unit 4
2044 – 235	Berm	New	Wildlife	N/A	.76	In Old Growth Grove
2046	Gate	Existing	KV	1.88	N/A	Just South of Unit 4
2046 – 505	Rip and Plant	Existing	Wildlife	.65	N/A	In Old Growth Grove
2032 - 315	Berm	New	Wildlife	N/A	.78	Just North of Unit 10
			Total	2.53	5.38	

Transportation System

Stream crossings listed in Table 5 have been reviewed and are on gentle road slopes and should not have any significant sediment input from the road as the road fills are well vegetated and should trap any sediment moving off the road surface. Should any mobilized sediment reach a stream channel, it should be entrained behind existing instream structure such as large boulders and large woody material before it is transported to habitat utilized by listed fish. The highest risk to listed fish habitat is the last .5 miles of Road 2032 along the South Santiam River. The risk will be reduced by placing new surfacing on the road and restricting haul to dry weather periods.

There are two road segments that have any risk of delivering sediment and/or turbidity to the South Santiam River (See Table 5). The first 1.7 miles of the 2032 Road parallels spawning and rearing habitat for Chinook salmon and winter steelhead. Most of the 2032 Road risk is minimized by good ditches, lush vegetation, distance from the river, use of straw bails, dry weather haul and dust abatement when needed. The 2044 Road parallels the South Santiam River, approximately one mile upstream from House Rock Falls. The nearest occupied habitat is about .5 miles below the falls. The risk of delivering sediment and/or turbidity to occupied habitat is low due to the downstream distance to habitat, vertical distance to the River, use of straw bails, required dry weather haul, and dust abatement as needed.

Table 5. Road Treatment Proposed for Timber Transportation.

Road Number	Surface Type Miles	Miles of Road Re-construction	Miles of New Aggregate Surfacing	Miles of Road Side Brushing	Number of Stream Crossings		Miles of Existing Road Within Perennial Stream Riparian Reserves
					Listed Fish Habitat ¹	Additional Perennial	
2032	Agg – 10.01	0.25	1.69	0	0	3	2.5
-317	Agg – 0.10	0	0	0	0	0	0
-320	Agg – 0.10	0	0	0	0	1	0
-365	Agg – 1.86	0	0	0	0	0	0
-417	Agg – 0.49	0	0	0	0	0	0
-418	Agg – 0.79	0	0	0	0	0	0
-423	Agg – 0.11	0	0	0	0	0	0
2044	Agg – 6.12	0	0	0	0	6	1
-115	Agg – 0.34	0	0	0	0	1	0
-127	Agg – 0.31	0	0	0	0	0	0
-208	Agg – 0.90	0	0	0	0	2	0
-210	Agg – 0.52	0	0	0	0	1	0
-212	Agg – 0.17	0	0	0	0	0	0
-216	Agg – 0.17	0	0	0	0	0	0
-218	Agg – 0.18	0	0	0	0	0	0
-230	Agg – 0.35	0	0	0	0	1	0
Total	22.61	0.25	1.69	0	0	15	3.5

¹Listed Fish Habitat is habitat potentially occupied by fish species listed under the ESA
AsPh = Asphalt, Agg = Aggregate. NS – Natural Surface.

Fuels Treatment

Treetops will be yarded in skyline and helicopter yarding areas. The ground-based systems will crush and use the slash in the skid roads. Hand piling will take place along the major forest roads: 2032, 2044, and 2044-230. Piles will be burned when project is complete.

Table 6. Riparian reserve acres treated by unit.

Unit	Unit Acres	Proximity to Listed Fish Habitat in S.Santiam River(miles)	Total Riparian Reserve Acres	No-Thin Riparian Reserve Acres	Riparian Reserve Acres Treated	Target %Canopy Closure in treated Riparian Reserves	No cut Riparian Reserve Buffer (Feet each side of stream)
1	27	0.1	11.1	2.9	8.2	40 – 60	25 – 50
2	38	0.1	22.8	6.0	16.8	40 – 60	25 – 50
3	60	2.3	31.1	8.6	22.5	60	100
4	51	3.0	11.4	2.7	8.7	50	25
5	44	4.0	3.2	0.4	2.8	40	25
6	30	3.9	0	0	0	N/A	N/A
7	92	1.0	32.7	12.6	20.1	50	25 – 100
8	97	.7	26.4	8.7	17.7	50	25 – 100
9	17	.7	3.7	0.3	3.4	50	50
10	55	1.3	27.7	3.8	23.9	50	100
11	37	0.9	9.0	1.0	8.0	50	100
12	48	0.9(Canyon Ck.)	12.5	1.9	10.6	60	25
13	50	N/A	0	0	0	N/A	N/A
Total	646	N/A	191.6	48.9 (26%)	142.7 (74%)	40 – 60	25 – 100

Soils

The Gordon Three Thin project area lies well within the Western Cascades physiographic region. Rocks are primarily tuffs and breccias of volcanic origin and are generally Eocene or Oligocene in age (around 32 to 17 million years). Falls Creek owes its unique topographic position to its glacial roots. Likely in early Pleistocene time, the main South Santiam canyon was filled with glacial ice at least as far west as Canyon Creek. It is likely, though evidence is scant, that glacial ice also occupied Canyon Creek at this same time. Melt water, moraine and outwash spilled off the glacial margins along their common boundary, and a drainage developed between the arms of the valley glaciers. After the ice melted, the stream was left perched on the divide between the two much greater canyons. Since that time, stream down cutting of the glacial deposits, and minor slumping have been the principal active erosional processes. The principal sediment delivery system now in operation is the down slope movement of the soil mantle by creep or colluvial processes.

In general soils on these side slopes have been stable and productive for many thousands of years. Soils formed either directly on the underlying volcanic bedrock or on the extensive glacial deposits. Both types have similar size gradations that range from silt loams to gravelly or cobbly sandy loams. Depth to bedrock ranges from 3 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 gentle side slopes.

History

All the proposed units are managed plantations that originated as clear cuts, which were harvested with ground-based or cable logging systems. The ground based logging occurred prior to the establishment of Regional Guidelines for compaction. Considerable brush and regeneration now cover these units, and almost no exposed soil remains. Disturbance and erosion are no longer a concern. Except in a very few cases, skyline or cable corridors are no longer visible. Numerous heavily used skid roads are for the most part still present, though many now have large alder or conifer regeneration. Because of the compaction, a few now contain wet seeps, small wetlands, or intermittent streams that provide riparian habitat where none previously existed. Old landings often contain piles of decomposing logs that provide habitat for a host of species. Slash was either piled and burned or broadcast burnt. Consequently, compaction from the ground-based equipment in some portions of some units may have been at the upper limit or exceeded Regional and current Forest standards. Some of that compaction has been naturally ameliorated over time by root growth, animal borrowing, and freeze/thaw; some likely remains, although finding it is difficult.

Much of the Gordon Area was burnt in an extensive stand replacement fire approximately one hundred and forty 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.

Vicinity Map

Gordon Three Thin - Figure 1

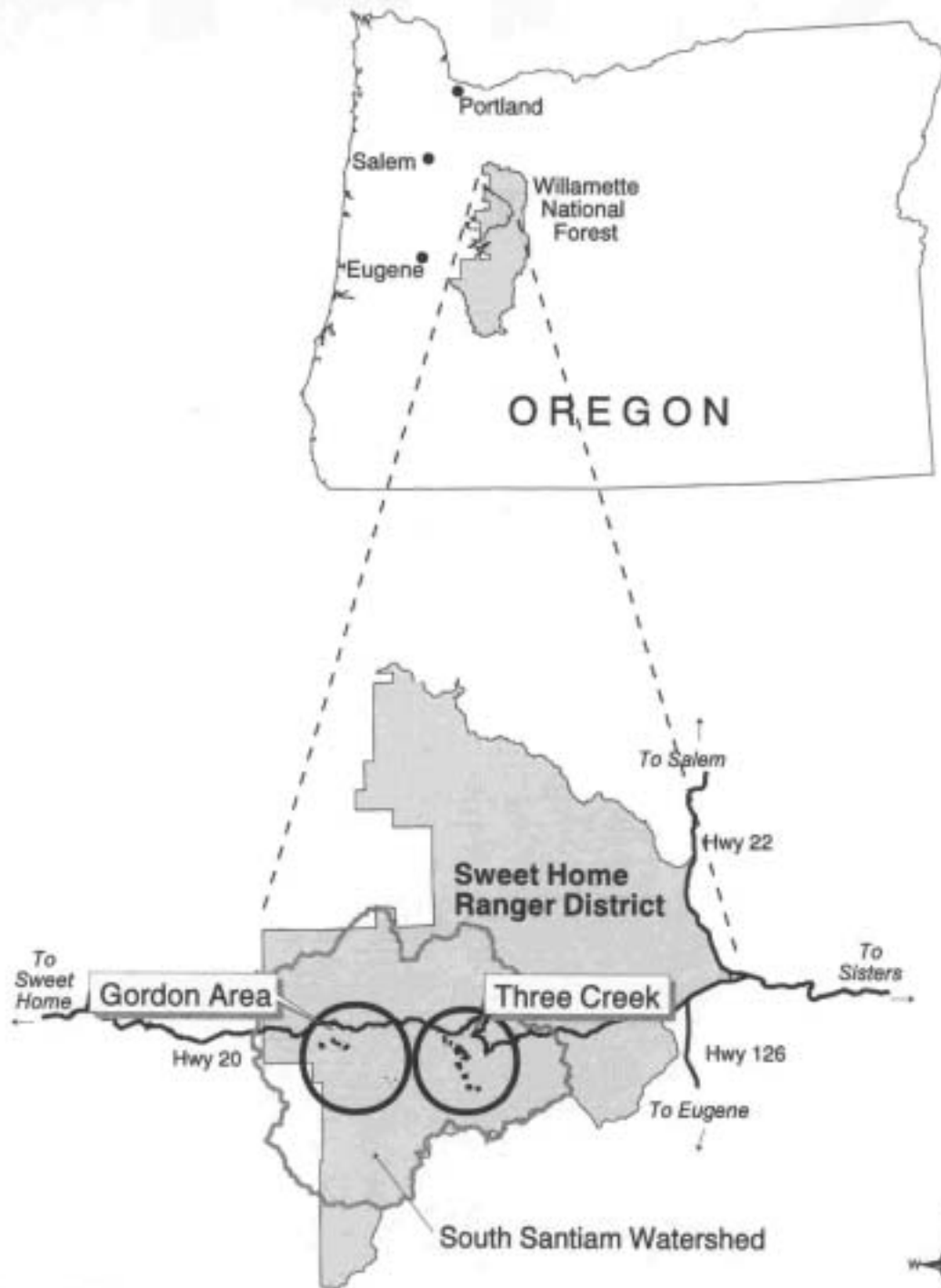


Figure 2

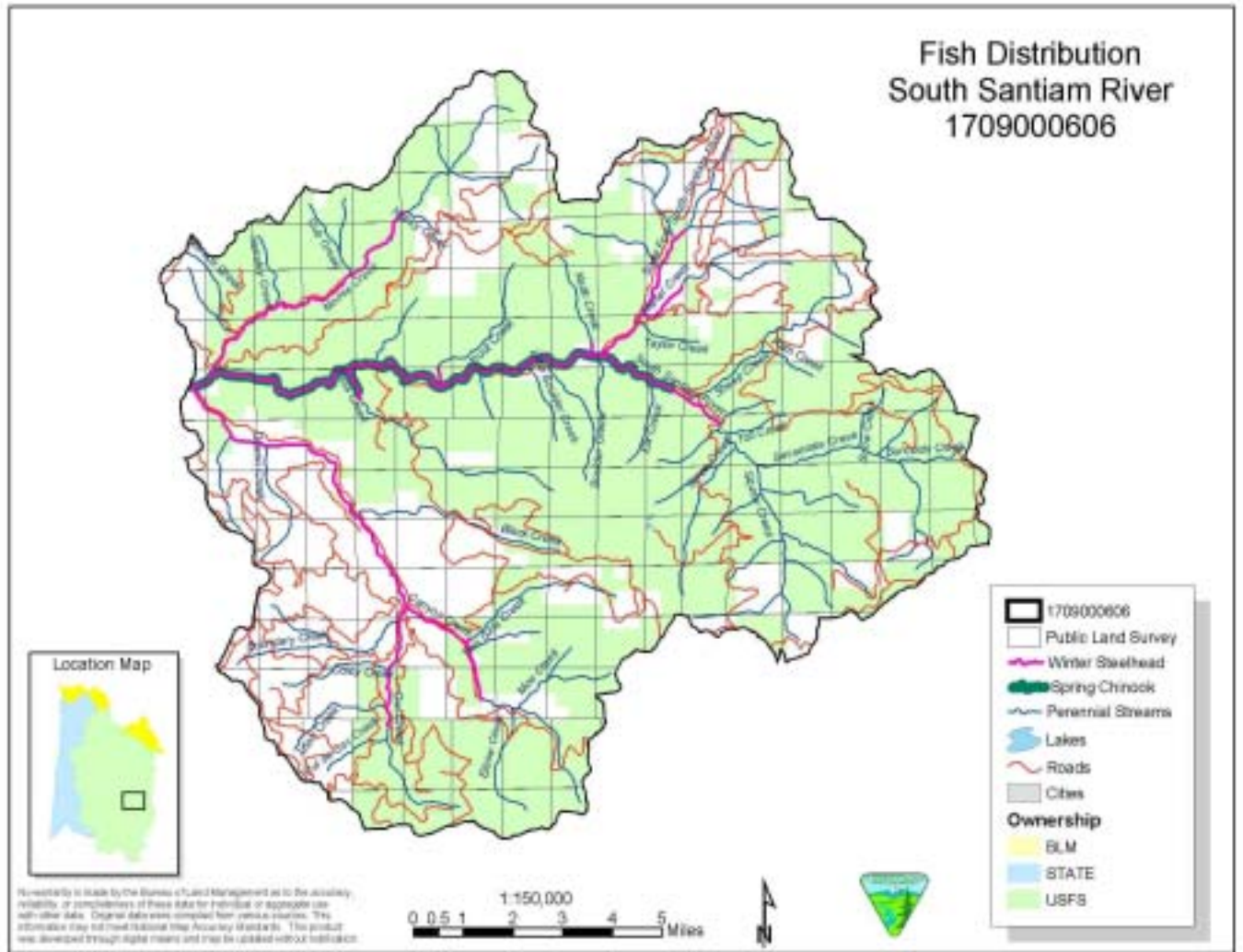


Figure 3

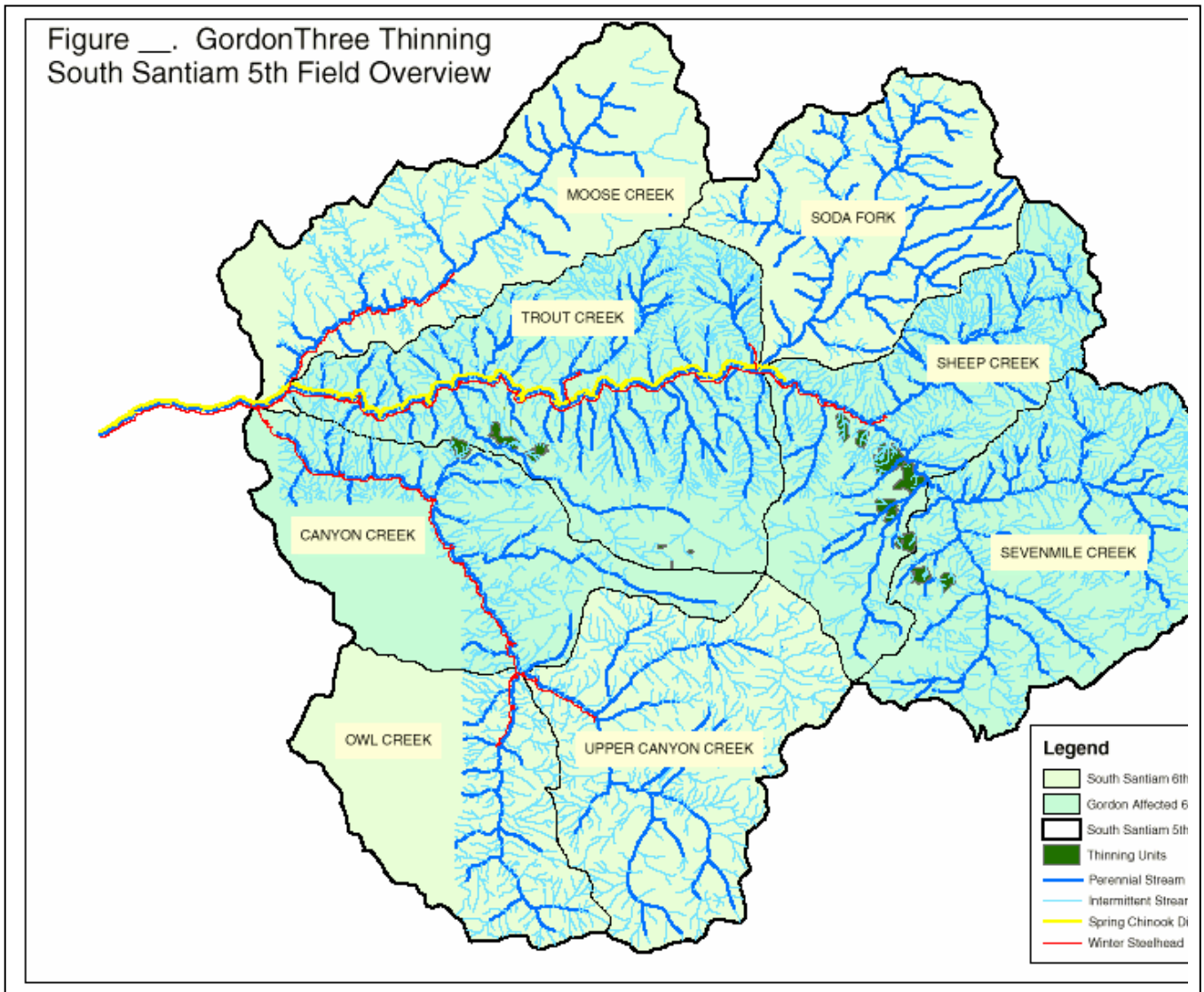


Figure 4

Alternative 2

Gordon Three Thin - Figure 6

R.4E. R.5E.

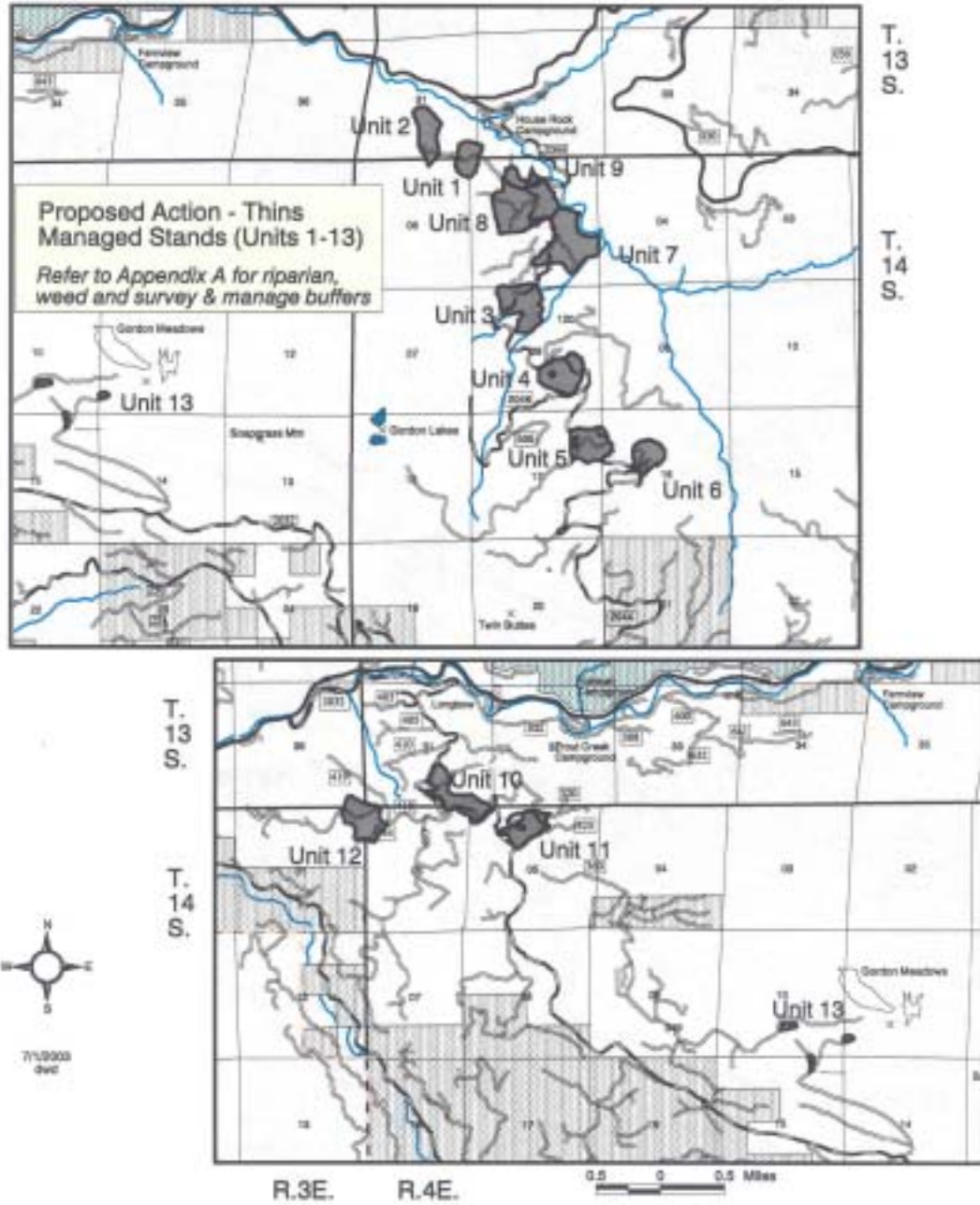


Table 7: Gordon Three Thin Prescriptions

Units	Tot. Ac.	Buffer Ac: RR, S&M LS, SH, Weeds	Thin Ac.	TPA Reten.	Target% Canopy Closure	RA/DTR Areas in % of unit	Skl. Ac.	Grd Ac.	Hel. Ac.	Addl. CWD& Snags	Est MBF /Ac	Est.Total Remove MBF
1	27	RR; TORR; ALRU/LYAM -Total 3ac	24	70&110	40% 18ac & 60% 6 ac	10%ea RA/DTR	10	9	5	10	12 Avg.	288
2	38	RR; Rock BAWR; -Total 6ac	32	70&110	40% 23ac & 60% 9ac	10%ea RA/DTR	9	0	23	10	11 Avg.	352
3	60	RR; LS; PSRA -Total 13ac	47	70&110	40% 26ac & 60% 21ac	10%ea RA/DTR	21	0	26	10	8 Avg.	376
4	51	RR; ALRU/LYAM; Rock/LS; Rock pit; -Total 3ac	48	90	50%	20%ea RA/DTR	12	18	18	10	10 Avg.	480
5	44	RR+ALRU/ LYAM; LS; BAWR -Total 7ac	37	70	40%	20%ea RA/DTR	18	19	0	10	10 Avg.	370
6	30	ALRU/LYAM; LS; Trees too small -Total 2ac	28	90	50%	None	18	10	0	10	8 Avg.	224
7	92	RR; LS; ALRU/LYAM; LECY -Total 16ac	76	90	50%	10%ea RA/DTR	55	16	5	10	12 Avg.	912
8	97	RR; LS; Rock LECY; ALRULYAM -Total 16ac	81	90	50%	10%ea RA/DTR	53	6	22	10	12 Avg.	972
9	17	LS; RR ALRU/LYAM -Total 1ac	16	90	50%	None	9	7	0	10	12 Avg.	192
10	55	RR; BRSY; LECY -Total 23ac	32	90	50%	10% DTR only	6	26	0	10	13 Avg.	416
11	37	RR; LS; BRSY -Total 16ac	21	90	50%	10% DTR only	11	10	0	10	11 Avg.	231
12	48	RR; BRSY; RATH -Total 7ac	41	110	60%	10% RA only	0	41	0	10	5 Avg.	205
13	50	BRNO -Total 42ac	8	70	40%	None	0	8	0	10	16 Avg.	128
Total	646		491				222	170	99		11 Avg.	5146

All acres are estimates. RR –Riparian areas w/in Riparian Reserves that have no-thinning; ALRU/LYAM – red alder/skunk cabbage; S&M – Survey and Manage; LS – Late-Successional; SH – Special Habitats; Grd., Skl., & Hel.= Ground, Skyline and Helicopter based logging systems; LECY-Leptoguim cyanescens; BRSY-false brome; MEHE-mollusk; RATH-Ramalina thrausta; BAWR = Oregon Slender Salamander; TORR=Torrent Salamander; BRNO= Bridgeoporus nobilissimus; PSRA=Pseudocypbellaria rainierensis; DTR=Dominant Tree Release; RA= Retention Areas

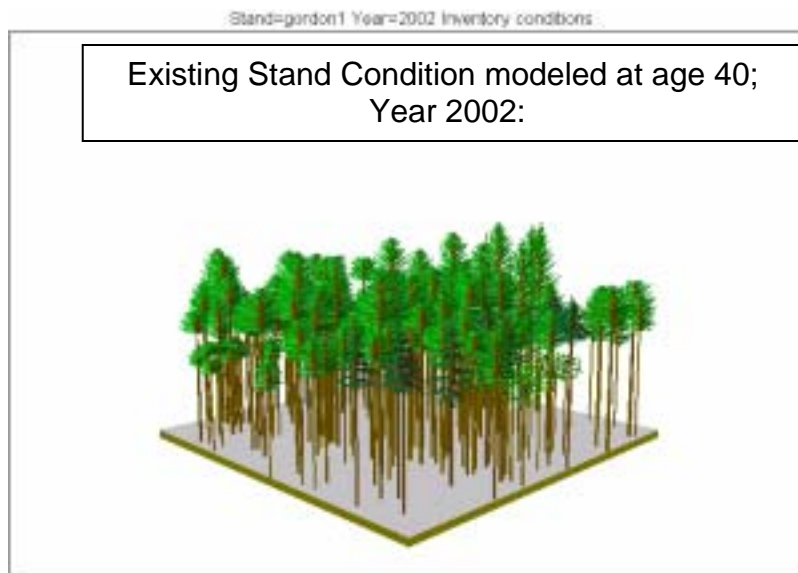
Stand Treatment Prescriptions

Final stand treatments will result in an average 40%, 50% and 60% canopy after harvest. A project objective is to develop thinning prescriptions from land management direction towards late-successional structure, there by enhancing stand vigor and growth while maintaining or increasing managed stands diversity. Variable thinning as discussed in the Mid-Willamette LSR Assessment (1998) will be achieved with dominant tree release (DTR) and no-thin Retention Areas (RA) interspersed with the 70, 90 or 110 TPA thinning densities throughout the units (40%, 50% and 60% canopy respectively).

A certain amount of the best dominant trees will be located and the smaller trees will be removed around them for 66 feet or ¼ acre DTRs. Units 1, 2, 3, 7, and 9 will have 10% of the acres in DTRs and Units 4 and 5 will have 20%. The dominant trees will be released from direct competition and tree seedlings will be planted to start a second age class/multiple canopy or cohort surrounding the retained dominant trees. In addition, retention areas (RA) will be in the same percentages. The size range of RA will vary but will be at least 1/4 acre and will be grouped to retain processes and conditions for plant and wildlife diversity benefits.

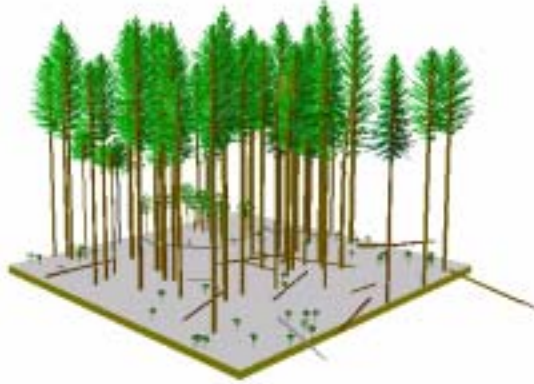
Different combinations of DTR and RA or neither are prescribed based on site specific conditions and are fully disclosed in Appendix A: Units Prescriptions. The resulting combination of thinning prescriptions will give the stands and landscape a variable thin appearance and in the long term more closely resemble the randomness of late-successional stands.

Stand growth and treatments were modeled using the updated Forest Vegetation Simulation and a subprogram Stan Visualization System (SVS) graphically displaying the modeled stand.



Stand=gordon1 Year=2043 Beginning of cycle

40% Canopy & 70 TPA Thin;
At 2043 Stand is 80 Years Old



Stand=gordon1 Year=2043 Beginning of cycle

50% Canopy & 90 TPA Thin;
At 2043 Stand is 80 Years Old



Stand=gordon1 Year=2043 Beginning of cycle

60% Canopy & 110 TPA Thin;
At 2043 Stand is 80 Years Old



IV. Effects of the Actions on Matrix Indicators

The potential effects that the Gordon Three Thinning project may have on the matrix indicators was analyzed at three different scales: effects to site specific condition, effects to listed fish habitat, and effects to the overall 6th field watershed conditions. The site-specific analysis focuses on the immediate direct effects to each indicator. This scale of analysis is the most sensitive as effects will be noted here where they might be diluted or eliminated before they effect listed fish habitat or affect the 6th field watershed condition. An example of a site-specific effect might be analyzing the effect to a pool located immediately downstream from a culvert replacement. This level of effects analysis is important in that it identifies all sources of potential cumulative or aggregate effects and sources of indirect effects to listed fish habitat or 6th field watershed condition. Secondly, effects to listed fish habitat are addressed. This helps determine direct and indirect effects to the listed species, and can help in determining if a project is likely or not likely to adversely affect the species. Then the effects to the 6th field watershed are assessed. Very rarely would a project be of the magnitude or duration that it would cause a change in existing condition at this large-scale. Table 11 summarizes the overall effects to each indicator at these three scales.

Temperature Determination:

Project	Effect to the Indicator at Different Scales		
	Site Specific	Listed Fish Habitat	6th Field Watersheds
Gordon Three Thinning Project	Maintain	Maintain	Maintain

Existing water temperatures within the watersheds potentially impacted by this project range from the mid 40's to the mid 60's in degrees Fahrenheit (F). Tributaries and upper reaches of major stream tend to be cooler while the main stem of the South Santiam River and the lower few miles of Canyon Creek are warmer and tend toward 64 degree F.

The implementation of the Gordon Three Thinning project will not affect stream shade or stream flow to an extent where stream water temperature would be increased. Timber projects will maintain the existing condition at all scales.

Rationale:

Utilization of the proposed no cut riparian buffers as shown in Table 6 will protect water quality in the South Santiam River 5th field. No alteration of available stream shade should occur on perennial streams with 50 to 100 foot buffers. Intermittent stream buffers of 25 feet within the Canyon Creek and other 6th field watersheds should be adequate to maintain downstream temperatures because they don't flow at the warmest time of the year. Temperatures will also be protected through maintenance of 70% canopy closure within portions of riparian reserve that provide shade to the stream. These areas will be marked to maintain the prescribed canopy closure. The negligible effects to the riparian tree overstory will be short term in duration. Overstory tree canopy closure is expected to return to pre-treatment levels within approximately 6 to 15 years depending on canopy closure after harvest.

Sediment Determination:

Project	Effect to the Indicator at Different Scales		
	Site Specific	Listed Fish Habitat	6th Field Watersheds
Gordon Three Thinning Project	Short-term Degrade	Maintain	Maintain

There is no specific information available on sediment levels in streams in the project area. The few embeddedness estimates from Hankins Reeves Level II surveys indicate it is in the 20 to 30 percent range.

High turbidity (60-70 NTU) has been shown to disrupt behavior of salmonid juveniles, with newly emerged fry appearing to be more susceptible to moderate turbidity levels. As fine sediment increases in substrate and habitat it can lead to decreased survival of eggs and fry from suffocation due to blockage of interstitial openings in the substrate.

The Gordon Three Thinning project will likely only cause a very small increase in sediment delivery rates to streams within the watershed upstream of habitat occupied by listed fish. This will lead to a short-term degradation of the indicator at the site-specific level. The risk that this slight increase in sediment will affect sediment levels in streams potentially utilized by listed fish is very low. Overall, it is expected that the positive effects from road improvements associated with these projects will result in a long-term reduction in road origin sediments in the project area. Aquatic habitat contributing to the life history needs of winter steelhead and spring chinook salmon will be maintained.

Rationale:

Harvesting and Yarding Effects

This project uses reduced-impact yarding systems such as skyline, helicopter yarding and a processor forwarder to reduce soil disturbance. All units are located on slopes with a low probability of mass failure. The processor forwarder cuts the tree, limbs it and cuts it to length. To reduce ground disturbance the limbs off the trees are placed in front of the machine as a bed to walk on. The processor forwarder will only be used on gentle ground under 20% in the Gordon Three Thinning project area.

Ground disturbance occurring with harvest equipment will be located at least 50 feet from perennial stream channels to avoid introduction of fine sediments. Mitigation methods prescribed for timber harvest operations will protect waterways from potential sedimentation sources, particularly those sources associated with temporary roads and skid trails, hauling, and seasons of use. Ground based harvest in riparian reserves will take place in areas identified in the Gordon Three Thin Prescription in the Appendix.

Within the riparian reserve management area trees will be yarded away from the riparian. There will be no ground based yarding across the buffer or stream. Trees cabled yarded across streams will be fully suspended. Any trees that are fallen to facilitate cable logging across streams will be left in place as large woody material.

Mitigation measures are designed to minimize transmission of fine sediments potentially originating from timber harvest activities. No measurable increase to turbidity is expected in association with harvest activities as riparian reserve widths in Table 6 are sufficient to protect waterways and mitigation measures are designed to reduce transportation of fines. See the unit prescriptions in the Appendix for specific no cut buffers by streams.

No increase in levels of cobble embeddedness is expected to occur. It is expected that due to the spatial location and low magnitude of the anticipated effects, sediment moving into stream channels due to these projects will not reach streams potentially utilized by listed fish, and the condition of listed fish habitat will be maintained (Table 11). The effect to this indicator is not of sufficient magnitude to affect overall condition of the 6th field watershed either negatively or beneficially, therefore the condition will be maintained.

Transport Effects

The potential for increases in turbidity through colloidal suspension of clay particles associated with hauling activity will be mitigated through dry weather hauling restrictions. Where hauling

occurs on road surfaces that become dusty during summer hauling, particularly in those areas adjacent to winter steelhead and spring chinook salmon spawning habitat (Rd 2032), dust abatement with water will occur.

Erosion control straw bales and mulch may be used and maintained at specific sites along the 2032 Road to further reduce the potential for sediment production.

Road Construction, Reconstruction and Maintenance Effects

This project constructs no new miles of permanent roads.

Road treatments are proposed on current sources of potential road origin sediments. Closure, where needed will consist of closing roads currently open with a gate or berm, maintaining existing drainage structures and installing waterbars on roadbeds with steeper grades. Closed roads would be subject to administrative travel if gated and periodic use for land management activities. Some reduction in long-term sources of road-derived sedimentation is expected with road storage. Proposed road treatments are low in ground disturbing activity and comparable to road maintenance activity during implementation. Implementation will not adversely affect aquatic habitat quality, for habitat important to winter steelhead and spring chinook salmon reproduction in the Trout Creek, Canyon Creek, and Sheep Creek 6th field watersheds.

Road reconstruction on the 2032 Road where it parallels the South Santiam River may result in impaired water quality through short-term increases in turbidity. This reconstruction is primarily maintenance with a resurfacing of rock. Mitigation measures to reduce potential transmission of sediment include requiring road reconstruction occur during dry periods and bringing roads to an upgraded condition to accommodate hauling activity with improved aggregate surfacing. All areas of exposed soil associated with road reconstruction will be seeded with native perennial species.

Large Woody Material Determination:

Project	Effect to the Indicator at Different Scales		
	Site Specific	Listed Fish Habitat	6th Field Watersheds
Gordon Three Thinning Project	Short Term Degrade	Maintain	Maintain

The **Gordon Three Thinning Project** is a short-term degrade at the site scale and a long term maintain at the Habitat and 6th Field watershed scales. At present LWM levels in streams in the project area are fairly low due to past logging practices and high stream gradients.

Rationale:

The removal of trees taller than the buffers from the riparian reserves adjacent to the buffers has the potential to remove trees that might fall into the stream and provide large woody material. This short term loss of potential large woody material to the streams is an acceptable trade-off for the acceleration in the ability of the stand to provide larger sized trees in the future. This is not a degrade at the 6th field scale due to a) limited spatial magnitude of effect, b) we’re only removing a portion of the potential wood sources (thinning), c) upstream and downstream riparian wood sources are not being treated and are good sources of short-term wood recruitment and, d) no harvest will occur within stands on unstable slopes, thus avoiding adverse effects on existing in-stream woody material levels or recruitment rates to area streams, e) no harvest will take place within 2 site potential tree heights of listed fish habitat.

**Peak/Base Flows
Determination:**

Project	Effect to the Indicator at Different Scales		
	Site Specific	Listed Fish Habitat	6th Field Watersheds
Gordon Three Thinning Project	Maintain	Maintain	Maintain

It is unlikely that the implementation of the Gordon Three Thinning Project will cause changes in peak and base flows. If minimal changes were experienced, they would not be expected to reach a level where they would be measurable, nor would a minor increase result in adverse effects such as accelerated stream bank erosion or channel scouring. A negligible increase in peak flow is not expected to result in degradation of this indicator at the site-specific level. These effects are not expected to reach the magnitude where listed fish or their habitat would be affected and would not be measurable at the 6th field scale. No change in existing condition is expected at the 6th field watershed level.

Table 8. Hydrologic Conditions in the Watersheds of the Gordon Three Thin Project.

6th Field	Planning Subdrainage	Unit Acres	Rx Canopy	Midpoint	Pretreatment ARP	Post-treatment ARP
Canyon	06J	41	60	75	70	70
Trout	06I	61	50	65	88	88
Sheep	06H	221 67 36	50 40 60	65	79	78
Sevenmile	06F	37 28	40 50	70	78	78

Rationale: Aggregate Recovery Percent (ARP) is a measure of the vegetative condition related to its ability to intercept rain, snow and wind. Proposed thinning units will maintain or exceed ARP midpoints prescribed in the Willamette Forest Plan (See Table 9). Field investigations during the planning for this project found the stream channels are stable with well-vegetated riparian areas containing fairly low amounts of large wood and do not show any effects of increased peak flows. Maintenance of ARP values on the planning sub-drainage scale is expected to maintain peak flow frequency and intensity and base flows. Maintenance of canopy in thinning units at 40% or greater (considered 50% recovered in terms of ARP) is expected to intercept a significant portion of snow load and dampen the potential effects of rain-on-snow events. Stand canopy recovery (to >70% canopy) is expected to occur within a decade. Maintenance of the current flow regime may be expected to maintain aquatic habitat conditions and the conditions necessary for winter steelhead and spring chinook salmon reproduction and rearing in the South Santiam River or Canyon Creek.

**Road Density, Location,
Drainage Network
Determination:**

Project	Effect to the Indicator at Different Scales		
	Site Specific	Listed Fish Habitat	6th Field Watersheds
Gordon Three Thinning Project	Maintain	Maintain	Maintain

Activities associated with timber management do not propose to construct any new permanent roads. The implementation of this project will not lead to any degradation of this indicator at the

site-specific level.

Rationale:

There will be no new permanent roads constructed as part of the Gordon Three Thinning Project. Road density in miles per square mile ranges from 2.61 in the Trout Creek 6th field to 4.49 in the Canyon Creek 6th field. See Table 10 for details.

Table 9. Road Density Information for Sub watersheds.

6 th Field Watershed	6 th FieldName	Existing Road Density (mi/mi ²)	New Road Miles	Temporary Road Miles	Road Reconstruction Miles	Post-project Road Density (mi/mi ²)
062	Trout Creek	2.61	0	0	1.69	2.61
063	Canyon Creek	4.49	0	0	0	4.49
067	Sheep Creek	2.81	0	0	0	2.81
066	Seven Mile Creek	3.39	0	.1	0	3.39

The drainage network in the affected watersheds will not be impacted with the implementation of the timber management projects. Mitigation measures to reduce potential transmission of sediment require road reconstruction and construction occur only during dry periods, and bring roads to an upgraded condition to accommodate hauling activity with improved aggregate surfacing. All areas of exposed soil associated with road reconstruction will be seeded with native perennial species

Disturbance History

Determination:

Project	Effect to the Indicator at Different Scales		
	Site Specific	Listed Fish Habitat	6 th Field Watersheds
Gordon Three Thinning Project	Short-term Degrade	Maintain	Maintain

Timber harvest and road reconstruction activities associated with Gordon Three Thinning Project will create newly disturbed areas on the landscape. This will add to the aggregate level of disturbance in each of the affected 6th field watersheds. This indicator will be degraded at the site-specific level. It is likely that this level of disturbance will not be of the magnitude where effects to streams occupied by listed fish would occur, so the existing condition at the habitat level will likely be maintained. Similarly, the effect at the 6th field watershed scale is minimal, and no change in baseline condition is expected.

Rationale:

This project will affect .04 % of the Trout Creek 6th field watershed, 2.0% of the Sheep Creek 6th field, 1.0% of the Sevenmile Creek 6th field watershed and .03% of the Canyon Creek 6th field watershed. See Table 11 for the disturbance history.

Management-induced effects are not significant in aggregate to create changes in 1) the timing or magnitude of peak flow events; 2) instability of stream banks; 3) adverse alteration of the supply of sediment to channels; 4) adverse alteration of sediment storage and structure in channels.

Timber management activities in combination with past or foreseeable events, are not expected to contribute to degradation of aquatic habitat conditions through increases in peak flow frequency or intensity. Habitat conditions necessary for winter steelhead and spring chinook salmon reproduction and rearing in the South Santiam River are expected to improve due to restoration elements of the project.

Table 10. Disturbance History

6 th Field Subwatershed	Total Acres	Private Land	Total Acres Previously With Regenerated Harvest	Acres Treated with this project	Total Acres of Riparian Reserve	Acres of Riparian proposed for Treatment
Trout Creek	16,701	974 (6%)	2171 (13)	61 (.04%)	9153 (55%)	32 (.003%)
Sheep Creek	12,025	1668 (14%)	3852 (32%)	276 (2%)	6614 (55%)	89 (.013%)
Seven Mile Creek	14,345	1874 (13%)	6013 (42%)	113 (1%)	7031 (49%)	12 (.0017%)
Canyon Creek	12,048	4413 (37%)	9533 (77%)	41 (.03%)	6084 (50%)	11 (.0018%)
Total	55,479	8929 (16%)	21,569 (39%)	491 (1%)	28,882 (52%)	144 (.005%)

Riparian Reserves Determination:

Project	Effect to the Indicator at Different Scales		
	Site Specific	Listed Fish Habitat	6th Field Watersheds
Gordon Three Thinning Project	Short Term Degrade	Maintain	Maintain

The Gordon Three Thinning Project will cause a short-term site specific degradation of the riparian reserves, with the long term objective of restoring the riparian at this scale.

Rationale:

The Gordon Three Thinning project proposes at least a 25 foot buffer on each side of intermittent stream channels and from 50 to 100 foot no cut buffers on perennial and fish bearing streams. The silvicultural prescriptions for these units are intended to improve the development of late-successional structure within the riparian reserve. This project will only affect a small part of the riparian reserves in each 6th field watershed. The magnitude of effect is not sufficient to degrade conditions at the 6th field scale and riparian reserves adjacent to listed fish habitat will not be treated.

Matrix Indicators With A Low Risk of Being Adversely Affected:

Chemical Contaminants

The Gordon Three Thinning Project is not expected to have any effect on this indicator. Any work by heavy equipment near or in the streams requires spill protection plans to be prepared, and emergency cleanup equipment available on-site. The existing condition will be **Maintained** at all scales.

Physical Barriers

The Gordon Three Thinning Project will not include any alteration of current human-made fish barriers to listed species (Foster Dam). This indicator will be **Maintained** at all scales.

Pool Frequency and Quality

These projects will not directly affect current or future quality or frequency of large pools; this indicator will be **Maintained** at all scales. No work occurs within fish-bearing stream channels.

Off-Channel Habitat

The Gordon Three Thin Project will not affect off-channel habitat. The existing condition of this indicator will be **Maintained** at all scales.

Refugia

This project will not lead to a reduction in the quality of existing refugia habitat. The existing condition of this indicator will be **Maintained** at all scales.

Width/Depth Ratio

This project will not affect stream channels or flows; the existing condition of this indicator will be **Maintained** at all scales.

Streambank Condition

The implementation of Riparian Reserves protections will protect streambanks from direct effects. These projects are not expected to increase stream flows, so streambank erosion should not be increased. This indicator will be **Maintained** at all scales.

Floodplain Connectivity

The Gordon Three Thinning Project will not change the existing connectivity between streams and their floodplains. Existing condition will be **Maintained** at all scales.

Table 11. Summarization of Effects to Matrix Indicators at Different Scales.

Indicator	Effect to the Indicator at Different Scales		
	Site Specific	Listed Fish Habitat	6 th Field Watershed
Water Temperature	Maintain	Maintain	Maintain
Sediment	STD,LTM	Maintain	Maintain
Large Woody Debris	STD/LTM	Maintain	Maintain
Change in Peak Base Flow	Maintain	Maintain	Maintain
Road Density and Location, Drainage Network	STD/LTM	Maintain	Maintain
Disturbance History and Regime	STD/LTM	Maintain	Maintain
Riparian Reserves	STD/LTM	Maintain	Maintain
Chemical Contaminants/Nutrients	Maintain	Maintain	Maintain
Physical Barriers	Maintain	Maintain	Maintain
Pool Frequency and Quality	Maintain	Maintain	Maintain
Off-Channel Habitat	Maintain	Maintain	Maintain
Refugia	Maintain	Maintain	Maintain
Wetted Width/Max Depth Ratio	Maintain	Maintain	Maintain
Streambank Condition	Maintain	Maintain	Maintain
Floodplain Connectivity	Maintain	Maintain	Maintain

STD = Short Term Degrade, effect limited in duration. LTR = Long Term Restore, action eventually will improve existing condition. LTM = Long Term Maintain, action will eventually allow a recovery to baseline condition.

Table 12. Summarization of Effects to Matrix Indicators at the Fifth Field.

**Fifth Field Matrix for South Santiam River Watershed
HUC Location 17090006**

Relevant Indicators	Current Condition			Effects of the Action (s)		
	Properly Functioning	At Risk	Not Prop. Functioning	Degrade	Maintain	Restore
Water Quality						
Temperature		2			X	
Sediment & Turbidity		2			X	
Chemical Conc./ Nutrients	2				X	
Habitat Access						
Physical Barriers			1,2		X	
Habitat Elements						
Substrate/ Sediment		2			X	
Large Woody Material		2			X	
Pool Character and Quality			2		X	
Pool Frequency			2		X	
Off-Channel Habitat	2				X	
Refugia	2				X	
Channel Condition and Dynamics						
Width/Depth Ratios		2			X	
Streambank Condition		2			X	
Floodplain Connectivity		2			X	
Flow/Hydrology						
Changes in Peak/Base Flows		2,3			X	
Increase in Drainage Network		2			X	
Watershed Conditions						
Road Density and Location		1			X	
Riparian Reserves		2			X	
Disturbance History			1		X	

Key for determination:

1 = Data came from Watershed Analysis

2 = Data came from surveys

3 = Data came from field review for the project

4 = Professional Judgment

5 = Data came from EA or EIS

6 = Data came from Water Quality Management Plan

7 = Restoration Project

Table 13. Summarization of Effects to Matrix Indicators at the Canyon Sixth Field.

**Sixth Field Matrix for the Canyon Creek Subwatershed
HUC Location 17090006063**

Relevant Indicators	Current Condition			Effects of the Action (s)		
	Properly Functioning	At Risk	Not Prop. Functioning	Degrade	Maintain	Restore
Water Quality						
Temperature		2			X	
Sediment & Turbidity		2			X	
Chemical Conc./ Nutrients	2				X	
Habitat Access						
Physical Barriers		2			X	
Habitat Elements						
Substrate/ Sediment		2			X	
Large Woody Material		2			X	
Pool Character and Quality	2				X	
Pool Frequency	2				X	
Off-Channel Habitat		2			X	
Refugia		2			X	
Channel Condition and Dynamics						
Width/Depth Ratios		2			X	
Streambank Condition	2				X	
Floodplain Connectivity		2			X	
Flow/Hydrology						
Changes in Peak/Base Flows	2				X	
Increase in Drainage Network	2				X	
Watershed Conditions						
Road Density and Location		2			X	
Riparian Reserves		2			X	
Disturbance History		2			X	

Key for determination:

1 = Data came from Watershed Analysis

2 = Data came from surveys

3 = Data came from field review for the project

4 = Professional Judgment

5 = Data came from EA or EIS

6 = Data came from Water Quality Management Plan

7 = Restoration Project

Table 14. Summarization of Effects to Matrix Indicators at the Trout Sixth Field.

**Sixth Field Matrix for the Trout Creek Subwatershed
HUC Location 17090006062**

Relevant Indicators	Current Condition			Effects of the Action (s)		
	Properly Functioning	At Risk	Not Prop. Functioning	Degrade	Maintain	Restore
Water Quality						
Temperature		2			X	
Sediment & Turbidity	2				X	
Chemical Conc./ Nutrients	2				X	
Habitat Access						
Physical Barriers	1				X	
Habitat Elements						
Substrate/ Sediment		1			X	
Large Woody Material		1			X	
Pool Character and Quality	1				X	
Pool Frequency		2			X	
Off-Channel Habitat	1				X	
Refugia	1				X	
Channel Condition and Dynamics						
Width/Depth Ratios	1				X	
Streambank Condition	1				X	
Floodplain Connectivity		1			X	
Flow/Hydrology						
Changes in Peak/Base Flows		1,3,5			X	
Increase in Drainage Network		5			X	
Watershed Conditions						
Road Density and Location		5			X	
Riparian Reserves		1,5			X	
Disturbance History		5			X	

Key for determination:

1 = Data came from Watershed Analysis

2 = Data came from surveys

3 = Data came from field review for the project

4 = Professional Judgment

5 = Data came from EA or EIS

6 = Data came from Water Quality Management Plan

7 = Restoration Project

Table 15. Summarization of Effects to Matrix Indicators at the Sheep Sixth Field.

**Sixth Field Matrix for the Sheep Creek Subwatershed
HUC Location 17090006067**

Relevant Indicators	Current Condition			Effects of the Action (s)		
	Properly Functioning	At Risk	Not Prop. Functioning	Degrade	Maintain	Restore
Water Quality						
Temperature	2				X	
Sediment & Turbidity		2			X	
Chemical Conc./ Nutrients	2				X	
Habitat Access						
Physical Barriers		2			X	
Habitat Elements						
Substrate/ Sediment		2			X	
Large Woody Material		2			X	
Pool Character and Quality	2				X	
Pool Frequency	2				X	
Off-Channel Habitat		2			X	
Refugia		2			X	
Channel Condition and Dynamics						
Width/Depth Ratios		2			X	
Streambank Condition	2				X	
Floodplain Connectivity		2			X	
Flow/Hydrology						
Changes in Peak/Base Flows	2				X	
Increase in Drainage Network	2				X	
Watershed Conditions						
Road Density and Location		2			X	
Riparian Reserves		2			X	
Disturbance History		2			X	

Key for determination:

1 = Data came from Watershed Analysis

2 = Data came from surveys

3 = Data came from field review for the project

4 = Professional Judgment

5 = Data came from EA or EIS

6 = Data came from Water Quality Management Plan

7 = Restoration Project

Table 16. Summarization of Effects to Matrix Indicators at the Sevenmile Sixth Field.

**Sixth Field Matrix for the Sevenmile Creek Subwatershed
HUC Location 17090006066**

Relevant Indicators	Current Condition			Effects of the Action (s)		
	Properly Functioning	At Risk	Not Prop. Functioning	Degrade	Maintain	Restore
Water Quality						
Temperature	2				X	
Sediment & Turbidity	2				X	
Chemical Conc./ Nutrients	2				X	
Habitat Access						
Physical Barriers		2			X	
Habitat Elements						
Substrate/ Sediment	2				X	
Large Woody Material		2			X	
Pool Character and Quality	2				X	
Pool Frequency	2				X	
Off-Channel Habitat		2			X	
Refugia		2			X	
Channel Condition and Dynamics						
Width/Depth Ratios		2			X	
Streambank Condition		2			X	
Floodplain Connectivity		2			X	
Flow/Hydrology						
Changes in Peak/Base Flows	2				X	
Increase in Drainage Network	2				X	
Watershed Conditions						
Road Density and Location		2			X	
Riparian Reserves	2				X	
Disturbance History		2			X	

Key for determination:

1 = Data came from Watershed Analysis

2 = Data came from surveys

3 = Data came from field review for the project

4 = Professional Judgment

5 = Data came from EA or EIS

6 = Data came from Water Quality Management Plan

7 = Restoration Project

V. Aggregate Effects

Management-induced effects are not significant in aggregate to create changes in 1) the timing or magnitude of peak flow events; 2) instability of stream banks (exclusion of bank destabilizing activity); 3) adverse alteration of the supply of sediment to channels; 4) adverse alteration of sediment storage and structure in channels. Recreation is the primary activity, outside of timber management, in these 6th field watersheds and is located primarily along the 2032 and 2044 Roads. The roads feeding into these main roads are generally gated and open to administrative access only. The quality of habitat important to spring chinook salmon and winter steelhead is expected to be maintained with implementation.

Cumulative Effects

The Trout Creek, Canyon Creek, Sheep Creek and Sevenmile Creek 6th field watershed activities should not have any significant cumulative effects due to non-federal actions. See Table 11 for non-federal acres in the four 6th field watersheds. It is expected that non-federal land within the Watersheds will continue to be managed for timber harvest.

VI. Determination of Effect - ESA

Gordon Three Thinning Project Determination:

The **Gordon Three Thinning** Project, including road reconstruction and road treatments **may affect, but is not likely to adversely affect** (NLAA) spring chinook salmon or winter steelhead or their habitat. While critical habitat is not currently designated for spring chinook salmon or winter steelhead, the implementation of these projects will not adversely modify habitat important to spring chinook salmon or winter steelhead in the South Santiam 5th field watershed.

Rationale:

The analysis of effects on the matrix indicators describe limited effects, generally limited to site-specific, short duration, low magnitude effects. The projects were designed to protect water quality and fish habitat. These effects are not expected to directly or indirectly change the condition of potentially occupied listed fish habitat, and these effects would be non-detectable at the 6th field watershed level. Although both spring chinook salmon and winter steelhead likely utilize habitat immediately downstream from the Gordon Three Thinning Project area, the probability the implementation of this project will affect these fish or their habitat is very low due to no new permanent road construction, resurfacing of existing roads near habitat occupied by listed species, using straw bales to minimize sediment movement, require dry weather haul, use of dust abatement as needed, maintaining 25 to 100 foot no cut stream buffers and using low impact harvest methods to reduce soil disturbance.

VII. Determination of Effect - Essential Fish Habitat

Gordon Three Thinning Project Determination:

When the Magnuson-Stevens Act of 1976 was re-authorized in 1996, it directed Regional Fishery Management Councils to identify Essential Fish Habitat (EFH) for commercial fish species of concern. The Pacific Fishery Management Council identified EFH in the Willamette Basin in June 2000. The Magnuson-Stevens Act requires Federal Agencies to consult with the Secretary of

Commerce (NMFS) regarding any action authorized, funded, undertaken by such agency which may adversely affect EFH. The National Marine Fisheries Service has identified the waters upstream from Foster Dam as Essential Fish Habitat for spring chinook salmon. Effects analysis contained in this Biological Assessment address potential effects to EFH (i.e., effects to spring chinook salmon habitat). The effects analysis presented in this effects summary indicates minimal risk of adversely affecting watershed condition. The biological assessment found that a “May Affect, Not Likely to Adversely Affect” determination for spring chinook salmon was appropriate in summarizing effects to habitat. Therefore it is expected that Gordon Three Thinning Project will have a minimal effect to EFH. It is determined that these projects will not exceed the “May Adversely Affect” EFH threshold and are therefore not subject to EFH consultation with NMFS.

VIII. References

- Buchanan, D.V., M.L. Hanson, and R.M. Hooton. 1997. Status of Oregon’s Bull Trout. Oregon Department of Fish and Wildlife, Portland, OR.
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- USDA Forest Service. 1995. South Santiam Watershed Analysis. Willamette National Forest, Sweet Home Ranger District, Sweet Home, Oregon.
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- Land and Water Environmental Services, Inc. 1994, Level II Hankins Reeves Sheep Creek Stream Survey, Roseburg, Oregon.
- Land and Water Environmental Services, Inc. 1994, Level II Hankins Reeves Ram Creek Stream Survey, Roseburg, Oregon.
- USDA Forest Service. 1993. Level II Hankins Reeves Seven Mile Creek Stream Survey Willamette National Forest, Sweet Home Ranger District, Sweet Home, Oregon.