USDA

United States
Department of
Agriculture

**Forest
Service**

August 2008

Park Smith Thin Environmental Assessment

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

Photo by K.C. Briggs (2008)

Summary

The Willamette National Forest proposes to commercially thin about 1300 acres of young, densely-stocked, managed stands in the northwestern portion of the Upper McKenzie watershed on the Sweet Home Ranger District in Oregon.

Purpose and Need

The purpose of the project is to:

- **improve stand health and vigor** and **enhance tree growth** in 30-55 year-old managed stands in both uplands and selected portions of Riparian Reserves
- **encourage species diversity** which more closely resembles that of native plant communities and **reduce the population of off-site ponderosa pine** in three stands where it is present within proposed harvest units
- **increase stand complexity**, where needed, to more closely mimic that usually found in natural stands because of normal disturbance agents. This may include understory development, creation of snag and down wood habitat, retention of minor conifer species and hardwoods, etc.
- **accelerate structural development** in stem-exclusion stands that are adjacent to patches of late-seral forest to ultimately reduce landscape level fragmentation and edge effects.
- **provide wood products** to the local market

In addition to the project purposes outlined above, the following apply to specific parts of the project area:

- **accelerate development of late-successional stand characteristics** in critical habitat for the northern spotted owl
- **improve northern spotted owl dispersal habitat** in the Santiam Area of Concern over time
- **accelerate development of large trees and structural components** in Riparian Reserves

This action is needed, because these stands generally have dense crowns that block out light to the forest floor and limit understory development although portions of these stands also have open, patchy areas. In the densely stocked areas, the trees are competing for growing space, nutrients and light and are beginning to show signs of reduced health and vigor as evidenced by reduced growth; tree mortality; suppression; and insect and disease activity. In addition, a few of these stands were planted with a component of off-site Ponderosa pine which are showing signs of maladaption and are being damaged and killed by insects.

These dense, young stands are largely single-storied and dominated by Douglas-fir and noble fir with minor tree species scattered throughout. They exhibit a simplified structure in terms of

canopy layers and understory species abundance although understory shrub vegetation is more prevalent in the open areas and includes blue huckleberry, Dwarf Oregon grape, vine maple, *ceanothus*, Prince's pine, and rhododendron.

These stands do not meet desired habitat/stand characteristics of Riparian Reserve management allocations or of Critical Habitat Unit (CHU) for northern spotted owls. In addition, the historic patch size of late-seral stands has been reduced in size from past harvest activities.

Alternatives

In addition to the proposed action, the Forest Service also evaluated the option of not taking any action at this time as well as a second action alternative that addresses a different way of achieving project objectives. The action alternatives vary in prescribed thinning intensities and the objectives for varying stand treatment prescriptions.

Alternative 1 is the No Action alternative. Natural processes would continue within these stands.

Alternative 2 thins about 292 acres to an average 40% canopy closure to maximize individual tree growth and 999 acres to an average 60% canopy closure with the goal of maximizing stand growth.

For the most part, in this alternative, 40% canopy closure thins are prescribed in stands: 1) with a large component of Riparian Reserves or 2) adjacent to existing late-seral habitat patches with the intent of increasing the size of those patches. In both of these areas, the long-term goal is to develop late-seral stand characteristics. Within the Riparian Reserves, thinning to an average 40% canopy closure not only maximizes individual tree growth but also extends the time period between successive harvest entries in order to minimize the frequency of disturbance here.

Thinning to an average 40% canopy closure in the Riparian Reserves would occur only in the outer portions of the Riparian Reserves that are outside of the primary shade zone. The area adjacent to stream channels would not be harvested.

The idea of thinning stands to an average 60% canopy closure in remaining stands is to maximize stand growth, allow understory development, and provide future commercial thinning opportunities.

Alternative 3 thins 467 acres to an average 40% canopy closure and 824 acres to an average 60% canopy closure. The focus of this alternative is to thin more heavily within the critical habitat unit (CHU) for northern spotted owls to maximize individual tree diameter growth and understory development; and increase the time period between harvest entries to minimize the frequency of disturbance to the owls.

Thinning in Riparian Reserves would only occur in the outer portions of the reserves as described above and no-harvest buffers would be identical to Alternative 2. Thinning intensities would be the same as prescribed for the upland portion of the stand.

The remainder of the stands would be thinned to an average 60% canopy closure is to maximize stand growth, allow understory development, and provide future commercial thinning opportunities.

Both Action Alternatives: In both action alternatives stand treatments would be accomplished using a combination of skyline (679 acres) and ground-based (612 acres) yarding systems.

Actions connected to this proposal are also similar between action alternatives. They include about 45 miles of road maintenance and reconstruction (ditch cleanout, roadside brushing, spot rocking, culvert clean out and five culvert replacements); re-opening about 3.8 miles of spur roads and constructing about 1.1 miles of new temporary roads to access harvest units; using 142 landings; and stormproofing approximately 10 miles of existing roads. Ten of the landings are in Riparian Reserves and occur on existing roads as far away from the streams as possible.

The following have been built into the alternative design to ensure compliance with Forest Plan standards and guidelines, laws, regulations and other policies: a) seasonal harvest restrictions when activities would be detrimental to a species' reproductive success or might cause undesired environmental impacts; b) treating activity-generated fuels to acceptable levels outlined in Forest Plan standards and guidelines in high risk areas; c) buffering sensitive species and habitats from disturbance during harvest operations; d) decommissioning temporary roads following harvest activities; e) implementing soil protection measures such a log suspension requirements and subsoiling to reduce soil compaction in selected areas and f); and implementing provisions to minimize the spread of invasive weeds such as pre-treating weeds along haul routes.

In order to mitigate environmental effects of past soil compaction in a portion of Unit 27, subsoiling would be required after harvest activities are completed on about one acre where Forest Plan standards and guidelines have been exceeded from past harvest.

Issues

Significant issues include: 1) the tradeoffs of improving habitat quality in the CHU for northern spotted owls with the frequency of disturbance to owls, and 2) the tradeoffs of growing large trees and developing structure within Riparian Reserves with the frequency of disturbance to the area and the risk of potential effects to aquatic and terrestrial resources here.

Environmental Consequences

Late-successional habitat is in short supply in the Pacific Northwest and some species dependent on this habitat are in decline, so active or passive methods of attaining desired stand characteristics affect the timing of habitat development in the CHU and Riparian Reserves. Alternatives Two and Three actively treat stands to attain desired stand characteristics while Alternative 1 passively addresses these stand objectives. It is estimated that attainment of desired stand characteristics would be perhaps decades faster with active treatment than with passive treatment (USDA 2002). There is some risk with passive management in these dense plantations.

Both active and passive management can have different effects on late-successionally dependent species or individuals within the treatment areas. With active treatments, there may be some short-term (5 to 10 years) impacts to the species that would ultimately benefit from treatments because thinning would open up the canopy on these stands for several years.

Between alternatives, there are differences in intensity of thinning, which can affect the frequency of future harvest entries and the impact that harvest entries could have on various resources.

There are virtually no differences in the amount of shade affected adjacent to streams in all alternatives because primary shade zones are kept intact except for some yarding corridors in the action alternatives. Stream temperature increases are not expected with any alternative although there is a slight risk in both action alternatives because they both treat stands in the secondary shade zones of Riparian Reserves. The tradeoff of not taking any risk in order to protect stream temperatures in the primary shade zones along streams is that development of desired stand characteristics, as defined by the NW Forest Plan, could be delayed, by perhaps decades. For example, the young, even-aged, overstocked, managed stands here would take longer to develop into large trees desired for habitat and quality stream shade in Riparian Reserves. In addition, it would take longer to develop the large woody component desirable in stream channels to hold sediments and pool water for aquatic habitat.

Tree growth expected from thinning in the secondary shade zones areas in the action alternatives would contribute to improved habitat conditions in the Riparian Reserves and the development of travel and dispersal corridors which would contribute to improved connectivity in the watershed, perhaps decades sooner than with passive management here.

Decisions to be Made

Based upon the effects of the alternatives, the responsible official would decide:

- Whether to actively treat these young, managed stands to accelerate the development of desired stand characteristics (in one of the action alternatives) or let those young stands develop desired characteristics on their own, over a much longer period of time (in the No Action alternative).
- Which mix of thinning intensities should be selected to meet project objectives in these young, managed stands. The intensity of thinning can affect the timing of future harvest entries designed to accelerate development of desired stand conditions. Frequency of harvest entries can affect species and habitat intended to benefit from treatments.
- Whether to choose an alternative that focuses on development of Riparian Reserve stand characteristics and increasing patch sizes of late-seral stands or to choose an alternative that focuses on development of habitat for northern spotted owls in the CHU.

Introduction

Document Structure

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

- **Introduction:** This section includes information on the project location, setting and stand history as well as an explanation of why the project is being considered in this location at this time. In addition, this section discusses applicable management direction that helps guide project design. Then, the purpose of and need for the project is defined and the agency's proposal for achieving that purpose and need is outlined. Finally, there is a discussion of what decisions would be made about the project, how the public was involved in the development of the project and what issues and concerns surfaced with respect to the project. .
- **Comparison of Alternatives, including the Proposed Action:** This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated project objectives. These alternatives were developed based on significant issues raised during scoping. This portion of the document also discusses project design elements that have been built into the alternatives to ensure compliance with Forest Plan standards and guidelines, laws, regulations and other policies as well as mitigation measures which are actions taken to avoid, minimize, rectify, reduce, eliminate, or compensate for environmental impacts caused by the project. Furthermore there is a comparison of the alternatives and a discussion of alternatives that were considered but were eliminated from further study for various reasons.
- **Environmental Consequences:** This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, there is a description of analysis methods used and scale of analysis considered; a description of desired future condition for the resource, a description of the current environmental conditions, followed by a disclosure of the direct, indirect, and cumulative environmental impacts that would result from taking no action, implementing the proposed action, or taking another course of action.
- **Agencies and Persons Consulted:** This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- **Appendices:** The appendices provide more detailed information to support the analyses presented in the environmental assessment.

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

A. Background

1. Project Location

The Park Smith Thin project area is located in western Oregon on the Sweet Home Ranger District of the Willamette National Forest. More specifically, it is situated near the crest of the Cascade Mountains where Highways 126 and 22 join Highway 20 just west of Santiam Pass.

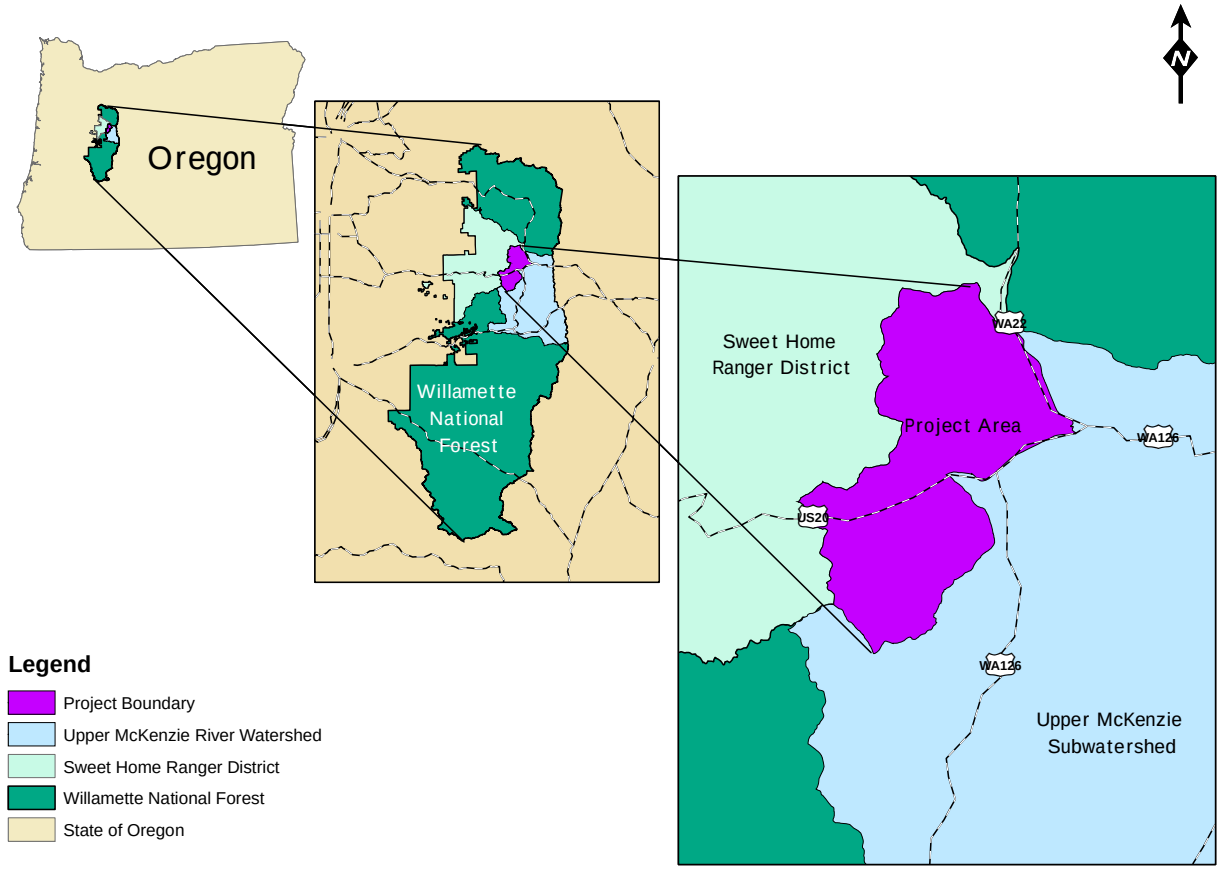


Figure 1: Vicinity Map

The project area encompasses about 36,170 acres of the northwestern portion of the 230,000-acre Upper McKenzie watershed (see figures 1 and 2) and includes the portions of Parks Creek/Lost Lake; Hackleman Creek and Smith River subwatersheds which lie on Sweet Home Ranger District

The legal description for the project area is: T12S, R6E, Sections 22-27 and 33-36; T12S, R7E, Sections 19 and 30-32; T13S, R6E, Sections 1-4, 9-16, and 22-36; T13S, R7E, Sections 4-9, 15-21, 30 and 31; T14S, R6E, Sections 1-5, 8-12, 13-17, 20-23 and 28; and T14S, R7E, Sections 6 and 7.

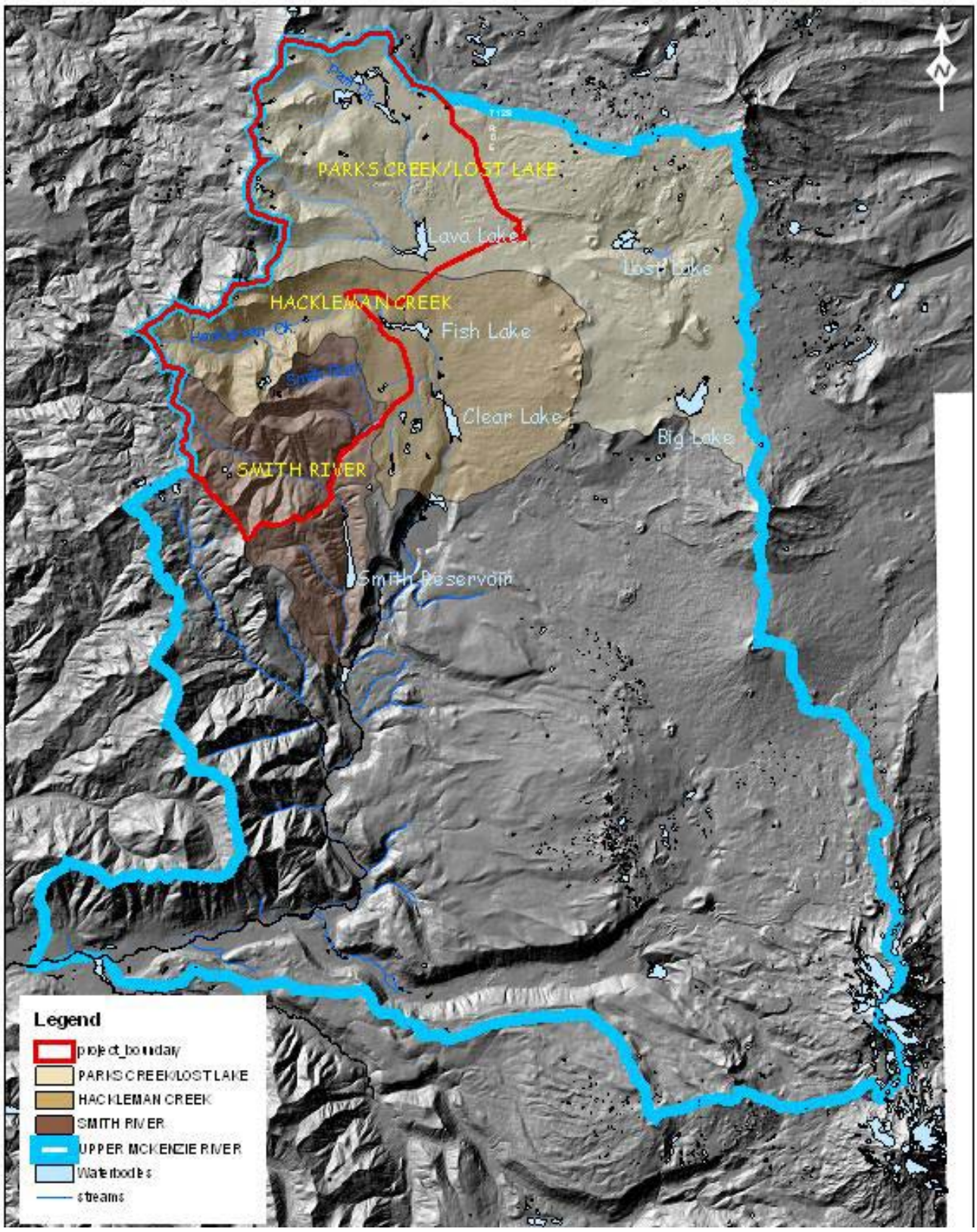


Figure 2: Project area in relationship to larger subwatersheds

2. Setting and Stand History

The young, even-aged, managed stands being considered for treatment occur within the Pacific silver fir plant series on relatively flat terrain (mostly <30% slopes). They are growing at an average elevation of 3,400 to 4,400 in an area characterized by short, dry and cool summer growing seasons and wet winters with persistent snow packs.

These stands were established after clearcuting and range in age from 30 to 60 years. They were planted primarily with Douglas-fir and noble fir while a few were also planted with some off-site ponderosa pine. The ponderosa pine tends to occur in small clumps scattered throughout the stands. The planning area is not within the native range of ponderosa pine and the seed source of these trees is unknown. Today, these pines are showing signs of maladaption such as mortality, thinning crowns, bole deformities, and susceptibility to insect damage.

In addition to the planted trees, a mixture of other conifer species naturally seeded in and make-up a minor component of the overstory. These minor species include Pacific silver fir, grand fir, western hemlock, western redcedar, incense cedar, Engelmann spruce, western white pine, and lodgepole pine.

Most stands were precommercially thinned in the 1970's and 1980's and fertilized with nitrogen 10 to 15 years later to promote tree growth. Approximately 1/3 of the stands were pruned between 1999 and 2005 to increase future wood quality.

Today the stands are largely single-storied and dominated by Douglas-fir and noble fir with minor tree species scattered throughout. They are in the stem exclusion stage (Oliver and Larson, 1990) and are characterized by dense crowns that block out light to the forest floor and limit understory development although portions of these stands also have open, patchy areas. Existing trees in the denser portion of these stands are competing for sunlight, water, and nutrients causing suppression mortality of the smaller diameter trees and a slowing down of tree growth. Understory shrub vegetation is more prevalent in the open areas and includes blue huckleberry, Dwarf Oregon grape, vine maple, ceanothus, Prince's pine, and rhododendron.

Average stand conditions as well as the range of conditions are outlined in the table 1 below.

Table 1: Average stand conditions

	Age (total years)	Overstory diameter (inches)	Overstory height (feet)	Overstory trees per acre	Total canopy closure
Average	49	12.6"	66'	239	80%
Range	31-60	9.9-15.4	54-83'	116-374	64-96%

Several insects and diseases were identified in these stands. Root rot diseases, primarily annosus root rot (*Heterobasidion annosum*) and armillaria root rot (*Armillaria ostoyae*), are occurring and resulting in tree mortality. This mortality tends to occur in clumps and has likely contributed to the development of the open patchy areas in some of the stands. Mountain pine beetle (*Dendroctonus ponderosae*) is causing

mortality in the lodgepole pine and ponderosa pine and white pine blister rust (*Cronartium ribicola*) is causing damage and mortality in the western white pine.

3. Why here? Why now?

Between 1999 and 2001, queries were made of the district's Geographic Information System (GIS) database of managed stands in the appropriate age ranges for commercial thinning in this watershed and elsewhere on the district. Time was spent ground-truthing these queries and determining when the identified stands would be ready for thinning. Areas were prioritized across the district and those areas most in need of treatment were placed highest on the list of projects needing to be accomplished. Stands in this watershed were prioritized for harvest in about 2010.

When these stands were initially harvested and reforested they were planted densely with the idea that they would be pre-commercially and commercially thinned as they grew and started to crowd each other and compete for light and nutrients. The objectives for these stands were aimed at maximizing tree growth to provide a sustained yield of timber commodities over time, while also meeting various multiple use objectives. In much of the planning area these objectives still hold true while in other areas the objectives have been altered.

In some areas objectives have changed to accelerate development of late-successional stand characteristics to address wildlife needs, especially in critical habitat for the northern spotted owl. In other areas, objectives include acceleration of development of large trees in Riparian Reserves that would eventually contribute to fish habitat in nearby streams or provide connectivity within and between watersheds for various wildlife species. On the landscape level, there are objectives to increase patch sizes of late-successional forests to more closely resemble the range of historical conditions (USDA, 1995 updated 2006).

In order to meet the various project objectives, these young, managed stands are proposed to be commercially thinned. Studies have shown that "trees grown in dense plantations are most responsive to thinning when they are less than 80 years old" (PNW, 2002). The managed stands identified for treatment in this watershed are between 30 and 60 years old, a time when they are most responsive to thinning. In addition, these stands are showing signs of decreased growth and vigor due to inter-tree competition for sunlight, water and nutrients and some stands are experiencing reduced health from insects and diseases.

Given that the age of the stands is optimal to respond to thinning, the stands show a need for thinning as evidenced by inter-tree competition, and a need has been identified to develop structural diversity in these managed stands, the stands proposed for treatment are good candidates in this area and at this time.

B. Planning and Management Direction

1. Planning

Planning for this project was done in accordance with National Environmental Policy Act (NEPA) of 1969. Procedures described in the Council of Environmental Quality's implementing regulations for NEPA (Title 40; CFR Parts 1500-1508) were used to ensure compliance with NEPA.

To avoid duplication of analysis that has already been completed, this document is tiered to and relies upon the analysis in:

- The 1990 Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) for the Willamette National Forest Land and Resource Management Plan (hereafter referred to as the *Forest Plan*) (USDA, 1990) and
- All subsequent NEPA analyses for plan amendments including the Final Supplemental Environmental Impact Statement on the Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl also referred to as the *NW Forest Plan* (USDA and USDI, 1994).

The *Forest Plan*, as amended, marries the forest-level strategy for managing land and resources on the forest with the *Northwest Forest Plan's* regional strategy for managing old-growth and late-successional forest ecosystems on federal lands. The plans provide direction, land allocations (management areas), and standards and guidelines for management of a myriad of natural resources.

2. Management Direction

Development and design of this project was guided by numerous state and federal laws, agency regulations, interagency agreements and management direction. The primary guidance for this project is summarized below and in individual specialist reports in the Project Record.

The amended *Forest Plan* provides resource management direction, defines various management areas (MA's), describes desired conditions for these management areas and outlines standards and guidelines under which lands and resources administered by the Willamette National Forest are managed. Table 2 lists the various management allocations within the project area, displays the sizes of those allocations, and identifies the allocations where management activities are proposed.

Table 2: Management Allocations

Management Allocation (MA)	Acres in Project Area	Acres of Harvest Proposed Within Management Allocation with this Project
MA 4 – Research Natural Area	1132	0
MA 5A – Special Interest Area	3476	0
MA 7 – Old Growth Grove	68	0
MA 9D – Special Habitat Area	3750	0
MA 10E - Dispersed Recreation	7935	0
MA 11 A - Scenic - Modification Middleground**	3973	265
MA 11C - Scenic - Partial Retention Middleground**	1966	130
MA 11F - Scenic - Retention Foreground**	3219	105
MA 14A - Matrix - General Forest**	8135	791
MA 15 – Riparian Reserves*	14,500*	156*
MA 16A – Late Successional Reserve	22	0
MA 16B – 100 acre Late-Successional Reserve	772	0
MA 17 – Adaptive Management Area	21	0
Other Ownership Lands	2833	0
Total	**36,170**	**1,291**

*__Note__: Riparian Reserve acreage is estimated. This allocation overlays other allocations so is not included in the total acreage figure shown at the bottom of the table. In addition, "Riparian Reserve standards and guidelines apply and are added to the standards and guidelines of other designated areas." (NW Forest Plan 1994, p. C-1).

****Note:** All scenic and general forest allocations where project activities are proposed are classified as matrix lands in the Northwest Forest Plan. Some project activities are also proposed in Riparian Reserves.

The relevant management allocations for this project are Scenic Modification Middleground (MA 11A, Scenic Partial Retention Middleground (MA 11C), Scenic Retention Foreground (MA 11F), Matrix-General Forest (MA14a) and Riparian Reserves (MA15). A complete explanation of the Management Allocation goals and objectives, descriptions of each area, and applicable standards and guidelines can be found in the Forest Plan, Chapter IV, and the NW Forest Plan Attachment A to the Record of Decision.

The map below illustrates the spatial arrangement of the various **management allocations** within the project area. The stands considered for treatment in this project are outlined in red. Most of the stands occur in matrix-general forest (tan) or various scenic allocations (shades of green) and most of these also include Riparian Reserves.

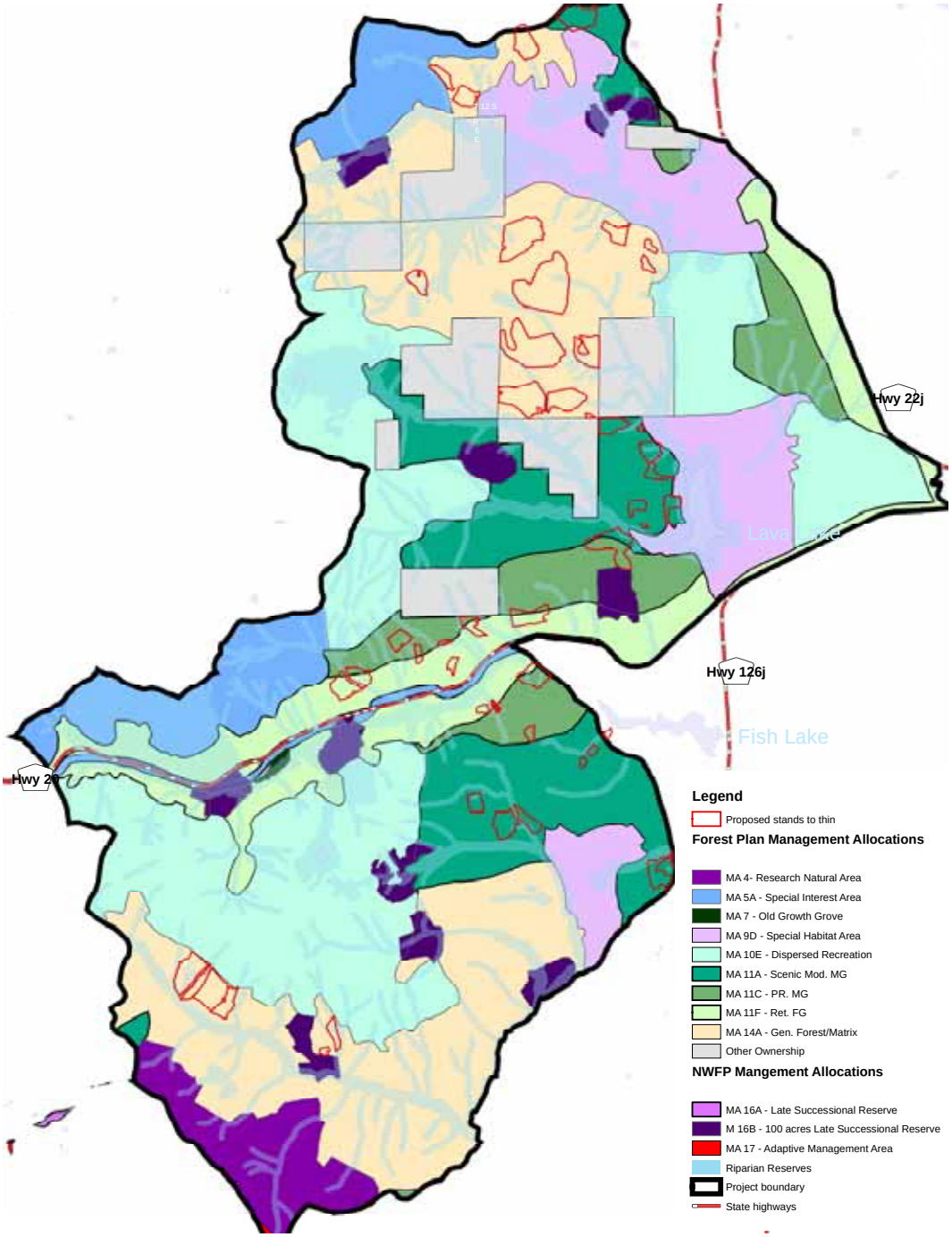


Figure 3: Management Allocations

Big game emphasis areas designated in the Forest Plan for this area are shown in the map below. The majority of the planning area lies in high emphasis areas (shown in green) with some moderate emphasis areas (shown in yellow) in the east and south. Habitat conditions are to be maintained or enhanced within each of these emphasis areas to meet habitat effectiveness objectives and support the potential populations of deer and elk as outlined in the Forest Plan (Chapter IV, pp. 67-70).

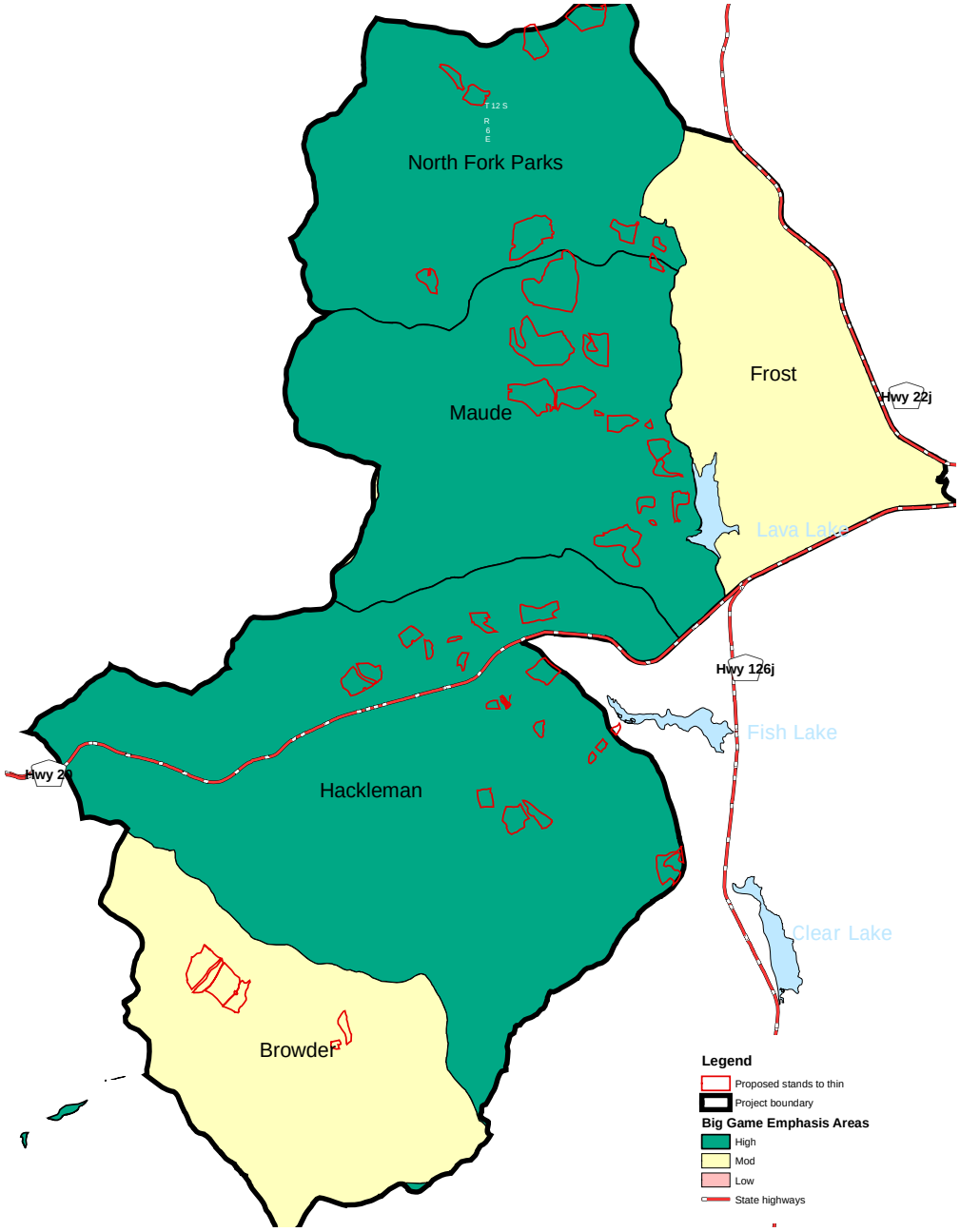


Figure 4: Big Game Emphasis Areas

C. Other Resource Guidance

1. Northwest Forest Plan Temperature TMDL Implementation Strategies (Sept. 2005)

The provisions of the NW Forest Plan Temperature (*Total Maximum Daily Load*) TMDL Implementation Strategies apply to streams not meeting State water quality standards for temperature. The implementation strategies in this document "provide a basis for analyzing stream shade, effects of shade on stream temperature, and management of riparian areas to meet water quality and broader objectives embodied in the NW Forest Plan Aquatic Conservation Strategy (ACS)." (USDA and USDI 2005, p. 4) This document is incorporated by reference and available for public review at the Sweet Home Ranger District offices.

As required by section 303 (d) of the Clean Water Act, the State of Oregon must keep a list of water quality impaired water bodies.

Currently no streams in the project area are listed on the State of Oregon's 303 (d) list. However, since the McKenzie River is listed on the State's 303 (d) list for stream temperatures, streams that are tributary to the McKenzie River must also follow recommendations from this document so as not to contribute to elevating stream temperatures in the McKenzie River.

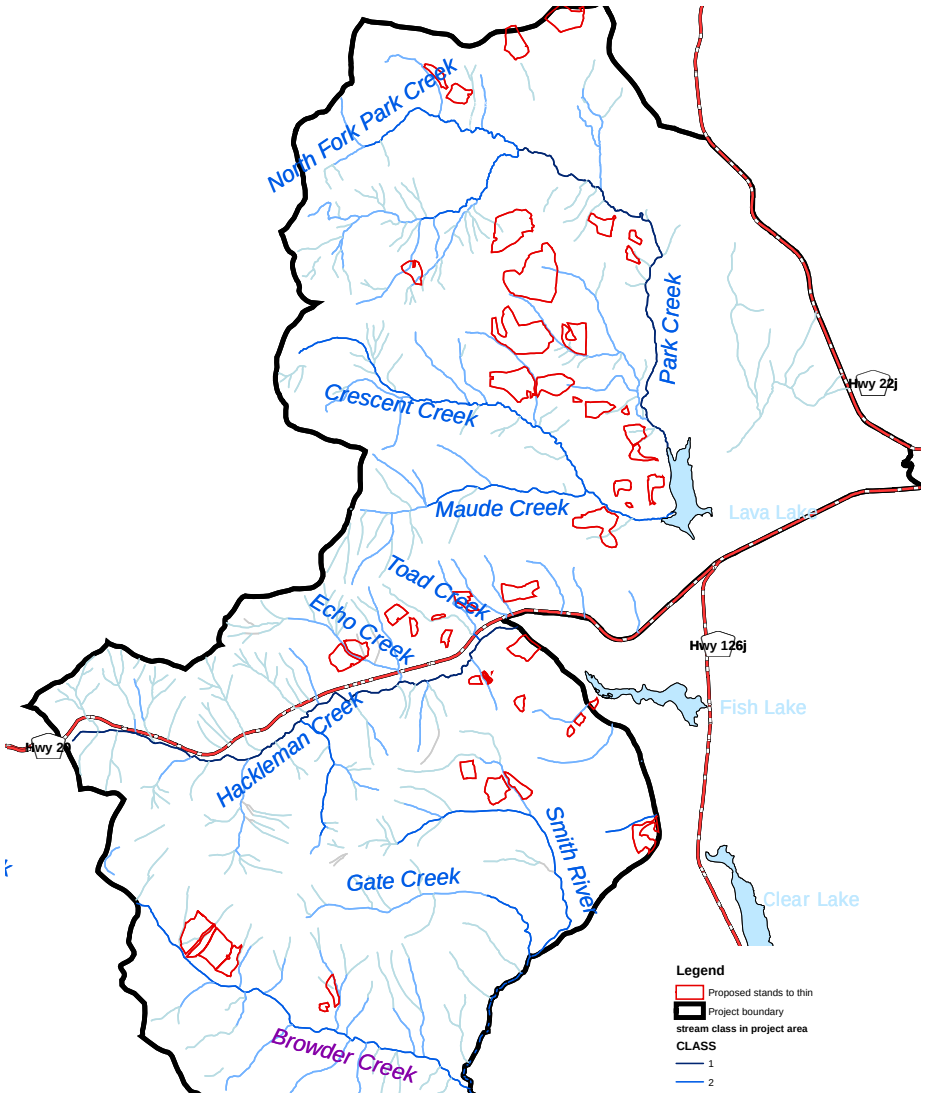


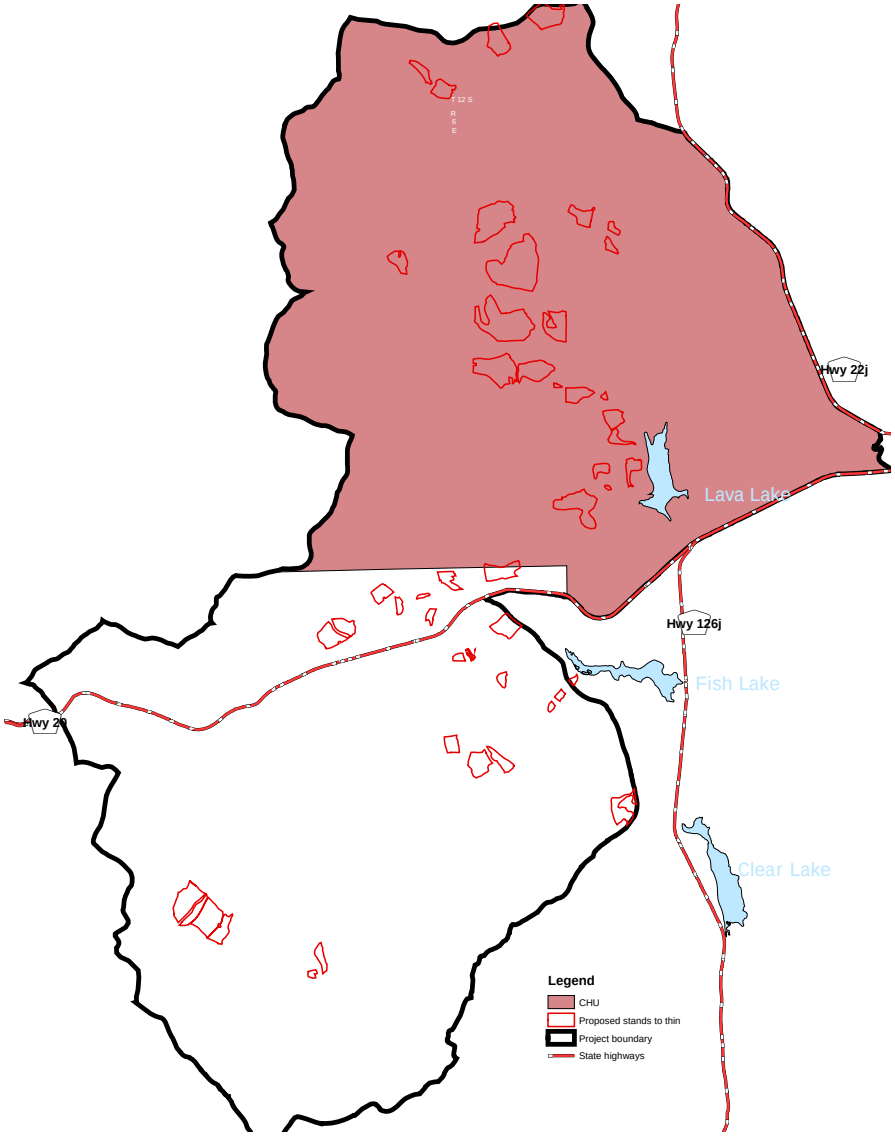
Figure 5: Proposed harvest units in relation to streams in the project area

In the planning area Browder Creek drains into the McKenzie system, which in turn drains into the Willamette River.

Hackleman and the Parks/Lost Lake drainages do not have surface connections to the McKenzie system. Instead these areas are drained through subsurface routes and are believed to charge the McKenzie spring systems that provides constant flow to the Mckenzie River , a tributary to the Willamette River.

2. Critical Habitat Unit (CHU) for Northern Spotted Owls

In 1990, the U.S. Fish and Wildlife Service listed the northern spotted owl under the Endangered Species Act and determined that the spotted owl was threatened throughout its range by the loss of suitable habitat as a result of timber harvesting and catastrophic events such as wildfires. In 1992 critical habitat units (CHU's) for the owls were designated on federal lands. As stated in the Federal Register designation, this "critical habitat focuses on the nesting and roosting habitat as the most important elements of spotted owl habitat" (Federal Register Vol. 57, No. 10 January 15, 1992). The designation goes on to say that "the emphasis for future management would be on maintaining or developing habitat that has the characteristics of suitable nesting and roosting habitat and to avoid or reduce the adverse effects of current management practices." Within a CHU, federal agencies must ensure that any actions they authorize, fund or carry out are not likely to jeopardize the continued existence of a listed species, or destroy or adversely modify its designated critical habitat.



The map to the left shows that about half of the project area, and about half of the stands being considered for treatment, fall within a Critical Habitat Unit for northern spotted owls.

Figure 6: Critical Habitat Unit (CHU)

3. The Santiam Pass Area of Concern (AOC)

The AOC encompasses portions of the Sweet Home, Detroit and McKenzie River Ranger Districts and was established because the area was unable to fully facilitate dispersal requirements for northern spotted owls in two quarter-townships around the Santiam Pass (USDI, 2006). This area was identified due to the existing poor quality, quantity and distribution of habitat, relatively low owl numbers and the concern that this area had the potential to be a biological bottleneck for north/south and east/west movement of owls (USDI, 2006).

The goal in the AOC is to improve connectivity between blocks of suitable habitat for northern spotted owls by providing habitat conditions that meet at least minimum dispersal requirements. This allows the owls to move between the blocks of nesting, roosting and foraging habitat "to provide genetic and demographic exchange among subpopulations" and "for juvenile owls to disperse from their natal areas" (USDI, 2006).

The map to the right shows the AOC in purple and proposed harvest units in red. Comparing maps of the AOC and CHU, shows that there is some overlap between them. In areas of overlap, the CHU requirements take precedence over AOC requirements.

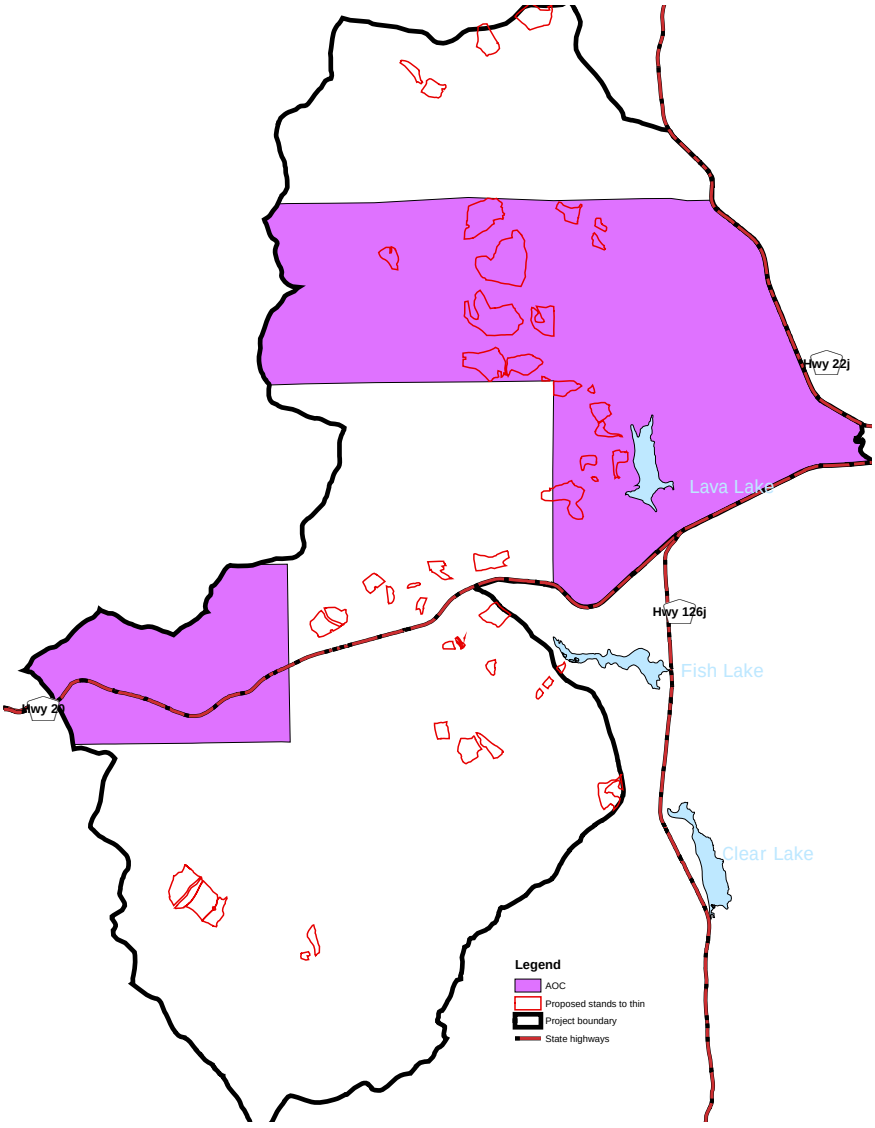


Figure 7: Area of Concern

4. Inventoried Roadless Area

A portion of the Echo Mountain Inventoried Roadless Area (IRA) lies within the project area. The Department of Agriculture adopted a final rule to establish prohibitions on road construction, road reconstruction, and timber harvesting in inventoried roadless areas on National Forest System lands. The intent of this rule is to provide lasting protection for inventoried roadless areas within the National Forest System in the context of multiple-use management (Federal Register, Jan. 12, 2001).The effective date of the rule was March 13, 2001. The map to the left shows the Echo Mountain Inventoried Roadless Area in brown and the outline of stands being considered for treatment with this project in red. No project activities are planned within the Inventoried Roadless Area although two units are immediately adjacent to it.

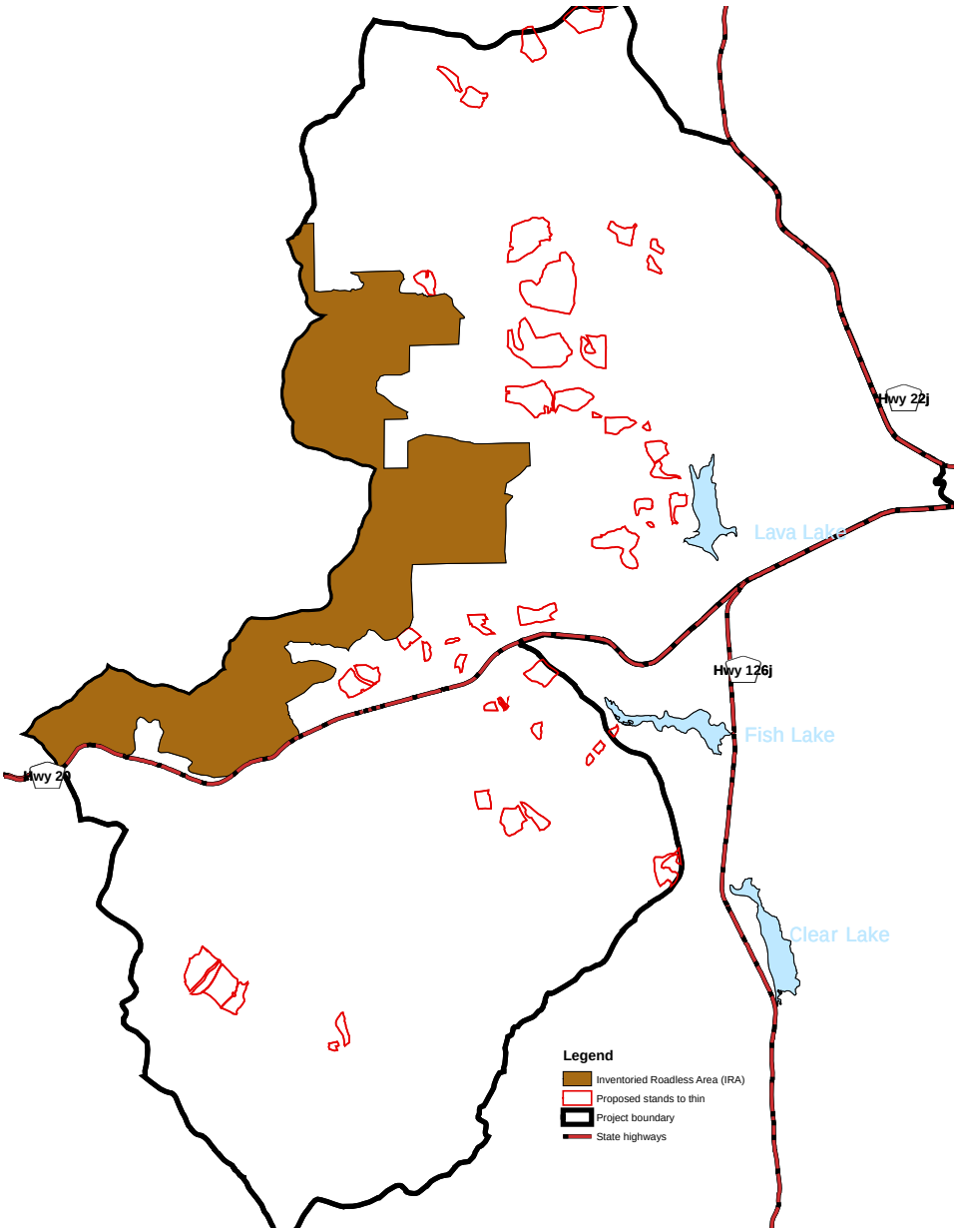


Figure 8: Inventoried Roadless Area

5. Watershed Analysis (1995 and 2006)

As required by the Aquatic Conservation Strategy in the NW Forest Plan, a comprehensive watershed analyses was completed for the Upper McKenzie watershed in 1995 and was updated in 2006. The purpose of the analysis was to enhance understanding of the relevant ecosystem elements in the area and to help guide the general type, location and sequence of appropriate management activities. It also provided baseline data from which to compare changes in the watershed over time. Table 3 below summarizes significant findings and recommendations for the area where this project is proposed.

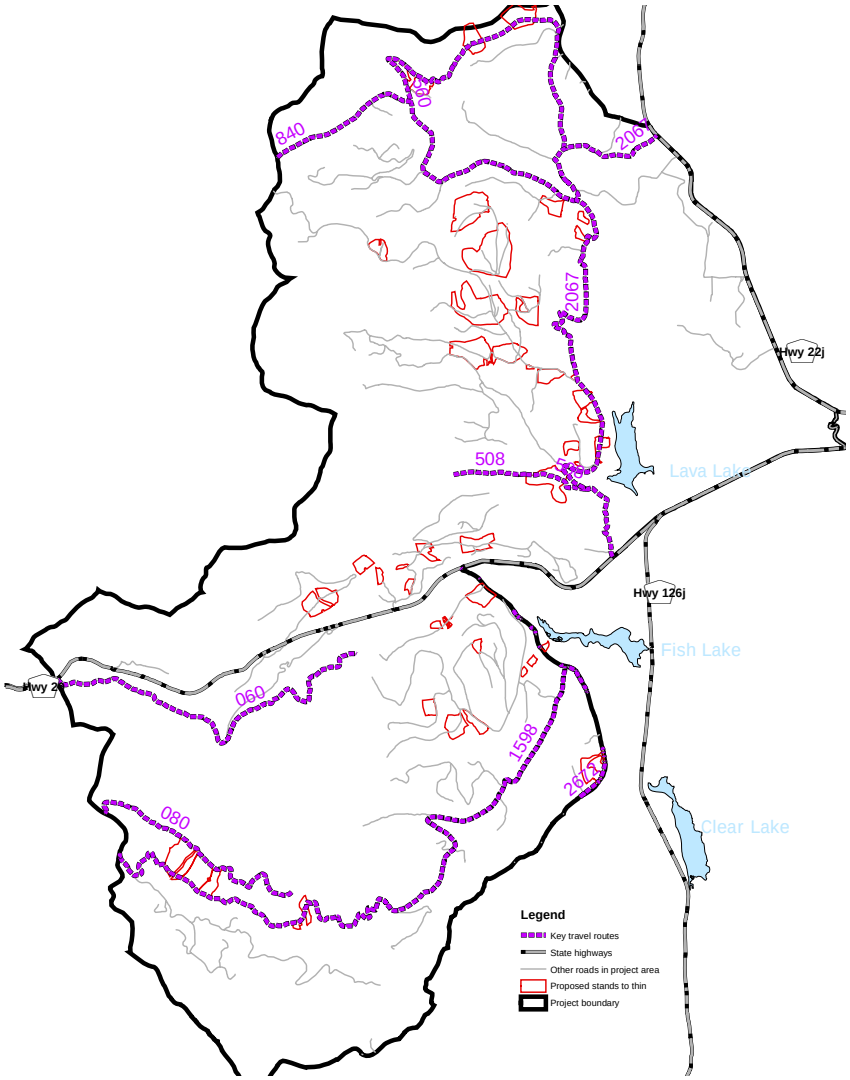
Table 3: Significant findings and recommendations from Upper McKenzie Watershed Analysis (1995 and 2006)

Significant Findings	Recommendations
Many of the stands exhibit high density conditions contributing to high levels of stress.	Emphasize stocking control through precommercial thinning and commercial thinning. Use prescribed fire.
There has been a loss of old growth system function from edge effect in leave blocks.	Opportunity for large block minimum fragmentation strategies in these areas.
All western white pines in the watershed have been significantly reduced by white pine blister rust.	Emphasize planting disease resistant white pines in areas within historic range.
There is a 40-year return interval for western spruce budworm in Pacific silver fir plant series.	Expect new outbreaks in the watershed. Take steps to reduce stand density and proportion of highly susceptible species.
Fires historically were stand replacement events of low to moderate intensity. Return intervals were long, however ridgetops tended to burn more often. Fires usually resulted in a mosaic of small patches. This area also experienced some of the largest fires in the watershed around 1900.	Landscape pattern should reflect a mosaic of large and small patches.
Construction and maintenance of roads introduces and spread noxious weeds and other non-native plants.	Implement FSM 2080 direction in all proposed timber sales and road maintenance programs. Use weed free fill material for road work projects. Clean soil from road equipment prior to use.
25% of species are associated with riparian areas. Riparian buffers that protect the integrity of the riparian vegetation and water quality would be critical to maintain these species, especially in class III streams. Class IV riparian areas contain minimal riparian vegetation.	Maintain protective riparian buffers on class III streams that include the riparian vegetation and a portion of the transition zone. Class IV buffer widths may be altered to reflect the range of natural variability of natural disturbances. However, 50-11-40 guidelines should be met and there should be no net loss of existing late successional habitat in Riparian Reserve designs. If portions of buffers are narrowed, other areas would need to be increased.
Most road related slope failures are from side-cast construction on slopes greater than 70% in western Cascades volcanics.	Continue road restoration work according to impact on Bull Trout population and Access and Travel Management Plan.

6. The Willamette Forest Roads Analysis, 1998 and 2003

The Willamette Forest Roads Analysis, 1998 as amended in 2003, is incorporated by reference and is available for public review at the Sweet Home Ranger District office. The roads analysis identified a network of Key Forest Roads "to provide sustainable access to National Forest System lands for administration, protection, and utilization in a manner consistent with Willamette Forest Plan guidance and within the limits of current and likely funding levels" (USDA. 1998 amended in 2003).

This analysis identified the following roads in the analysis area as being Key Forest Roads. They are: 1500, 1500-080, 1598, 2067, 2067-508, 2067-560, 2266-317, and 2672 and are highlighted on the map below. The analysis goes on to say, "Roads that are not selected as Key Forest Roads would generally be candidates for some form of treatment that stabilizes their erosion potential and reduces that impact on the resources. These roads would be considered for closure, stabilization, or, if unneeded, decommissioning. Their status would be determined with input from watershed, district or project planning; NEPA; or as travel management plans are developed in response to local resource and social issues. Declining road maintenance budgets would also be a factor. Non-Key Forest Roads that pose an immediate threat to resources may require a physical barrier to eliminate traffic or may be decommissioned." (USDA. 2003)



The map to the left shows the Key Forest Roads within the planning area in purple and the stand proposed for harvest in red.

Figure 9 - Location of Key Forest Roads in Relation to Proposed Thinning Units

D. Purpose and Need for Action

The purpose of the project is to:

- **improve stand health and vigor** and **enhance tree growth** in 30-60 year-old managed stands in both uplands and selected portions of Riparian Reserves.
- **encourage species diversity** which more closely resembles that of native plant communities and **reduce the population of off-site ponderosa pine** in three stands where it is present within proposed harvest units.
- **increase stand complexity**, where needed, to more closely mimic that usually found in natural stands as a result of normal disturbance agents. This may include understory development, creation of snag and down wood habitat, and retention of minor conifer species and hardwoods.
- **accelerate structural development** in stem-exclusion stands that are adjacent to patches of late-seral forest to ultimately reduce landscape level fragmentation and edge effects.
- **provide wood products** to the local market.

In addition to the project purposes outlined above, the following apply to specific parts of the project area:

- **accelerate development of late-successional stand characteristics** in critical habitat for the northern spotted owl while minimizing the frequency of disturbance to the owls over time.
- **improve northern spotted owl dispersal habitat** in the Santiam Area of Concern over time.
- **accelerate development of large trees and structural components** in Riparian Reserves while minimizing the number of harvest entries over time.

This action is needed for the following reasons:

- **Stand health and vigor:** Some of the stands proposed for treatment are showing reduced health and vigor as evidenced by insects and diseases; mountain pine beetle; annosus root rot; armillaria root rot; and white pine blister rust (an introduced pathogen).

  Although insects and diseases are a natural part of the ecosystem and support processes such as decomposition and nutrient recycling some introduced pathogens have decreased or eliminated various species from some areas (ODF, 2007). In addition, impacts of native root diseases, such as annosus root disease, are increasing (Hadfield, Donald J. et. al, 1986). Warmer and drier summers have resulted in moisture-stressed forests which are more susceptible to insect and disease mortality and fires (US National Assessment of the Potential Consequences of Climate Variability and Change Educational Resources, Regional Paper: Pacific Northwest). These diseases and insect infestations can result in growth loss, tree mortality, topkill, branch dieback, root and butt rots, etc.

Increasing tree vigor can increase the ability of these stands to cope with various insects and diseases.

- **Tree growth:** These young, managed, second-growth trees are beginning to compete with each other for water, nutrients and sunlight. As this competition increases, "without density reductions, planted forests eventually evidence suppressed growth, high height to diameter ratios, and short crowns; conditions that have been shown to make stands susceptible to windthrow and inhibit the development of the large trees associated with old growth forests" (Wilson & Oliver 2000).
- **Species Diversity/Invasive species/Off-site Species:** After these managed stands were harvested, they were planted with a species mix that more heavily favored Douglas-fir or noble fir than those species represented in natural stands in the area.

  In addition, use of roads in the area has contributed to the introduction of invasive weed species along these travel routes.

  Furthermore, in the 1950's and 60's some off-site ponderosa pine was planted in portions of the project area. These off-site trees are not a natural component of this ecosystem and can potentially affect/displace species dependent on the natural mix of species here.
- **Stand complexity:** A wide variety of research has shown that many managed stands are impoverished in structure, species and ecological function (Carey, 1995, 1998, 2003; Carey et. al. 1996, 1999a: Harmon et. al.1996; Carey and Harrington, 2001). "Although researchers and land managers had assumed that these dense, young forests would, in time, grow to resemble the old-growth forests they replaced, a group of researchers have accumulated a wide range of evidence suggesting that this may not occur unless the young forests are selectively thinned to allow the remaining, uncut trees to grow under less-dense conditions." (ENS, 2002). Research has found that "young planted forests, established at high densities in very short time periods with the expectation of pre-commercial and commercial thinnings, are typically uniform and dense with little differentiation.
- **Structural development** to reduce fragmentation in the long-term: Late-successional forests occupy approximately 37% of the Upper McKenzie watershed (USDA, 1995; p. 43). Within the watershed these late-seral stands comprise a similar area to historic conditions, but they have smaller patch sizes and are more fragmented than they were historically. Efforts to minimize fragmentation would be important in maintaining the contiguity of the patches left (USDA, 1995; p.70). Acceleration of the structural development of stem exclusion stands that connect the small patches of late-seral forests could ultimately reduce landscape level fragmentation and edge effects.
- **Wood products**: The amended Willamette National Forest Plan has a goal in general forest/matrix management allocations, to produce an optimum and sustainable yield of timber, based on the growth potential of the land which is compatible with multiple use

objectives and meets environmental requirements for soil, water, air and wildlife habitat quality.

- **CHU habitat:** When the U.S. Fish and Wildlife Service designated critical habitat for the threatened northern spotted owls it included a variety of seral stages such as the 30-60 year-old managed stands proposed for treatment with this project. These young, managed stands were established to produce high yields of timber for commodity production rather than nesting, roosting and foraging habitat desired in the CHU's for northern spotted owls.

  The goal in the CHU is to provide large blocks of suitable habitat that provide the necessary elements to maintain stable, viable and interconnected populations of northern spotted owls. According to the Interagency Scientific Committee, the attributes of superior nesting and roosting habitat typically include a moderate to high canopy closure (60 to 80 percent closure); a multi-layered, multi-species canopy with large overstory trees (>30in DBH); a high incidence of large trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and debris accumulations); large accumulations of fallen trees and other debris; and sufficient open space below the canopy for owls to fly (Thomas, et al. 1990).

  These are not the same characteristics that are desired for high-yield commodity production in even-aged timber stands. The current stocking levels and structure of these young, managed stands exhibit symptoms of suppressed growth and declining crown ratios that could delay the development of desired stand characteristics in the CHU. Scientific evidence has shown that thinning of younger forests can accelerate the development of desired old growth characteristics (Acker et. al 1998, Tappeiner et. a. 1997, Carey et. al 1999, Muir et. al. 2002)
- **Area of Concern (AOC):** Ownership patterns and past harvesting in the AOC have resulted in poor quality, quantity and distribution of habitat for northern spotted owls and created an area that is unable to fully facilitate spotted owl dispersal requirements (USDA, 2006). The ability of these threatened owls to disperse between areas of suitable habitat is important for genetic exchange and for young owls to move from their natal areas. The young, managed stands being considered for treatment in this project are currently providing poor quality dispersal habitat for owls because of their small size and limited structural development.
- **Riparian Reserves:** Many of the forest stands proposed for treatment with this project include areas designated as Riparian Reserves under the Northwest Forest Plan. Many of these Riparian Reserves were previously managed for timber production and are characterized by relatively dense, uniform, even-aged stands that typically are lacking in structural and biological diversity desired in these areas.

E. Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to commercially thin about 1291 acres of 30 to 60 year-old managed stands and to begin to convert off-site ponderosa pine in three managed stands to a more natural species mix. These stand treatments would be accomplished using a combination of skyline and ground-based yarding systems. Project objectives would be accomplished through the use of a variety of management techniques including: a) commercial thinning to reduce current stocking levels thereby lessening the competition for nutrients, sunlight, and growing space; b) thinning stands more heavily to encourage individual tree growth and increase the time period between successive harvest entries and c) increasing stand biodiversity and complexity through various combinations of the following treatments:

- Retaining some areas of stands that are unthinned;
- Retaining minor conifer species and hardwoods;
- Creating snags and down wood;
- Maintaining an average of 50% canopy closure at the stand level in the secondary shade zone of Riparian Reserves. The secondary shade zone is included within one site tree potential (140 ft) either side of perennial and intermittent channels flowing in summer

In the proposed action, about 999 acres would be thinned to an average 60% canopy closure (90-110 trees per acre) and 292 acres would be thinned to an average an average 40% canopy closure (60-80 trees per acre). Thinning to an average 60% canopy closure is aimed at maximizing stand growth while thinning to an average 40% canopy closure is aimed at maximizing individual tree growth.

The 40% canopy closure thins are prescribed in stands with a large component of Riparian Reserves or in stands adjacent to patches of existing late-seral stands.

Within the Riparian Reserves, the goal is to maximize individual tree growth and to minimize the frequency of disturbance to the area over time. This thinning is intended to accelerate attainment of desired stand characteristics while also increasing the time period between successive harvest entries in order to minimize the frequency of disturbance to the area. Thinning would occur outside of primary shade zones on perennial streams, leaving the primary shade zones intact.

The goal of thinning to an average 40% canopy closure adjacent to existing late-seral stands is to accelerate development of late-seral stand conditions and eventually contribute to larger late-seral patch sizes in the watershed.

Harvest units would be yarded with ground-based equipment on 612 acres and skyline on 679 acres. The expected harvest would be about 9.1 MMBF of timber to the local market.

Actions connected to this proposal include:

- Reopening of about 3.8 miles of spur roads used in previous harvest entries. This entails blading and brushing. About 20% of the roads are on flat ground away from streams,

30% are on ridgetops, 47% are midslope and 3% are within or adjacent to Riparian Reserves. These roads would be decommissioned at the conclusion of project activities.

- Constructing approximately 1.1 miles of temporary roads which involves blading, brushing and removal of stumps. One road is located on flat ground outside of riparian areas, the second road crosses three intermittent streams and continues midslope across the proposed harvest unit. These roads would be decommissioned at the conclusion of project activities.
- Maintenance and reconstruction of about 45 miles of system roads along the haul route. This entails 2.8 miles of slough removal from ditchlines; 530 yd^3 of spot surface aggregate; 5 culvert replacements (three are ditch-relief culverts and two are on live streams); five culvert catch basin cleanouts; filling slumps with about 1540 yd^3 of rock.; and improving fish passage at the creek crossing on road 2672 near Unit 34.
- Reduction of activity-generated slash through roadside grapple piling (35 acres), grapple piling within harvest units in areas that were yarded with ground-based equipment (242 acres), yarding tops (240 acres), and burning landings (142 landings).
- Falling of selected riparian trees to be placed into fish-bearing streams for structure would occur in Units 1, 14, 17, 24 and 36 as well as a short distance upstream and/or downstream of the units.
- Storing, stormproofing and decommissioning about 14.4 miles of existing roads. This involves installation of closure devices; pulling culverts; subsoiling and planting trees; waterbarring and installing drain dips.

The following have been built into the alternative design to ensure compliance with Forest Plan standards and guidelines, laws, regulations and other policies: a) seasonal harvest restrictions when activities would be detrimental to a species' reproductive success or might cause undesired environmental impacts; b) buffering sensitive species and habitats from disturbance during harvest operations; c) decommissioning temporary roads following harvest activities; d) implementing soil protection measures such a log suspension requirements and subsoiling to reduce soil compaction in selected areas; and e) implementing provisions to minimize the spread of invasive weeds such as pre-treating weeds along haul routes.

In order to mitigate environmental effects of past soil compaction in a portion of Unit 27, subsoiling would be required after harvest activities are completed on about one acre of this unit where Forest Plan standards and guidelines for soil compaction have been exceeded.

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

F. Decision Framework

The Sweet Home District Ranger, who is the deciding official for this project, would review the information presented in this Environmental Assessment including its analysis of the environmental consequences of the various alternatives, proposed design criteria (Table 10) to minimize anticipated effects and other supporting documentation as a basis for making the following decisions regarding this project:

- Whether to actively treat these young, managed stands to accelerate the development of desired stand characteristics (in one of the action alternatives) or let those young stands develop desired characteristics on their own, over a much longer period of time (in the No Action alternative).
- Which mix of thinning intensities should be selected to meet project objectives in these young, managed stands. The intensity of thinning can affect the timing of future harvest entries designed to accelerate development of desired stand conditions. Frequency of harvest entries can impact species and habitat intended to benefit from treatments.
- Whether to choose an alternative that focuses on development of Riparian Reserve stand characteristics and increasing patch sizes of late-seral stands or to choose an alternative that focuses on development of habitat for northern spotted owls in the CHU.

Information regarding heritage resources would be included in the supporting documentation made available to the decision-maker although this information is exempt from public disclosure under the Freedom of Information Act (FSM6271.2).

This decision affects the length of time it would take for young stands to develop desired stand characteristics within the Upper McKenzie watershed as well as the number of acres treated and the intensity of thinning on the treated acres. For some species dependent on this habitat for their survival, the timing issue is very important.

G. Public Involvement

The proposal was first listed in the Schedule of Proposed Actions (SOPA) or “Forest Focus” in the fall of 2007 (July 2007- Sept 2007) and has been listed throughout the project planning process. The Willamette National Forest publishes the SOPA quarterly on the web and sends the document to over 100 individuals, groups and industry representatives. The SOPA provides a way of informing the public about upcoming projects and keeps them abreast of progress of individual projects.

A scoping letter dated May 1, 2007 was mailed to people, organizations or agencies on the district’s mailing list who had expressed interest in district projects or were affected by them. This letter briefly described the Park Smith Thin Timber Sale project and invited them to a public meeting to discuss it. In addition, a news release was issued on May 8, 2007 inviting the public to this meeting.

During the public meeting and in response to the scoping letter, the following comments were received:

Table 4: Concerns expressed about the project during scoping

Comment Topic	Concerns
Seasonal operating restrictions	Need to articulate the objectives of the seasonal closures rather than being prescriptive. This gives operators more options/flexibility.
Variable density thinning in matrix	In matrix allocations variable density thinning shouldn't be used. Instead do what is silviculturally best for the stand to increase timber production.
Off-site species	Concern about the health of off-site Ponderosa pine in some of the proposed harvest units, as well as in other units the planning area.
Big game forage	Since the big game emphasis areas are moderate to high emphasis here, forage development should be considered. Gaps should be introduced into stands that range in size from ½ to 2 acres in size, outside of the AOC and CHU. There was also concern about protection of spring calving areas in the planning area.
Haul routes	There was concern that hazard trees along roadsides be removed to improve safety along haul routes rather than be retained for snag habitat in the road corridor.
Economic viability of sale	Sale cost efficiencies are very important , especially when market is down. Consideration needs to be given to the type of logging sytem and variable density thinning is also an added cost to the operator. Variable density thinning should be marked. Plan to make pre-commercial thinning available when the market for chips is high. This could address some of the slash accumulations caused by thinning.
Slash treatments	Set standards you want to achieve in the EA and don't be prescriptive about how met. Consider: biomass utilization or using a mulcher.

H. Issues

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

Planning regulations direct agencies to narrow the scope of environmental analysis by concentrating on the issues that are truly significant to the proposed action and to only briefly discuss other non-significant issues. Therefore, the Forest Service separated the issues into two groups: significant or non-significant. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Significant issues can be factors in creating alternatives to the proposed action for meeting the identified purpose and need for action. Evaluation criteria for comparing effects are identified at the end of each issue description.

Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to

the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…"

A list of both significant and non-significant issues are described below. Non-significant issues and reasons regarding their categorization as non-significant are found below.

Significant Issues:

Significant issues identified as those driving the action alternatives included: a) habitat quality and frequency of disturbance in Critical Habitat Units for northern spotted owls; and b) habitat quality and frequency of disturbance in Riparian Reserves.

- **Habitat quality and frequency of disturbance in Critical Habitat Units (CHU) for Northern spotted owls:** A portion of the project was designated as critical habitat under the Endangered Species Act. According to the Federal Register (Vol. 57, No. 10, January 15, 1992) "the emphasis for future management (in the CHU) is on maintaining or developing habitat that has the characteristics of suitable nesting and roosting habitat and to avoid or reduce the adverse effects of current practices."

  The role of critical habitat units is to provide a network of habitat areas that are considered important to maintaining stable and interconnected populations over the range of the Northern spotted owl. Primary constituent elements (PCEs) are the physical and biological features of critical habitat. These features provide and support nesting, roosting and foraging conditions for the Northern spotted owl and are typically found in late-successional or old growth conditions. Such features include a multi-layered, multi-species canopy structure with trees greater than 30" DBH; large snags and accumulations of down wood;and stands typically greater than 120 years old.

  Past harvest activities on both public and private lands have altered the seral stage distribution and arrangement within the project area. These seral stage changes have influenced the primary constituent elements, and thus, habitat effectiveness of the Northern spotted owl. Young managed stands that resulted from this harvest do not meet the desired stand characteristics in the Critical Habitat Unit. At least 40% of the area within a 1.2 mile radius of an activity center should be maintained as suitable habitat to avoid adverse effects to nesting northern spotted owls that would result in incidental take" (USDI and USDA, 2007).

  In addition, the intensity of thinning to improve habitat for the owls can affect the length of time to develop desired habitat characteristics and can also influence the number of harvest entries required to achieve those characteristics. The length of time between successive harvest entries can also influence the effectiveness of the habitat while it is developing. (**Measurement criteria** - Acres of suitable habitat maintained within the 1.2 mile buffer radius of an activity center, acres of various thinning intensities in CHU and years to next harvest entry).

- **Habitat Quality and frequency of disturbance to Riparian Reserves:** Many of the forest stands proposed for treatment with this project include areas designated as Riparian Reserves under the Northwest Forest Plan. Many of these Riparian Reserves were previously managed for timber production and are characterized by relatively dense, uniform, even-aged stands that typically are lacking in structural and biological diversity desired in these areas. Young managed stands that resulted from this harvest do not meet the desired stand characteristics in Riparian Reserves.

  In addition, the frequency of timber harvest and associated activities in the reserves affects the amount of risk to both aquatic and terrestrial resources here. The more frequent the entries the more chance of sedimentation entering stream channels, soil compaction interrupting the natural flow of water across the landscape, stream shade being affected and the like. (**Measurement criteria** – Acres of Riparian Reserves affected, acres of various thinning intensities in Riparian Reserves, years to next harvest entry)

Non-significant Issues

- **Water Quality**: Localized surface erosion caused by: a) timber harvest and related activities such as road use and construction near stream channels; b) abandoned road maintenance resulting in accumulations of soil ravel in road ditches, blocked drainage structures, etc.; and c) soil compaction which interrupts the natural flow of water across the landscape could result in increased turbidity in stream channels. Turbid waters that exceed background values over time can increase the risk to the survival and well-being of aquatic organisms.

  In addition, timber harvest and stream crossings associated with yarding corridors and/or road crossings could reduce stream shade allowing increased solar radiation to reach stream waters. If this occurs on a large enough scale, it can lead to increased stream temperatures and affect the well-being of aquatic organisms.

  This issue was not considered significant because all alternatives would meet the law (Clean Water Act), regulations, and Forest Plan standards and guidelines. All action alternatives include the same measures to ensure compliance with these laws, standards and guidelines, regulations or policy such as: 1) Riparian Reserve prescriptions which exclude harvest in primary shade zones; 2) retention at least 50% canopy closure in the remainder of the Riparian Reserve, and 3) incorporating Best Management Practices to maintain or reduce any water quality impacts to within legal levels. The effects of the proposed action and the other alternatives on water quality are addressed in the environmental consequences section of the document.

- **Big Game:** The planning area is located in both moderate and high Big Game Emphasis Areas. Changes in timber management objectives on federal lands over the last 10-15 years have resulted in less regeneration harvest and more commercial thinning. This

coupled with tree growth in previously harvested units has resulted in fewer acres of high quality forage for big game in the planning area now than in the past.

In addition, Forest Plan management objectives in these Big Game Emphasis Areas may be in conflict with management objectives for suitable and dispersal habitat for the Northern spotted owl, a threatened species under the Endangered Species Act. In areas designated as suitable owl habitat, proposed harvest activities cannot decrease canopy closure below 60% without adversely affecting the species and population viability. In areas designated as owl dispersal habitat, proposed harvest activities cannot decrease canopy closure below 40% without adversely affecting the species and population viability.

In addition, roads built to access harvest units have given rise to high road densities in the planning area. Human use of these roads can impact elk security, habitat effectiveness and vulnerability. With high road use, elk may be forced into less desirable habitat and use of key habitat components such as watering holes, foraging areas and calving areas may be compromised. In addition, the greatest amount of hunting pressure is concentrated near road systems and as a result, the majority of the big game harvest occurs near roads.

The issue was not considered significant because big game forage production and enhancement was not an objective of this project as described in the Purpose and Need. In addition, there are many existing openings within proposed harvest units and in the adjacent areas, so it was felt that this, combined with the number of acres that were heavily thinned to achieve other resource objectives, would benefit big game forage at least in the near term.

- **Dispersal Habitat within the Santiam Area of Concern (AOC):** Past timber harvest patterns have influenced Northern spotted owl dispersal capabilities within the Santiam Area of Concern which was intended to provide owl dispersal habitat, at a minimum, and to provide connections with Late-Successional Reserves nearby.

  Habitat connectivity in this area is unable to fully facilitate dispersal requirements for the Northern spotted owl, and as a result, has a high potential to be a biological bottleneck for north/south and east/west movement, genetic exchange and movement of young owls dispersal from natal areas.

  Thinning and other stand treatments can improve tree health and vigor in these young, densely stocked, managed stands and accelerate development of desired habitat conditions here in the long-term, but could degrade this dispersal habitat in the short-term. Standards and Guidelines require that, at a minimum, dispersal characteristics be maintained in this area.

  This issue was not determined to be significant for designing alternatives because dispersal habitat would not be downgraded or removed in any alternatives. Proposed thinning would serve to improve this habitat in the long-term.

- **Snag and Down Wood Habitat**: Commercial thinning reduces competition for light, nutrients and water between trees increasing the growth and vigor of residual trees. This can potentially delay the natural development of snags and down wood in the stand until the trees grow enough to begin competing with each other again.

  This issue was not considered significant for designing alternatives because similar measures would be used in all action alternatives to address snags and down wood.

- **Invasive Plants/Off-site Species** – Ground-disturbing activities associated with harvest operations and road maintenance/reconstruction could cause the introduction and/or spread of invasive plants in the planning area thus degrading the native plant community and potentially affecting species dependent on that community. In addition to invasive plants, past reforestation practices have led to some stands supporting populations of ponderosa pine which is also not genetically adapted to this area.

  This issue was not considered significant for designing alternatives because similar measures would be used in all action alternatives to prevent expansion of existing invasive weed populations. (See Design Elements Common to all Action Alternatives and Botanical Specialist Report in the Project Record and Integrated Prescriptions in Appendix A). The affects of the proposed action and other alternatives on invasive weeds are discussed in the Environmental Consequences section under Vegetation.

- **Soil Compaction**: Unrestricted use of ground-based logging equipment has resulted in soil compaction in some of the proposed harvest units in the past. Further use of ground-based logging for this entry could result in additional compaction which can affect tree growth, water infiltration rates and surface erosion.

  In a few areas, existing soil compaction approaches or exceeds forest plan standards and guidelines. Treatment of this compaction through techniques such as subsoiling can help improve soil productivity but it can also result in pruning tree roots which can reduce tree growth and stability. In addition, subsoiling has the potential to disturb heritage sites which are abundant in portions of this project area.

  This issue was not considered significant because it is addressed by the Forest Plan standards and guidelines (FW-079 through 086, especially FW-081). All alternatives are designed to meet the standards and guidelines as well as Best Management Practices with respect to the soil resource with the exception of a portion of one unit that already exceeds standards and guidelines. This unit would be subsoiled following harvest activities, to bring the soil compaction into compliance with standards and guidelines.

- **Dispersed recreation:** Harvest activities may impact dispersed recreation activities in this area by physically disturbing sites and/or displacing recreation use either temporarily or permanently. Disturbance or displacement could affect summer or winter visitors depending on the season of operation of harvest.

This issue was not considered significant for designing alternatives because similar measures would be used in all action alternatives to address the impact of harvest activities on dispersed recreation.

- **Increasing travel corridors for off-road vehicles (OHV's):** Reopening spur roads used in previous harvest entries, creating skid roads and/or cable yarding corridors could increase the opportunities for OHV's to travel off managed road systems. Flat terrain, existing high road densities and the opening of spur roads to access harvest units would increase opportunities for people to use OHV's in the project area. Increased use OHV's could create wildlife disturbance, soil displacement, water quality effects, soil compaction, spread of non-native/invasive weeds, and increase the potential for fire starts on both public and adjacent private lands.

  This issue was not considered significant for designing alternatives because similar measures would be used in all action alternatives to address this issue. The timber sale contract would require the purchaser to close and decommission temporary roads following harvest activities.

- **Scenic Issues along Highway 20** – About 127 acres of stands proposed for thinning lie within the Scenic Retention Foreground management allocation and another 160 acres lie within the Scenic Partial Retention Middleground management allocation. Thinning and new temporary road construction to access these units could affect the scenic quality (form, line, color and texture) as seen from Highway 20 and Highway 126 viewsheds

  This issue was not considered significant for designing alternatives because Forest Plan standards and guidelines address the amount and type of harvest acceptable in each decade in these management areas. All alternatives are designed to meet the standards and guidelines that address scenic quality.

- **Fuels:** Fuels generated from harvest activities could increase fire risk and severity especially in the vicinity of dispersed recreation sites and major travel corridors.

  This issue was not considered significant because it is addressed by the Forest Plan standards and guidelines (FW-252) for management- created fuel, specifically fine fuels. All alternatives are designed to meet the standards and guidelines for fuel treatments.

- **Economic viability of sale:** The design of harvest units, selection of logging systems, road work requirements, season of operation, harvest prescriptions, slash treatment and other sale design features can all affect the economic viability of a timber sale. If an economically viable timber sale offering cannot be made then many of the project objectives cannot be achieved.

This issue was not considered significant because this issue was addressed similarly in both action alternatives. Economic analysis shows that both action alternatives are economically viable.

- **Fish:** The cutthroat trout in both Hackleman and Park Creek are uniquely adapted to Fish Lake and Lava Lake seasonal habitat (respectively). These fish may be genetically distinct from the rest of the cutthroat on the Willamette. Harvest and associated activities in the vicinity of Hackleman and Park Creeks could affect water quality and fish habitat for these unique fish.

  This issue was not considered significant for designing alternatives because similar measures would be used in all action alternatives to address these fish. All harvest units employ similar no-harvest buffers in primary shade zones that are at least 60 feet wide on perennial streams, wider if fish are present. These buffers help ensure protection of water quality and habitat for these fish.

Alternatives, including the Proposed Action

This section provides a detailed description of the proposed action for the Park Smith Thin planning area as well as alternative methods for achieving the stated project objectives, including taking no action. It discusses design elements that have been built into alternatives to ensure compliance with Forest Plan standards and guidelines, laws, regulations and other policies as well as mitigation measures designed to avoid, minimize, rectify, reduce, eliminate, or compensate for environmental impacts caused by the project. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., helicopter logging versus the use of skid trails) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of erosion or cost of helicopter logging versus skidding).

Alternatives

Alternative 1- No Action

Under the No Action alternative, current management plans would continue to guide management of the project area.

The project objectives of increasing growth and vigor of residual trees and accelerating the development of structural and compositional diversity of young, densely-stocked, uniformly-spaced, managed stands under the No Action alternative would be addressed passively, without timber management intervention. Stands would be allowed to advance through the natural growth cycle of competition for growing space resulting in growth reductions and eventual mortality of some trees. At this point there would be an expression of further dominance by some of the remaining trees and eventually a shade-tolerant canopy layer would develop. The rate at which these stands develop the desired stand characteristics would be dependent on growth rates and frequency of natural disturbances such as fire, insects and diseases.

In this alternative the off-site ponderosa pine would persist as a component of the stands where it has been planted. It would continue to exhibit signs of maladaptation through mortality, thinning crowns, bole deformities and susceptibility to insect damage.

Finally, the objective of providing wood products would not be realized at this time.

The No Action alternative provides a basis for comparison to evaluate changes in the existing condition associated with the action alternatives.

Action Alternatives

There are many similarities between the two action alternatives, so the discussion that follows would outline the unique characteristics of each alternative followed by a description of the elements common to both alternatives.

Alternative 2- The Proposed Action

The proposed action addresses all of the basic project objectives but focuses attention on the following elements of the project's purpose: a) accelerating development of large trees and structural components in stands with a large component of Riparian Reserves, and b) accelerating structural development in stem-exclusion stands that are adjacent to patches of late-seral forests with the ultimate goal increasing the size of the late-seral patches to more closely approximate historic conditions. Another goal in the Riparian Reserves and stands adjacent to late-seral patches is to minimize the frequency of disturbance to these areas from management actions. The focus for the remainder of the stands is to enhance growth while also meeting other project objectives.

To achieve these goals, about 1291 acres of 30-60 year-old, managed stands would be commercially thinned and various measures would be taken to encourage species diversity and improve stand complexity. These measures are described in the section entitled "Elements Common to Both Action Alternatives" that follows the description of Alternative 3.

The design of this alternative entails varying the intensity of thinning across the landscape. About 292 acres of stands would be thinned to an average 40% canopy closure, leaving approximately 60-80 trees per acre. These are primarily stands with 1) a large component of Riparian Reserves and/or 2) adjacent to late-seral forests. The idea of this thinning intensity is to maximize individual tree diameter growth and understory development as well as to increase the time period between successive harvest entries and therefore minimizing the frequency of disturbance. A second commercial entry is not anticipated for most of these stands. The stocking levels would be reduced down to a level that allows most stands to be free to grow and maximize diameter growth for the next 30 to 50 years and to develop late-successional characteristics.

About 999 acres of stands would be thinned to an average 60% canopy closure, leaving about 90-110 trees per acre. The idea of this thinning intensity is to maximize stand growth, allow understory development, and produce future commercial thinning opportunities. These stands would likely have a second commercial entry in about 20 to 30 years. The stocking levels would be reduced down to a level that allows the stands to be free to grow and maximize diameter growth for 20 to 30 years and begin to develop late-successional characteristics.

The desired result in the Riparian Reserves is to develop large trees that would provide better shade for streams; moderate microclimate; improve overall structural diversity; and provide future sources of recruitment of large wood for streams. An additional goal of thinning here is to enhance habitat diversity and connectivity in the upland portion of the reserves.

Thinning in Riparian Reserves would only occur outside of the primary shade zones on perennial streams or intermittent streams that flow during the summer or have riparian plant communities. The primary shade zones would be left intact (see table 4 below for no-harvest buffer widths) to ensure adequate stream shade to maintain desirable stream temperatures. Thinning intensities in the Riparian Reserve portion of units would be the same as prescribed for the upland portion of the stand. Between the thinned and unthinned portion of the Riparian Reserves the resulting average canopy closure would be at least 50% as required in recommendations in the "Northwest Forest Plan Temperature (*Total Maximum Daily Load*)

TMDL Implementation Strategies" (USDA and USDI 2005) for streams which are tributary to those on the State of Oregon's 303(d) list for stream temperatures outside of the desirable range.

Table 4: No-harvest buffer widths in primary shade zones

Stream Class	No-harvest buffer width
Class IV stream (intermittent – does not flows in summer) riparian plant communities are absent	25 ft.
Class IV stream (intermittent – flows in summer) or riparian plant communities are present	60 ft
Class III stream protection measures when no fish are present	60 ft
Class II stream protection measures when fish are present	100-125 ft.

This alternative would contribute about 9.1MMBF of commercial timber to the district's harvest target. Table 5 below summarizes information for individual harvest units in this alternative followed by a map of the alternative. For a more complete description, see also the Integrated Prescriptions in Appendix A which provides more details of activities prescribed for each harvest unit along with individual unit maps. In addition, refer to the section entitled "Elements Common to Both Action Alternatives" and table 10 outlining Design Criteria. Common to all Alternatives.

Table 5: Alternative 2 Unit Summary

Unit #	Planned Thinning Acres	Acres in Riparian Reserves	Late-seral connectivity opportunities	Acres in CHU	Acres in AOC	Target Canopy Closure %	Acres Unthinned within Original Stand Boundaries (skips) *	Acres of Ground-based Yarding	Acres of Skyline Yarding	Volume (MBF)
1	36	11		36	0	40	61	0	36	245
2	37	4		34	0	60	5	5	32	274
3	48	0		48	0	60	10	48	0	216
4	21	3		21	21	40	25	17	4	124
5	81	5		81	81	60	23	20	61	365
6	143	1		143	143	60	23	85	58	1087
7	23	1		23	23	60	31	19	4	205
8	15	0.2		15	15	60	50	14	1	101
9	115	6		115	115	60		94	21	610
10	40	6		40	40	60	10	20	20	224
12	114	9		114	114	60	20	40	74	570
13	29	2		29	29	60	12	29	0	171
14	35	4		34	34	40	37	33	2	301
15	14	0		14	14	60	11	13	1	63
16	17	3		17	17	60	19	17	0	139
17	61	5		61	52	60	5	43	18	427
19	52	11		0	0	60	1	0	52	494
20	26	7		0	0	40	40	7	19	182
21	10	2		0	0	60	42	10	0	54
22	17	2		0	0	60	5	17	0	85
23	35	2	35	6	0	40	6	0	35	221

Unit #	Planned Thinning Acres	Acres in Riparian Reserves	Late-seral connectivity opportunities	Acres in CHU	Acres in AOC	Target Canopy Closure %	Acres Unthinned within Original Stand Boundaries (skips) *	Acres of Ground-based Yarding	Acres of Skyline Yarding	Volume (MBF)
24	11	4		0	0	40	23	0	11	112
25	32	15	32	0	0	40	2	22	10	352
26	8	0		0	0	60	32	0	8	36
27	12	4	12	0	0	40	9	12	0	101
32	16	3		0	0	60	36	16	0	147
33	52	7		0	0	60	14	0	52	468
34	31	5		0	0	60	18	31	0	279
36	66	30		0	0	40	9	0	66	667
37	25	2		0	0	60	22	0	25	263
39	18	6		0	0	40	66.3	0	18	180
41	51	0.1		0	0	60	0	0	51	377
Totals	**1291**	**160**	**79**	**831**	**698**			**612**	**679**	**9,138**

- See description of unthinned areas (skips) on page 44.

Alternative 2

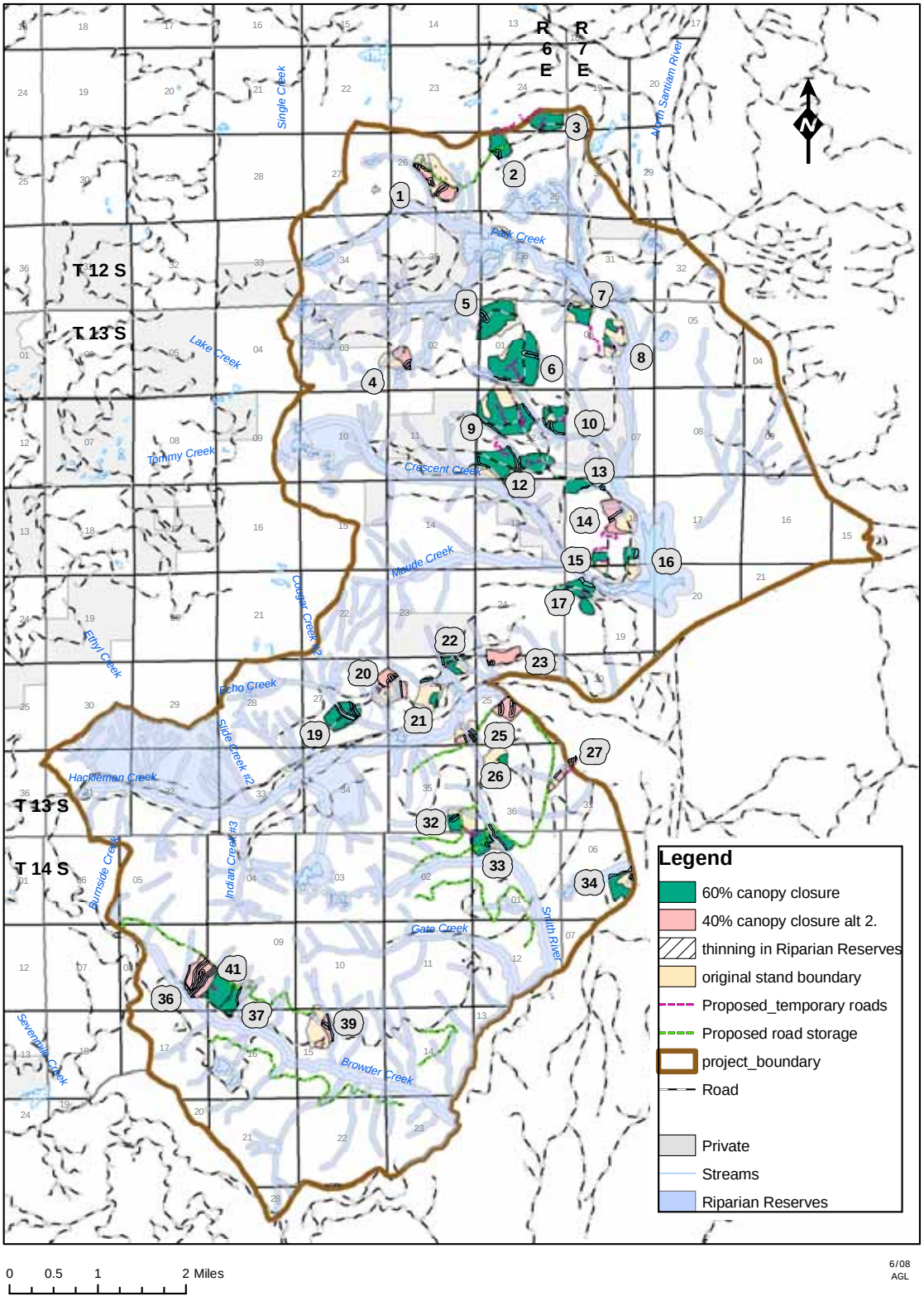


Figure 10: Alternative 2 Map

Alternative 3

This alternative also addresses all of the basic project objectives but focuses on different elements of the purpose and need than the previous alternatives. The focus of this alternative is on accelerating development of late-successional stand characteristics in critical habitat for the northern spotted owl and increasing the time between harvest entries to minimize the frequency of disturbance to the owls. The goal for the remainder of the stands is to enhance growth while also meeting other project objectives.

To achieve goals, about 1291 acres of 30-60 year-old, managed stands would be commercially thinned and various measures would be taken to encourage species diversity and improve stand complexity. These measures are described in the section entitled “Elements Common to Both Action Alternatives” that follows the description of this alternative.

The design of this alternative, similarly to Alternative 2, entails varying the intensity of thinning across the landscape. The same 1291 acres of 30-60 year old, managed stands would be commercially thinned as in Alternative 2, but the thinning densities in individual harvest units vary between alternatives.

About 467 acres would be thinned to an average 40% canopy closure, leaving approximately 60-80 trees per acre. These stands are in the Critical Habitat Unit (CHU) for the northern spotted owl. The idea of this thinning intensity in critical habitat is to maximize individual tree diameter growth and understory development as well as to increase the time period between successive harvest entries minimizing the frequency of disturbance to owls. The reasoning is that it would take longer for tree canopies to grow back together and trees to begin competing with each other for growing space in a more widely spaced thin than it would if trees were more closely spaced. A second commercial entry is not anticipated for most of these stands. The stocking levels would be reduced down to a level that allows most stands to be free to grow and maximize diameter growth for the next 30 to 50 years and to develop late-successional characteristics.

The desired result is to accelerate development of late-successional stand characteristics in the CHU including: a multi-layered, multi-species canopy with large overstory trees (>30 in. DBH); large accumulations of fallen trees and other debris; sufficient open space below the canopy for owls to fly; and over time, moderate to high canopy closure (60 to 80 percent closure) (Thomas, et al. 1990).

Thinning in Riparian Reserves would only occur in the outer portions of the reserves and no-harvest buffers would be identical to those described in Alternative 2. The thinning intensity would be the same as prescribed for the upland portion of the stand.

The remainder of the stands, about 824 acres, would be thinned to about 60% canopy closure (approx. 90-110 trees per acre). These thins are aimed at maximizing stand growth providing future commercial thinning opportunities. Unlike Alternative 2, young stands adjacent to late-seral patches would be thinned to an average 60% canopy closure and may require a shorter time period between successive entries to achieve desired stand characteristics. These stands could potentially have a second commercial entry in about 20 to 30 years. The stocking levels would be

reduced down to a level that allows the stands to be free to grow and maximize diameter growth for 20 to 30 years and begin to develop late-successional characteristics.

This alternative would contribute about 9.3 MMBF of commercial timber to the district's harvest target. Table 6 below summarizes information for individual harvest units in this alternative followed by a map of the alternative. For a more complete description, see also the Integrated Prescriptions in Appendix A which provides more details of activities prescribed for each harvest unit along with individual unit maps. In addition, refer to the section entitled "Elements Common to Both Action Alternatives" and table 10 outlining Design Criteria. Common to all Alternatives.

Table 6: Alternative 3 Unit Summary

Unit #	Planned Thinning Acres	Acres in Riparian Reserves	Acres in CHU	Acres in AOC	Target Canopy Closure %	Acres Unthinned within Original Stand Boundaries (skips) *	Acres of Ground-based Yarding	Acres of Skyline Yarding	Volume (MBF)
1	36	11	36	0	40	61	0	36	245
2	37	4	34	0	40	5	5	32	403
3	48	0	48	0	40	10	48	0	312
4	21	3	21	21	40	25	17	4	124
5	81	5	81	81	60	23	20	61	365
6	143	1	143	143	60	23	85	58	1087
7	23	1	23	23	60	31	19	4	205
8	15	0.2	15	15	40	50	14	1	126
9	115	6	115	115	60	0	94	21	610
10	40	6	40	40	40	10	20	20	268
12	114	9	114	114	40	20	40	74	798
13	29	2	29	29	40	12	29	0	244
14	35	4	34	34	40	37	33	2	301
15	14	0	14	14	40	11	13	1	92
16	17	3	17	17	40	19	17	0	177
17	61	5	61	52	40	5	43	18	580
19	52	11	0	0	60	1	0	52	494
20	26	7	0	0	60	40	7	19	130
21	10	2	0	0	60	42	10	0	54
22	17	2	0	0	60	5	17	0	85
23	35	2	6	0	60	6	0	35	158
24	11	4	0	0	60	23	0	11	90

Unit #	Planned Thinning Acres	Acres in Riparian Reserves	Acres in CHU	Acres in AOC	Target Canopy Closure %	Acres Unthinned within Original Stand Boundaries (skips) *	Acres of Ground-based Yarding	Acres of Skyline Yarding	Volume (MBF)
25	32	15	0	0	60	2	22	10	262
26	8	0	0	0	60	32	0	8	36
27	12	4	0	0	60	9	12	0	84
32	16	3	0	0	60	36	16	0	147
33	52	7	0	0	60	14	0	52	468
34	31	5	0	0	60	18	31	0	279
36	66	30	0	0	60	9	0	66	561
37	25	2	0	0	60	22	0	25	263
39	18	6	0	0	60	66.3	0	18	130
41	51	0.1	0	0	60	0	0	51	377
Totals	**1291**	**160**	**831**	**698**			**612**	**679**	**9,308**

*see description of unthinned areas (skips) on page 44.

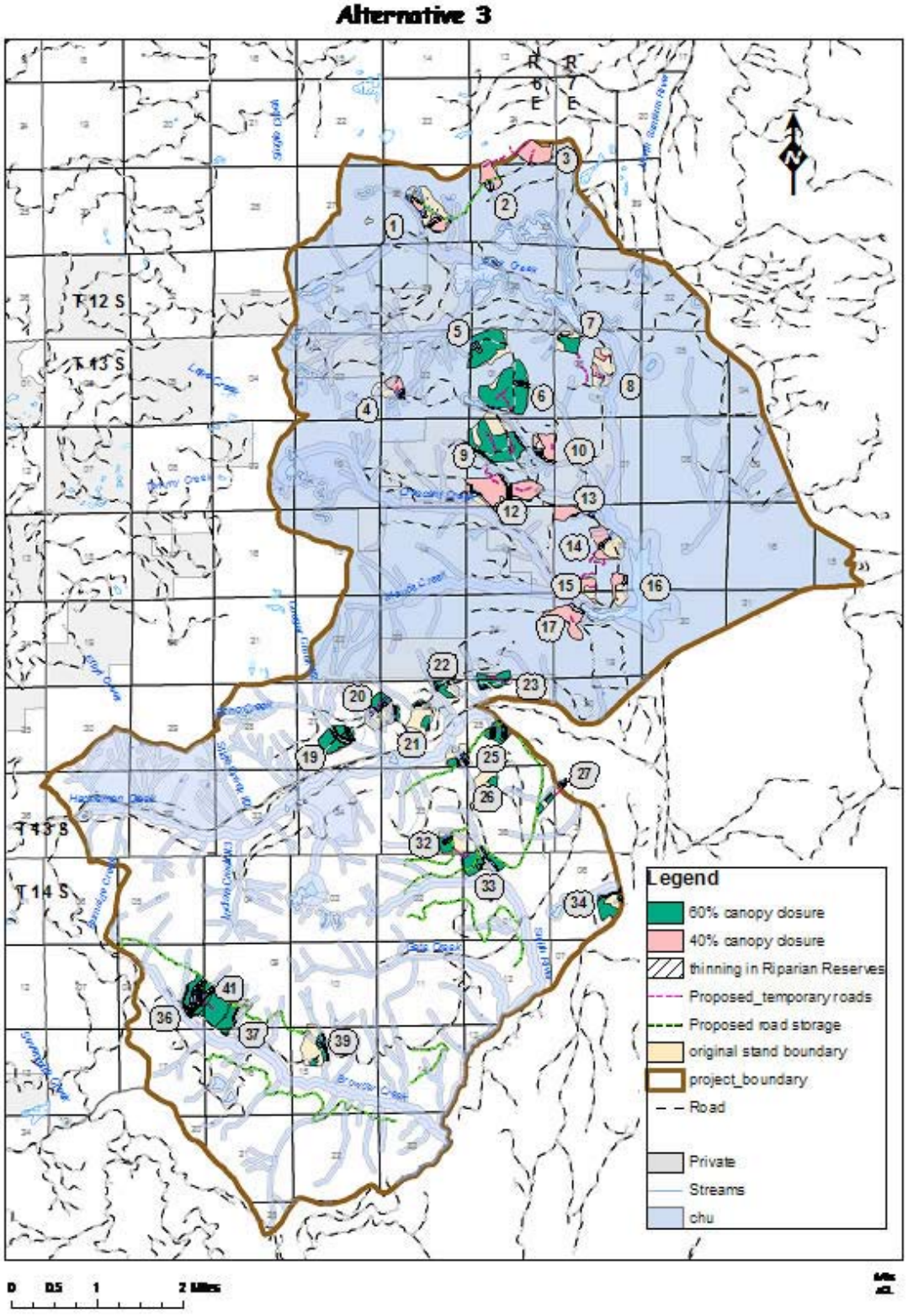


Figure 11: Alternative 3

Elements Common to Both Action Alternatives

Thinning - A total of 32 young, overstocked, managed stands would be commercially thinned to reduce competition for nutrients, sunlight and growing space and to provide wood products to the local community. With less competition for these essential resources, the aim is to enhance tree growth and vigor, resulting in healthier trees, which are better able to cope with insects and diseases than stands experiencing a lot of competition from other trees.

In both action alternatives some stands, although not necessarily the same stands, are thinned to an average 40% canopy closure. This thinning intensity would result in wider spacing of leave trees than stands thinned to an average 60% canopy closure. In the units with more-widely spaced leave trees, it is unlikely that a second commercial thinning entry would be needed to attain desired stand characteristics. On the other hand, in units thinned to an average 60% canopy closure, a second commercial thinning entry would likely be anticipated in about 20 to 30 years.

Retention of Unthinned Areas (skips)- Unthinned areas would be retained in portions of the original stand boundaries being considered for thinning with this project. There were about 1979 total acres within the original stand boundaries and about 688 acres (or about a third of the area) would be retained as unthinned areas (skips). The remaining 1291 acres would be thinned. These retention areas (skips) may include, but are not limited to, buffers to protect sensitive plant species, stream shade buffers, portions of stands that do not require thinning at this time, natural openings, and special habitat protection buffers (see individual unit maps in Appendix A).

Retention of noble fir - Noble fir which is greater than seven inches in diameter at breast height (DBH) would be left in Units 5, 6, 7 and 9 to protect sites of *Bridgeoporus nobilissimus*, a sensitive species. This fungus grows on large specimens of noble fir. These units are prescribed for thinning to an average 60% canopy closure in order to maintain the microclimate for this species.

Retention of Minor Conifer Species and Hardwoods- Thinning prescriptions are designed to promote diverse, native species composition including all hardwoods and other minor conifer species. Many of these managed stands are predominantly Douglas-fir and noble fir. Minor conifer species such as western redcedar, incense cedar, Engelmann spruce, western white pine and lodgepole pine would be retained in harvest units.

The one exception is grand fir in Unit 17, which is the preferred species to cut in order to reduce annosus root disease, which is present in this unit and which grand fir is very susceptible to.

Converting off-site ponderosa pine in three managed stands- All merchantable ponderosa pine greater than seven inches in diameter would be removed in Units 8, 10, 14, and 15. Any gaps greater than ¼ acre created in the units as a result of ponderosa pine removal, would be planted with rust-resistant western white pine at a density of 200 trees per acre to help restore this species within its native range.

Snags and Down Wood- All existing snags and coarse woody material would be protected to the greatest extent possible from disturbance during harvest operations. Remnant stand structure

such as large, live trees, snags, and down wood would be retained, except within road rights-of-way, yarding corridors or for safety reasons.

Both action alternatives would leave at a minimum, 5 wildlife trees per acre (2 snags & 3 down wood pieces) in addition to the trees prescribed to be left in the silvicultural prescription.

Roads- About 45 miles of road would be used for log haul, which includes about 20 miles in share-cost agreement areas. These roads would require various maintenance and reconstruction including: about 40 miles of roadside brushing, three miles of ditch reconditioning, 530 cubic yards of spot surface aggregate, cleaning of five culverts, five culvert replacements and placement of 1540 cubic yards of rock at a cost of about $100,000.

Other road work includes reconstruction of about 3.8 miles of spur roads that were used during the first harvest entry. In addition, about 1.1 miles of new temporary spur roads would be constructed to access harvest units. Table 7 following the haul route map describes these roads and includes information about: slope position, length, whether spur/temp. roads are existing or new, approximately how many acres they access, road length within Riparian Reserves and number of stream crossings. These roads are necessary to get logging equipment to the sites to implement the proposed silvicultural treatments. Following this harvest entry, these spur roads would be closed by blocking them with berms, ripping them and seeding them with native seed. These spur roads access approximately 531 acres of stands proposed for thinning.

Road or landing aggregate, either crushed or pit run, that might be required for this project is available from the following rock sources: North Parks, Little Nash, Latiwi or Boundary (see following map for locations). Minor clearing of less than one acre for any individual rock source may be associated with the development of any of these rock sources. Clearing may include trees in existing plantations or brush.

The following map shows harvest units, haul routes, and potential rock sources for road work. It also identifies roads proposed for decommissioning/storm-proofing or other storage.

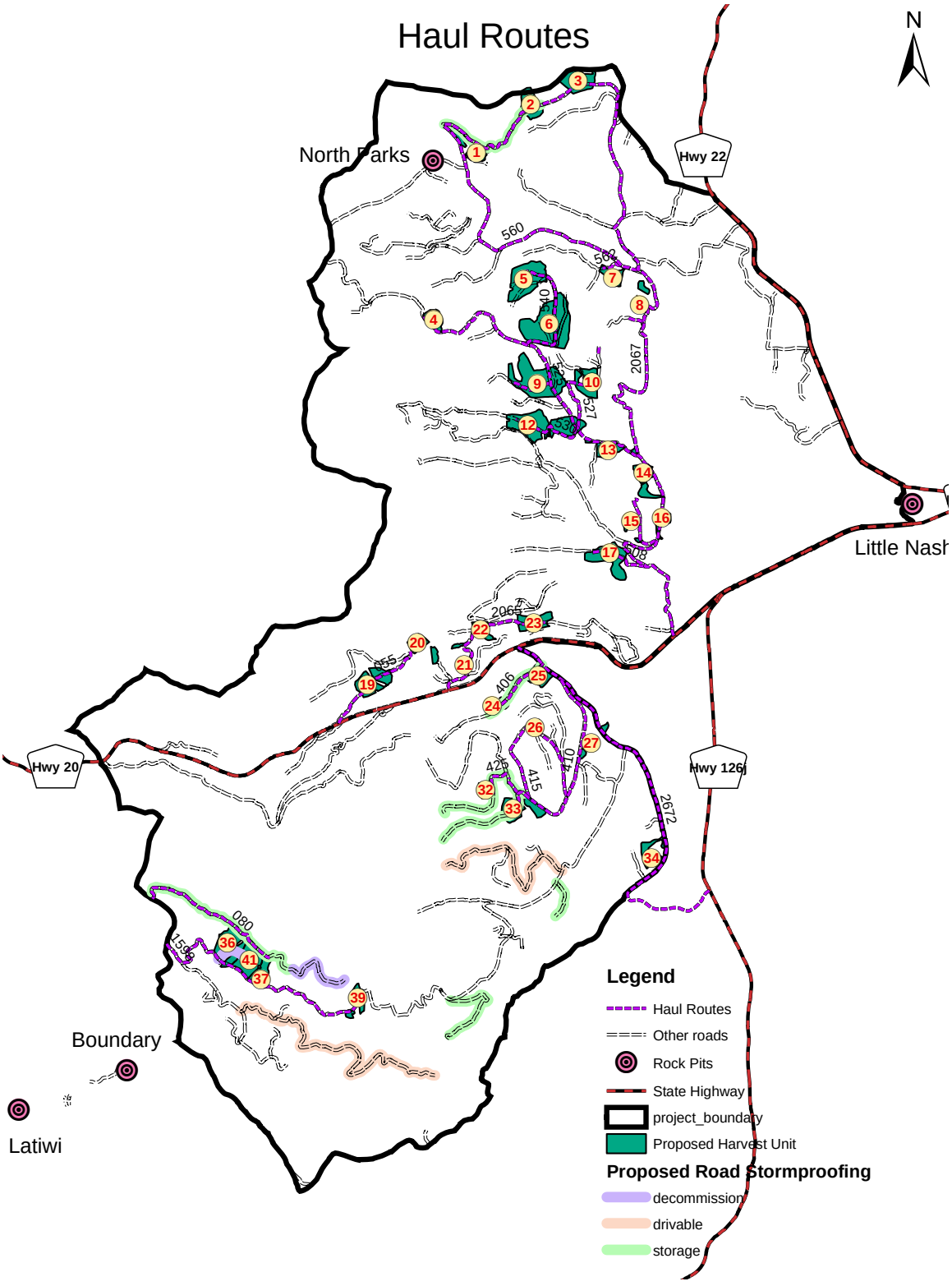


Figure 12: Haul Routes, rock sources and proposed road decommissiong/stormproofing and storage

Table 7: Temporary and Non-system Road Information

Unit	Slope Position of Temporary Road	Total Length of Temporary Road	Of the total length of road to be constructed:		Estimated Acres of Thinning Accessed by temporary road	Road Distance in Riparian Reserve	Stream Crossings Required
			Feet of existing non-system spur road	Feet of new temporary road			
2	Ridgetop	1520	1520	0	23	0	0
3	Ridgetop Midslope	1869 1159	1869 1159	0 0	38	0	0
4	N/A	600	600	0	12	0	0
6	Midslope Midslope	530 450	530 450	0	50 50	0 0	0 0
7	Flat	2300	2300	0	15	0	0
8	Flat Flat	510 645	510 645	0 0	7 8	0 0	0 0
9	Midslope	1545	0	1545	70	0	0
10	Ridgetop	405	405	0	15	0	0
12	Midslope Ridgetop	1120 1800	1120 900	0 900	35 35	0 0	0 0
14	Flat Flat	750 1000	750 1000	0 0	5 6	0 0	0 0
15	Flat Flat	970 440	970 440	0 0	5 5	0 0	0 0
17	Flat	580	580	0	12	0	0
20	Midslope	1020	Do not use existing road	1020	26	300 ft.	1 (class IV)
22	Flat	260	260	0	12	130 ft.	0
23	Midslope	1290	0	1290	24	0	0
25	Midslope	1300	1300	0	12	0	0
27	Flat	625	0	625	4	0	0
33	Ridgetop	1350	625	625	20	0	0
36	Midslope	2080	2080	0	22	1000 ft.	3 (class IV)
41	Midslope	Same as Unit 36	Same as Unit 36	0	20	Same as Unit 36	Same as Unit 36
Totals		**4.9 mi.**	**20,000 ft. 3.8 mi.**	**6,000 ft. 1.1 mi.**	**531 ac.**	**1430 ft. 0.3 mi.**	**4**

Yarding: Careful consideration was given to appropriate logging systems to accomplish project objectives. Depending on topography, soil conditions, accessibility, suspension requirements to meet ecological needs and cost-benefit ratio, a combination of skyline (679 acres), and ground-based systems (612 acres) were selected to harvest these units. Log suspension requirements are outlined in the Integrated Prescriptions in Appendix A.

There are three ground-based yarding stream crossings on intermittent streams and one skyline corridor stream crossing. Locations of these stream crossings would be designated, as per Best Management Practices and would occur perpendicular to stream channels. In addition, bump logs would be used to reduce riparian disturbance at ground crossings. Logs would be fully suspended across stream channels in skyline corridors. In addition, trees felled for yarding corridors within Riparian Reserves would be left in place to contribute to down woody material (Refer to Appendix A Unit Prescriptions for specific locations).

A total of about 142 landings would be utilized to harvest these units. Of these landings, 107 are on existing roads and ten of these are on roads within Riparian Reserves. The remaining 36 landings would be located on temporary roads and would have to be constructed. Landings located in Riparian Reserves are outside of the primary shade zones.

Slash Treatment- Slash would be treated in high-risk areas to minimize fire starts which could potentially jeopardize the functioning of the habitat conditions that are being developed through this project. Slash treatments include: 240 acres of yarding tops, 35 acres of roadside grapple piling (or equivalent system that accomplishes fuel treatment objectives) along the more heavily traveled roads, grapple piling (or equivalent system) on 242 acres that are proposed to be logged with ground-based yarding systems, and burning 142 landings and numerous grapple piles (see table 8 below). ***Note***: Opportunities would be made available for the public to utilize logging slash for firewood and potentially for alternative biomass utilization if a market exists for the wood fiber. These fuel utilization opportunities would reduce the amount of fuel to be burned. See Integrated Prescriptions in Appendix A or fuels report in Project Record for fuel treatments prescribed for individual harvest units.

Table 8: Proposed slash treatments

New Unit Number	Acres of Ground-based Yarding	Grapple Pile Acres	Roadside Grapple Pile Acres	Acres of Skyline Yarding	Yard Top Acres	Number of Landings to Burn
1	0		1	36		4
2	5			32		4
3	48			0		6
4	17		1	4		5
5	20	20		61	61	6
6	85		7	58		9
7	19			4		4
8	14	14		1		3
9	94	94	1	21		7
10	20	20	1	20		4
12	40		4	74		10
13	29		2	0		4
14	33		1	2		5
15	13			1		4
16	17	17		0		2
17	43	43	2	18		5
19	0		3	52		4
20	7	7		19	19	3
21	10	10		0		3
22	17	17		0		2
23	0		3	35		5
24	0		1	11		3
25	22		3	10		4
26	0			8		1
27	12		0.5	0		3
32	16			0		2
33	52		3	52		9
34	31		1	0		4
36	0			66	66	5
37	0			25	25	4
39	0			18	18	4
41	0			51	51	4
Totals	**612**	**242**	**35**	**679**	**240**	**142**

Other Design Elements of the action Alternatives would be implemented to meet Forest Plan standards and guidelines, laws, regulations and policies. These include seasonal harvest restrictions when activities would be detrimental to a species' reproductive success; treating activity-generated fuels to acceptable levels in high risk areas; buffering sensitive species and habitats from disturbance during harvest operations; decommissioning temporary roads; implementing soil protection measures during harvest operations as well as subsoiling to reduce past soil compaction in selected areas after harvest operations are complete; and implementing provisions to minimize the spread of invasive weeds such as pre-treating weeds along haul routes (See table outlining these project "Design Elements Common to All Alternatives).

Mitigation Measures include subsoiling one acre of Unit 27 to reduce existing soil compaction within forest plan standards and guidelines.

Post Sale Activities (non-mitigation) - As funding is available, post-sale opportunities listed on the bottom of table 9 below would be implemented in priority order. Both design criteria/mitigation and post-sale opportunities are described in more detail in Appendix B.

Table 9: Mitigation, Design Criteria and Post-Sale Opportunities

Priority	Type of Project	Covered in this EA
Mitigation		
1	Subsoiling and seeding to be within Forest Plan S and G's in 1 acre of Unit 27.	Yes
Other Post Sale Activities – non-mitigation		
2	Fisheries project to thin (and leave material) to improve size of future DWD in part of secondary shade zone not otherwise being treated. (units 1 14, 17, 24, 36)	No
3	Road sotrage, stormproofing and decommissioning	Yes
4	Snag and down wood creation	Yes
5	Trailhead reconstruction near Unit 1, road signs and gate	No
6	Plant gaps in stands where removal of Ponderosa pine resulted in openings larger than ¼ acre in size (Units 8, 10, 14 and 15)	Yes
7	Medium priority subsoiling units	Yes
8	Pre-commercial thinning that is also high priority for fuels (stands 014, 015, 313, 085)	No
9	Monitoring of Bridgeporus nobilissimus	Yes
10	Dispersed Recreation site rehab and development (unit 2, 7/8, 16, 17, 19/20, 22/23, 25, 27 and 34)	No
11	Pre-commercial thinning (rest of proposed stands – see post-sale activities in Appendix B)	No
12	Lower priority subsoiling units	Yes
13	Firewood	Yes
14	TSI fertilization	No

Design Elements Common to All Action Alternatives

The following have been built into the alternative design to ensure compliance with Forest Plan standards and guidelines, laws, regulations and other policies. They apply to any of the action alternatives, unless another specifically identified criterion is listed below or in the individual unit prescriptions in Appendix A.

Table 10: Design Elements Common to All Action Alternatives

<table>
<tr><th>Unit #</th><th>Objective</th><th>Design Element</th><th>Restriction Dates</th></tr>
<tr><td colspan="4">Wildlife</td></tr>
<tr><td>All units</td><td>Protect existing biological legacies</td><td>Existing biological legacies such as large live trees, snags and down logs would be protected to the greatest extent possible during harvest operations, except within road rights-of-way, yarding corridors or for safety reasons. If snags or large legacy trees need to be felled, they would be retained in the unit.</td><td>N/A</td></tr>
<tr><td>All units</td><td>Ensure adequate snag/down wood habitat</td><td>Leave 5 trees per acres for snags and down wood creation in addition to thinning leave trees</td><td>N/A</td></tr>
<tr><td>1, 17, 39</td><td>Protect threatened species during critical nesting period</td><td>“Except for hauling and the removal of hazard trees to protect public safety, No activities will take place within the disruption distance of a known owl site or predicted nest patch during March 1 – July 15 (critical nesting period for northern spotted owls), unless the habitat is known to be unoccupied or there is no nesting activity, as determined by survey to protocol. The distance and timing may be modified by the district wildlife biologist according to site-specific information” (USDI, 2008)</td><td>No activities 3/ 1 – 7/15</td></tr>
<tr><td>All units</td><td>Protect threatened species during nesting season</td><td>The following table lists minimum disturbance and disruption distances of activities affecting northern spotted owls during breeding season.
<table>
<tr><th rowspan="2">Source of Disturbance/ Disruption</th><th>Disturbance Dist.</th><th colspan="2">Disruption Distance</th></tr>
<tr><th>March 1 – Sept. 30</th><th>March 1 – July 15</th><th>July 16 – Sept. 30</th></tr>
<tr><td>Blasting</td><td>1760 yds – 1 mile</td><td>1760 yds – 1 mile</td><td>440 yds -0.25 mile</td></tr>
<tr><td>Burning</td><td>440 yds -0.25 mile</td><td>440 yds -0.25 mile</td><td>0 yds</td></tr>
<tr><td>Chainsaw Use</td><td>440 yds -0.25 mile</td><td>265 yds</td><td>0 yds</td></tr>
<tr><td>Hauling on Open Roads</td><td>0 yds</td><td>0 yds</td><td>0 yds</td></tr>
</table></td><td>See table</td></tr>
</table>

Table 10: Design Elements Common to All Action Alternatives

<table>
<tr><th>Unit #</th><th>Objective</th><th>Design Element</th><th>Restriction Dates</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th rowspan="2">Source of Disturbance/ Disruption</th><th>Disturbance Dist.</th><th colspan="2">Disruption Distance</th></tr>
<tr><th>March 1 – Sept. 30</th><th>March 1 – July 15</th><th>July 16 – Sept. 30</th></tr>
<tr><td>Heavy Equipment</td><td>440 yds -0.25 mile</td><td>235 yds</td><td>0 yds</td></tr>
<tr><td>Helicopter – Type 1*</td><td>880 yds - 0.5 mile</td><td>440 yds -0.25 mile</td><td>440 yds -0.25 mile</td></tr>
<tr><td>Helicopter - Other</td><td>440 yds -0.25 mile</td><td>220 yds</td><td>0 yds</td></tr>
<tr><td>Rock Crushing</td><td>440 yds -0.25 mile</td><td>380 yds</td><td>0 yds</td></tr>
<tr><td colspan="4">* - Type 1 helicopters seat 16 people and have min. capacity of 5,000 lbs.</td></tr>
</table>
</td><td></td></tr>
<tr><td colspan="4">Vegetation</td></tr>
<tr><td>All units</td><td>Protect residual trees from logging damage</td><td>Logging operations (falling and yarding) are restricted to the time period outside of sap flow (approximately April 1 to June 15) to minimize damage to residual trees.</td><td>No falling or yarding
4/1 to 6/15</td></tr>
<tr><td colspan="4">Logging Systems</td></tr>
<tr><td>All units</td><td>Minimize damage to soil resource and residual trees</td><td>• Ground-based yarding systems – Require pre-designated skid roads and subsoil skid roads as needed following logging.
• Skyline systems – require parallel corridors whenever possible, fall trees to the lead, avoid downhill yarding.</td><td></td></tr>
<tr><td colspan="4">Sensitive, Rare and Uncommon Botanical Species</td></tr>
<tr><td>1, 6, 27 and 39</td><td>Protect sensitive and rare and uncommon species</td><td>Known sites would be protected from physical disturbance by prescribed no-harvest protection buffers of 50 to 300 feet (see Integrated Prescriptions for individual unit protection buffers in Appendix A)</td><td></td></tr>
<tr><td colspan="4">Invasive Plants</td></tr>
<tr><td>All units</td><td>Minimize spread of invasive plants</td><td>• Pre-treat existing weed sites along haul routes and within proposed harvest units prior to sale activities
• Survey and control invasive weeds where possible on all harvest units and adjacent roads/haul routes (pre- and post-sale)
• All road construction and logging equipment would be pressure washed prior to working in the area.
• Obtain gravel for road construction and reconstruction from a weed-free rock source.</td><td></td></tr>
</table>

Table 10: Design Elements Common to All Action Alternatives

Unit #	Objective	Design Element	Restriction Dates
		• Minimize areas of soil disturbance during all harvest activities including spur road construction and re-opening, road reconstruction, fuels treatment, etc. Seed all disturbed areas with native species, including landings and subsoiled skid roads to reduce weed establishment. • Berm, gate, or rip and seed any new roads and re-opened roads to reduce disturbance and incoming seed due to vehicular traffic.	
3 and 41	Minimize spread of invasive plants	Buffer by 50 feet the yellow toadflax in Units 3 and 41 to prevent weed seed from being transported throughout the harvested area.	
Special Habitats			
All units	Protect special habitats from disturbance during harvest activities	• General protection measures include: • Directional falling away from special habitats • Avoiding placement of equipment, landings, skyline corridors, and designated skid roads through special habitats • Seeps and small wetlands would have a 50 foot no-harvest buffer.	
Fisheries			
All units	Protect fish and other aquatic species and their habitat	• Comply with Oregon Department of Fish and Wildlife seasonal restrictions for in-stream work activities for any project activity that must occur within fish-bearing and other perennial streams. • Include Best Management Practices in project design, as necessary, to control off-site movement of sediment. This may include placement of sediment barriers, provision of flow bypass, and other applicable measures.	July 1 – August 15
Hydrology/Stream Channels/Water Quality/Riparian Reserves			
All units	Maintain natural filtration of surface, overland flow, through post sale activities.	Establish appropriate riparian management units and establish fire lines to ensure maintenance of established buffers, filter strips (BMP T-7; T-8; F-2; F-3).	
	Maintain or improve channel bank stability.	Establish riparian management units that include channel bank areas and or establish marking prescriptions that prevent any tree attributing to bank stability from being marked (BMP T-2; T-6; T-7; T-8).	

Table 10: Design Elements Common to All Action Alternatives

Unit #	Objective	Design Element	Restriction Dates
All units with streams	Minimize sediment delivery to streams and reduce potential for temperature increases.	• Retain no-harvest riparian buffers of at least 60 feet on perennial streams and intermittent streams with riparian plant communities. • On all other intermittent streams retain trees within 25 feet of the stream or trees contributing to channel bank stability (see Appendix A for exact distances on individual units). All buffers are measured from the trees nearest the stream rather than the waters edge. • Haul on native surface roads would generally occur during the time of year when weather and soil moisture conditions do not result in road surface damage that can lead to sediment washing from damaged road surfaces into stream channels. This time period is usually during the normal operating season established for the timber sale (BMP R-20). • To minimize impact from skyline corridors across streams and riparian areas, trees would be directionally felled into stream channels, where possible. If trees cannot be felled into stream channels, fell them away from riparian vegetation to minimize damage. These trees would be left on site. • Ground-based harvest operations would be restricted in Riparian Reserves when ground and weather conditions result in excessive erosion and sedimentation. • Utilize Best Management Practices (BMP's) which can be found in "General Water Quality Best Management Practices" Pacific Northwest Region, Nov., 1988.	Haul on native-surfacr roads during Normal operating season
	Continue recovery of downstream riparian, channel and water quality conditions	Design units to insure channel bank stability, and provide adequate buffers to reduce sediment inputs and minimize peak flow effects (BMP T-2; T-7; T-8; T-12). Place unit boundaries to avoid compromising stability of the channel banks.	
	Maintain or improve water quality for domestic and fisheries users	Designate riparian management units and specific prescriptions for each individual unit adjacent to stream courses requiring protection (BMP; T-7).	
All Units	Control the amount of sediment leaving the road system.	Utilize appropriate provisions within the contract to ensure that winter haul occurs on roads with adequate surface rock and that erosion control techniques such as mulching of bare soils associated with the road system occur and season of haul permissible for water quality reasons.	

Table 10: Design Elements Common to All Action Alternatives

Unit #	Objective	Design Element	Restriction Dates
Soils and Yarding Suspension			
All units	Protect soil resource	• Ground-based equipment should generally operate in the dry season, usually considered from May through October, unless otherwise restricted by other resource concerns or waived by Forest Service personnel. • Where operable, harvested trees should be topped and limbed in the units in order to provide small limbs and needles for nutrient recycling. This objective has to be tempered with the need to reduce fuel loading to control potential wild fires, and to meet site specific standards for slash loadings. • Ground -based equipment are usually limited to side slopes less than 30%, unless otherwise directed by Forest Service personnel, in order to reduce soil disturbance. • Ground-based skidding equipment shall stay on designated skid trails. Ground-based skid trails would be predesignated and preapproved before use (B6.422). Existing skid roads should always be used before new skid road locations are approved. They should not usually exceed 15 feet in width, and the objective is to maintain a 10 to 12 foot width throughout the length. Where practical, the skidder, cat, shovel or forwarder should travel on slash. Traveling on slash has been shown to reduce off site soil erosion or lessen soil compaction. Skid roads would generally be 100 to 200 feet apart with conventional line pulling operations, and 40 to 60 feet apart with processor / forwarder operations (see Appendix A for individual unit requirements). • Partial or one end suspension is required on skyline units, except at tail trees and landings. Given the gentle to moderate slope of the terrain, small areas of ground lead may occur in some areas, and this is acceptable (see Appendix A for individual unit requirements). • The reopening of temporary, unclassified roads should usually occur in the dry season, generally considered May through October to avoid surface erosion from exposed soil (unless directed otherwise by Forest Service personnel). Open roads should be storm proofed if they have to set through extended periods of wet weather.	Operate ground-based equip. May – Oct.
All units		• 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. • Unclassified or temporary roads used outside the standard operating season, should generally be rocked, snow covered, or frozen to reduce the potential for erosion, unless other mitigating or extenuating circumstances are present. • Cable corridors spacing should be set to both minimize damage to standing timber, as well as the under lying vegetation and soil. • Trees, not designated for harvest in riparian buffers that need to be cut to facilitate harvest	

Table 10: Design Elements Common to All Action Alternatives

Unit #	Objective	Design Element	Restriction Dates
		operations, should be dropped into the stream if possible to aid in woody debris recruitment. • Avoid disturbance to the existing large down woody debris concentrations created by the initial entry as much as practical. • At the completion of harvest activities, spur roads, tractor skid roads or forwarder roads should be water barred and scarified, as is necessary. Where possible, skid roads and landings should be subsoiled in order to reduce compaction and return the site to near original productivity. Subsoiling needs to be considered in light of the potential for root pruning, damage to existing regeneration, and the increased amount of soil disturbance. • Ground-based equipment would operate on top of slash to the extent possible to minimize soil compaction.	
Fire/Fuels/Air Quality			
All units	Protect soil resource, residual trees and air quality	• In order to protect air quality, the Oregon Smoke Management instructions would be strictly adhered to. The Santiam River Zone fire and fuels fire management strategy for prescribed burning is to avoid large, uncontrolled releases of smoke that are produced during large wildfires. • Tops and limbs removed from units to landing areas, would be made into piles at those locations. Removal of tops and limbs could generate 2-3 tons of slash per acre logged. For this reason, landings for those units would be planned to accommodate the potential for large volumes of slash. • Machine piles may be created at any landing area and along any roads adjacent to units within the project area. Machine piles should be piled in haystack fashion, meaning that the heights of the piles are approximately equal to their width. Machine piles would be burned during the fall/winter. • Care should be taken to make piles so as to minimize damage to standing trees during the burning phase. • Slash piles would be covered and dry when burned to reduce the amount of smoke produced. • Grapple and landing piles would be burned during fall and winter months according to limitations established by Oregon Smoke Management System forecaster	
Transportation			
All units with temp rds.	Protect soil and water resources	Any previously utilized spur roads re-opened to access harvest units and all new temporary spur roads constructed would be closed, water barred and seeded with native seeds following activities.	

Table 10: Design Elements Common to All Action Alternatives

Unit #	Objective	Design Element	Restriction Dates
All units	Safety	Danger trees along haul routes would be identified, assessed, and treated according to the Forest Service Pacific Northwest Region (Region 6) policy as detailed in FSM 7733, R6/PNW Supplement Number 7730-2005-1, December 12, 2005."	
Haul routes		Haul activities outside of the normal operating season would require additional work to preserve the desired maintenance objectives.	
Recreation/Public Safety			
All units	Prevent damage to recreation resources	Physical damage to trailheads should be corrected through contract clauses that require site cleanup, revegetation of newly disturbed slopes around trailheads, grading of trailhead surfaces damaged by logging equipment, and the placement of additional gravel where needed. Increased impacts on the Pyramids trail can be avoided by denying the purchaser the ability to haul through the trailhead. Temporary roads should also be closed to motorized traffic to prevent these roads from becoming a sustained opening over time. Avoid timber sale operations during key holiday weekends and the opening weekends of deer and elk rifle hunting seasons. Minimize the number of local roads that need to be closed to the public for safety reasons at any one time. Require the contractor to apply dust abatement measures on forest road 2067, 2067-560, 2067-525, and 2672 when hauling on summer and fall weekends. Require the contractor to clean up any existing dispersed camp sites that become damaged by logging operations. Site cleanup may be specified in the timber sale contract or as a post-sale project.	No operations during Holiday weekends and opening of hunting season
Heritage			
All units	Heritage resource protection	• All National Register of Historic Places (NRHP) eligible sites and potentially eligible sites must be avoided during project activities. • Specific avoidance measures have been developed to ensure protection of known sites within the project area. Consult District archaeologist if there are any changes in unit design and/or roading which could lead to ground disturbance. • Changes to the current unit configurations and/or the addition of any new units, would require consultation with the District Archaeologist in order to protect known and unknown heritage resources.	

Table 10: Design Elements Common to All Action Alternatives

Unit #	Objective	Design Element	Restriction Dates
		• Project activities planned outside of the area defined in the heritage resource inventory schema must be coordinated with the District Archaeologist prior to initiation. This includes the establishment of harvest landings, helicopter landings, guy-line equipment anchors, equipment staging areas, rock storage areas, slash burning and silvicultural treatments. • Prior to cultivating/ripping skid roads post harvest, a re-entry survey must be conducted in those areas deemed high probability for the occurrence of heritage resources. Coordination with the district archaeologist is essential to ensure the protection of heritage resources. • In order to extend protection to heritage resources which have not yet been discovered, but which may be uncovered during the course of project activities, contract clause C6.24 or a similar clause must be included in all project prospecti and contracts. The contract clause outlines the procedures to follow in the event heritage resources are inadvertently discovered or disturbed during project activities. If cultural material is inadvertently discovered, suspend operations and consult the District Archaeologist to allow for development of the proper course of action. • Include contract clauses BT6,24 and CT6.24 for site specific special protection measures that are needed to protect known areas identified on the Sale Area map	

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in tables 11, 12 and 13 are focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 11: General Differences between Alternatives

Project Element	Unit of Measure	Alternative One	Alternative Two	Alternative Three
Thinning Within Entire Project Area				
Thin to 40% canopy closure	Acres	0	292	467
Thin to 60% canopy closure	Acres	0	999	824
Totals	**Acres**	**0**	**1291**	**1291**
Portion of Thinned Areas That Lie Within Riparian Reserve Management Allocation				
Thin to 40% canopy closure	Acres	0	79	47
Thin to 60% canopy closure	Acres	0	79	109
Totals	**Acres**	**0**	**156**	**156**
Estimated Timber Volume				
Commercial Timber Volume	MMBF	0	9.1	9.3

Table 12: Common Project Elements between Action Alternatives

Project Element	Unit of Measure	Alternative Two	Alternative Three
Timber Harvest			
Commercial Thinning of Managed Stands	Acres	1291	1291
	Number of harvest units	32	32
Portion of Commercial Thinning within Riparian Reserve Management Allocations	Acres	156	156
Class IV stream protection measures – no summer flow and riparian plant communities are absent	No-harvest buffer width	25 ft.	25 ft.
Class IV stream no-harvest buffers when summer flow is present or riparian plant communities are present	No-harvest buffer width	60 ft.	60 ft.
Class III stream protection measures when no fish are present	No-harvest buffer width	60 ft.	60 ft.
Class II stream protection measures when fish are present	No-harvest buffer width	100 -125 ft.	100 – 125 ft.

Table 12: Common Project Elements between Action Alternatives

Project Element	Unit of Measure	Alternative Two	Alternative Three
Logging Systems			
Ground-based yarding to pre-designated skid roads (acceptable areas identified by district geologist and generally were prescribed on slopes < 30%) (BMP T-9)	Acres	612	612
Skyline yarding with one-end suspension (generally prescribed on slopes >30%)	Acres	679	679
Yarding across streams	Number of Crossings	3	3
Roads and Access			
Haul Road Maintenance/Reconstruction	Miles	45	45
Proposed Road Drivable Stormproofing, Decommissioning or Storage	Miles	14.4	14.4
Temp. Road Construction (new) (* see map for locations)	Miles	1.1	1.1
Spur Road Reopening (*see map for locations)	Miles	3.8	3.8
Landings			
Total number of landings	Number of	142	142
Landings on existing roads	Number of	107	107
New landings on temporary roads	Number of	36	36
Landings within Riparian Reserve Management Allocation (on existing roads)	Number of	9	9
Fuels Treatments			
Roadside Grapple Pile and Burn	Acres	35	35
Grapple Pile and Burn	Acres	242	242
Yard Tops Attached	Acres	240	240
Burn landings	Each	142	142

Table 13: Comparison of Action Alternatives with Respect to Project Objectives and Significant Issues

Attainment of Project Objectives and How Significant Issues are Addressed				
Criteria	**Measure**	**Alternative 1**	**Alternative 2**	**Alternative 3**
Improve stand health and vigor and enhance tree growth	Acres thinned	0	1291	1291
Encourage species diversity	Minor species retained	Yes	Yes	Yes
Increase stand complexity	• Snags and down created. • Acres by type of treatment Acres unthinned (skips) • Species Diversity	• No snags/down wood created • No treatment 1993 acres unthinned in orig. stand boundaries • Retention of hardwoods and minor species	• 5 snags & dwd/ac. • 292 acres -40% cc • 999 acres -60% cc • 653 acres of unthinned in orig. stand boundaries • Retention of hardwoods and minor species	• 5 snags & dwd/ac. • 467 acres -40% cc • 824 acres -60% cc • 653 acres of unthinned in orig. stand boundaries • Retention of hardwoods and minor species
Accelerate stand structural development in stem-exclusion stands adjacent to late-seral stands to reduce landscape level fragmentation and edge effects. Minimize frequency of disturbance.	Acres treated adjacent to late-seral stands	0	• 79 thinned to 40% canopy closure. A second harvest entry is not anticipated in most of these stands. Stands are free to growth and maximize diameter growth for next 30-50 years.	• 79 acres thinned to 60% canopy closure – could potentially have a second commercial thinning entry in about 20-30 years. The stands are free to growt and maximize diameter growth for 20-30 years.
Reduce population of off-site ponderosa pine	Acres treated	0	104 acres	104 acres
Contribute wood products to local market	MMBF	0	9.1 MMBF	9.3 MMBF
Accelerate development of late-successional stand characteristics in CHU.	Acres thinned	0	• 91 acres thinned to 40% canopy closure. A second harvest entry is	• 444 acres thinned to 40% canopy closure. A second harvest entry is not

Table 13: Comparison of Action Alternatives with Respect to Project Objectives and Significant Issues

Attainment of Project Objectives and How Significant Issues are Addressed				
Criteria	**Measure**	**Alternative 1**	**Alternative 2**	**Alternative 3**
Minimize frequency of disturbance to owls.			not anticipated in most of these stands. Stands are free to grow and maximize diameter growth for next 30-50 years. • 733 acres thinned to 60% canopy closure. These stands could potentially have a second commercial thinning entry in about 20-30 years. The stands are free to grow and maximize diameter growth for 20-30 years.	anticipated in most of these stands. Stands are free to grow and maximize diameter growth for next 30-50 years. • 380 acres thinned to 60% canopy closure. These stands could potentially have a second commercial thinning entry in about 20-30 years. The stands are free to grow and maximize diameter growth for 20-30 years.
Improve northern spotted owl dispersal habitat in AOC over time	Acres degraded or downgraded (short term), improvement acres thinned in long-term	0	698 acres	698 acres
Accelerate development of large trees and structural components in Riparian Reserves. Minimize frequency of disturbance.	Acres thinned in RR Acres thinned to 40% canopy closure Acres thinned to 60% canopy closure	0	• 156 acres • 79 acres to 40% CC • 77 acres to 60% CC	• 156 acres • 47 acres to 40% CC • 109 acres to 60% CC

Alternatives Not Considered in Detail

The following alternatives were considered by not evaluated further as described below:

Thinning in Natural Stands: Consideration was given to thinning is all second growth stands in the analysis area. It was decided that there was a backlog of managed stands that needed treatment and that the priority should be in treating the previously managed stands. For this reason the natural stands were dropped from further consideration at this time.

Introduction of Gaps in the Thinning Stands for Big Game Forage: Consideration was given to introduction of gaps up to two acres in size, within the stands to be thinned, to create forage for big game animals. The project area is located in high and moderate Big Game Emphasis Areas (BGEA) and forage in much of the district is becoming a limiting factor.

For the following reasons, this alternative was dropped from further consideration at this time:

1. The northern portion of the project area is either in critical habitat (CHU) for the northern spotted owl and/or in the Santiam Area of Concern (AOC). In these areas, openings over ½ acre in size would jeopardize the functionality of dispersal habitat for the owls.
2. In this project area, forage values calculated using Habitat Effectiveness Index are considered viable in all BGEA's where harvest units were proposed
3. There are many existing openings within proposed harvest units as well as many meadows and other openings scattered throughout the project area, so it was felt that this, combined with the number of acres that were heavily thinned to achieve other resource objectives, would also benefit big game forage at least in the near term.
4. The proposed harvest units which lie outside of the CHU and AOC are on much steeper terrain which is less desirable for foraging areas or contain a lot of Riparian Reserves where these openings are not desirable.

Harvest in the primary shade zones of Riparian Reserves was not considered because of the need to meet the TMDL implementation strategy to protect shade on tributaries to the 303 (d) listed Willamette River. Until such time as stream temperatures moderate, no harvest would likely be planned in these areas.

Climate Change Adaptation – There was consideration given to developing an alternative that addresses adaptation to climate change. In this alternative it was suggested that the ponderosa pine should be favored instead of discouraged. Assuming that with climate change it would get warmer and drier, it might be a good argument to keep the pine. This alternative was not considered further because the pine was not genetically adapted to the Park Smith area and was already showing signs of maladaption such as mortality, thinning crowns, bole deformities, and susceptibility to insect damage. It was felt that a better way to address climate change was to keep as much diversity in tree species as possible within harvest units. This provision was already included in all alternatives.

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 in the chart above.

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

A listing of past, present and reasonably foreseeable future actions that are still having an influence on one resource or another in the watershed are: timber harvest, road development, traffic on roads, recreation use of area, and amount of broadcast burning. General information about these projects is listed below. Project names are listed in Appendix D. The scale of analysis for the each resource varies from the individual harvest units to the planning area to the 5th field watershed. The following is a summary of past, present and reasonably foreseeable actions that are still contributing to cumulative effects for some resources.

Past Actions

Extensive timber harvest, mostly regeneration harvesting, has occurred on both public and private lands in this planning area and 5th field watershed. In order to access harvest areas, an extensive road system was developed. For some resources these past activities are still contributing to cumulative effects and for some resources they are not.

Table 14 below shows the amount of timber harvest that has occurred on public lands and is estimated to have occurred on private lands since the first timber harvests began in the 1940's both at the planning area scale and the 5th field watershed scale. Most of this harvest that occurred was clearcuting and much of it included broadcast burning for slash treatment. It can be inferred from table14 that broadcast burning is on the same level of magnitude as timber harvest for each decade. There is no traffic count data or dispersed recreation use data for these areas. The traffic is likely to be somewhat proportional to the amount of roads in the planning area (159 miles) and in the 5th field watershed (760 miles).

Table 14: Watershed Harvest Rates by Decade

Harvest Year	Regeneration harvests on Federal land	Estimated regeneration harvests on private land*	Commercial thinning on Federal land	Acres and total percentage of Upper McKenzie Watershed (290,925 acres)
1940-1949	448			448 (<1%)
1950-1959	2,540			2,540 (1%)
1960-1969	10,324	3,423	259	14,006 (5%)
1970-1979	5,638	1,206	2,557	9,401 (3%)
1980-1989	12,857	723	343	13,923 (5%)
1990-1999	6,655	243	596	7,494 (3%)
2000+	5177		1,672	6,849 (2%)
Total	43,639	5,595	5,427	54,661 (19%)
*Harvesting on private land was estimated based on aerial photointerpretation.				

To get an idea of the spatial arrangement of harvest in the planning area see figure 13 and in the 5th field watershed see figure 14 below.

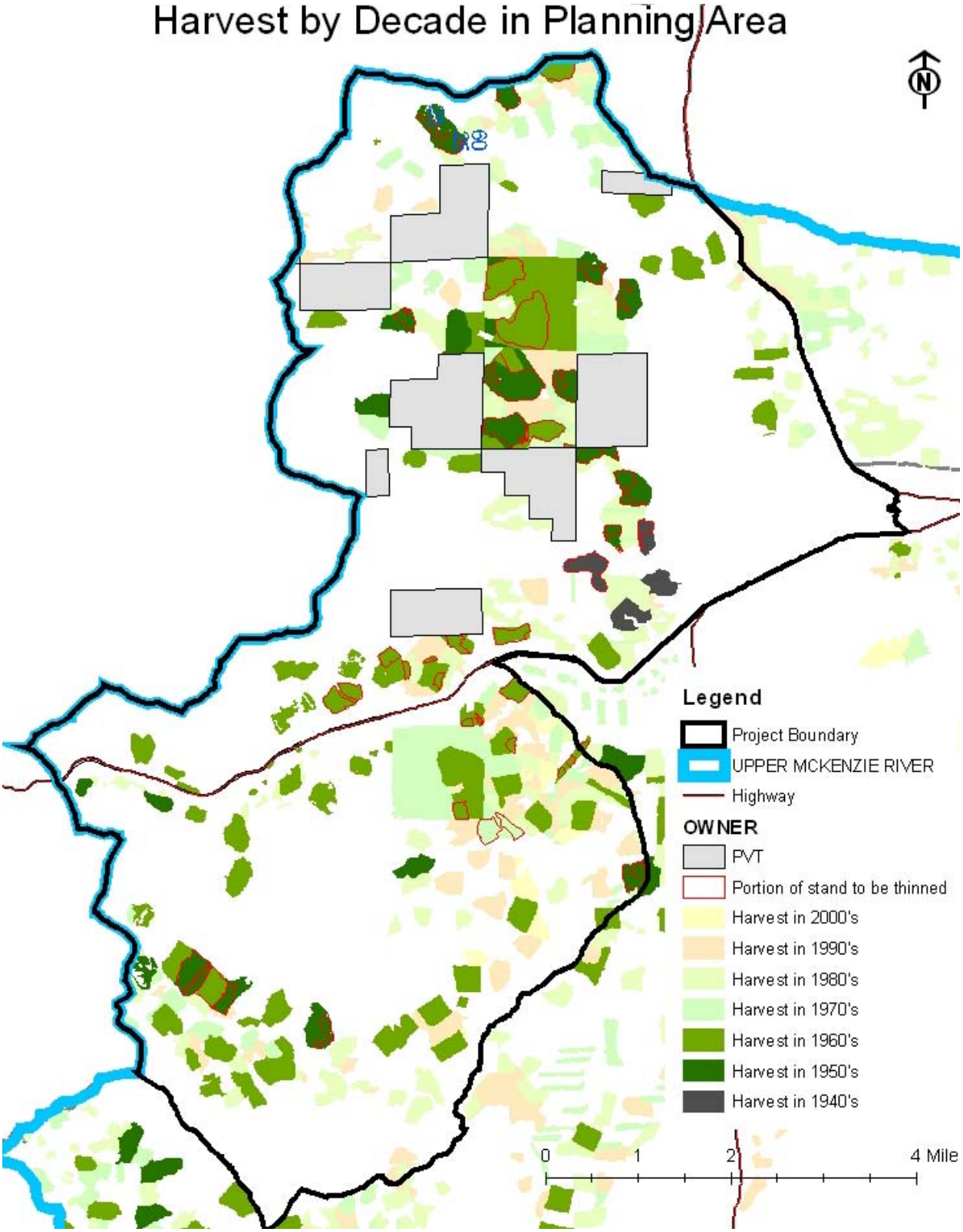


Figure 13: Harvest by Decade in Project Area

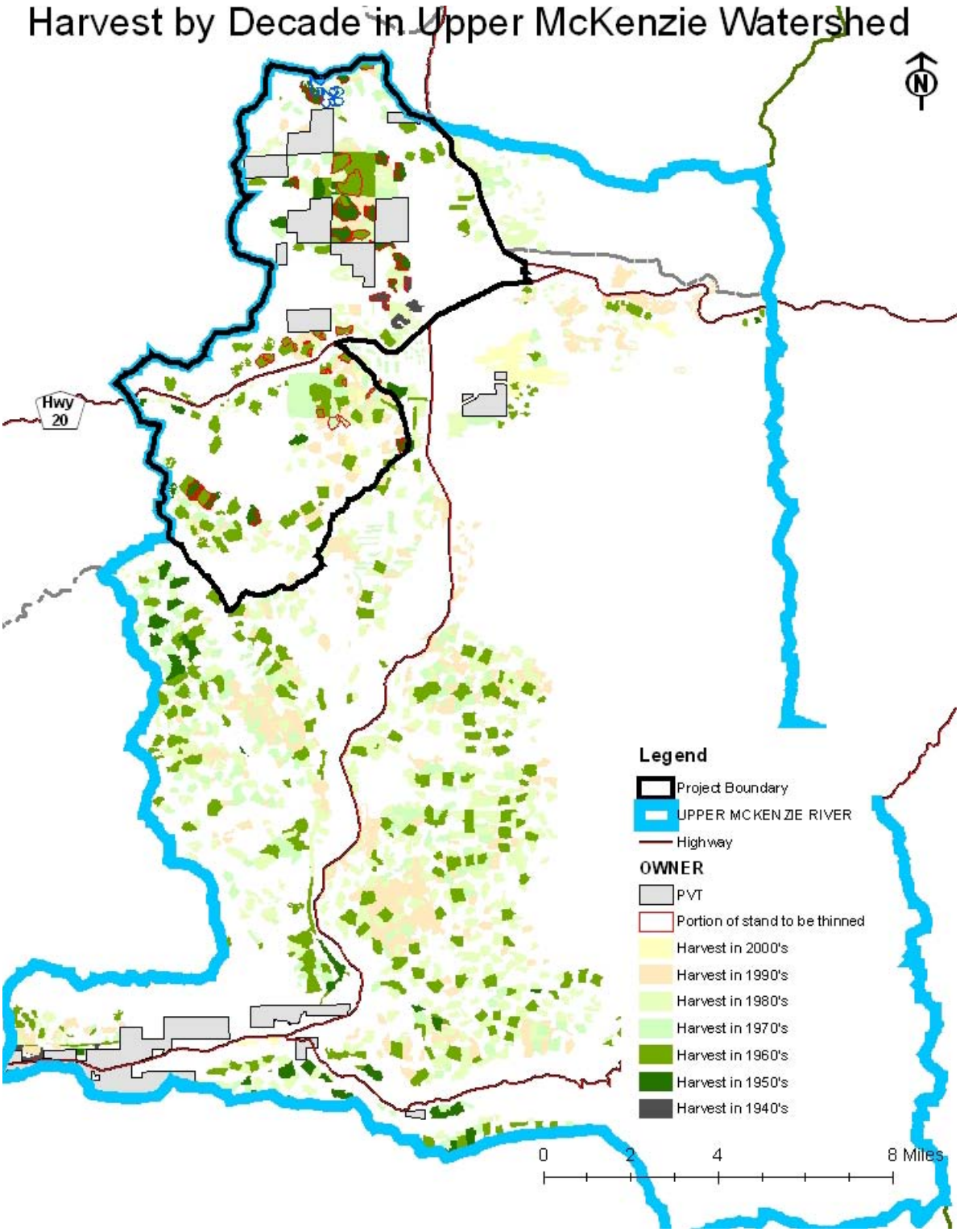


Figure 14 - Harvest by Decade in the Upper McKenzie 5th field Watershed

Present Actions

The Park Smith Thin timber sale would thin about 1291 acres of young, managed stands in this watershed in the next four to five years. Ball Park Timber Sale on the McKenzie Ranger District would commercially thin about 915 acres and create about 129 acres of gaps. In addition, they would underburn and burn piles on about 1156 acres.

Reasonably Foreseeable Future Actions

In the foreseeable future, the Sweet Home Ranger District is planning pre-commercial thinning of managed stands in this subwatershed. No additional commercial harvest is planned on public lands here in the foreseeable future but would more than likely occur on private lands.

About 230 acres of young managed stands on public lands in the subwatershed are prime candidates for pre-commercial thinning (PCT) in the foreseeable future. PCT operations reduce stand densities to approximately 200-250 trees per acre. This work does not require new road construction or reconstruction to complete. Current appropriated budgets have only been able to accomplish 10% of PCT thinning needs. Funding from commercial thinning sales could accomplish another 10% of available acres over the next 10 years.

On slightly over 2800 acres of private land in this planning area and 5,500 acres in the 5th field watershed, some commercial thinning and regeneration harvest would likely occur in the foreseeable future. How much private harvest would occur is difficult to estimate, but given the landowner's even-flow harvest strategy, harvest could affect 12-15% of private lands in this subwatershed in the next decade.

Regeneration harvesting would likely be more common than commercial thinning on these private lands. In contrast to public lands, very little pre-commercial thinning occurs on these private lands.

Private land harvest would also rely heavily on the existing road system, requiring very little new road construction.

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

It is also likely that windthrown trees from natural and managed stands would be salvaged in the next 10 years. Such salvage would likely be confined to existing road prisms, unless a sizable stand area (over 5 acres) is substantially affected (half of the trees).

For further information about cumulative effects, refer to environmental effects in the following pages, individual specialist reports in the project record available at the Sweet Home Ranger District, and cumulative effects information in Appendix D.

Vegetation

Methodology and Scale of Analysis

Existing and future stand conditions were quantified and modeled using stand examination data and the Forest Vegetation Simulator Model (Donnelly and Johnson, 1997). In addition, ArcGIS version 9.1 was used for the mapping analysis.

Table 15 shows the scale of analysis and measurement criteria used to evaluate effects on vegetation from proposed project actions.

Table 15: Scale of Analysis and Measurement Criteria

Scale of Analysis	Resource Effect	Measurement Criteria
Stand level (proposed harvest units)	Tree growth and vigor	Tree diameter growth
	Structural and vegetative diversity	Overstory canopy closure
	Wood production	Board-foot volume
Landscape Level (Upper McKenzie Watershed or Pacific Silver fir plant series within the watershed)	Late-successional stand characteristics	Structural index which includes: density of large conifers in overstory, density of shade-tolerant conifers in the understory, density of large snags and density of large down wood

Existing Condition

Landscape Conditions: The planning area is within the Pacific silver fir plant series which is indicative of cool, moist sites with moderate winter temperatures, substantial winter snow pack, and relatively limited summer drought.

The primary disturbance agents influencing landscape vegetation patterns in the area have been fire, insects, diseases, and timber harvesting.

The planning area is in a combination of mixed and high severity fire regimes with fire return intervals that range from 100 to 400 years. Because of the long fire return intervals, the forests within the Pacific silver fir plant series can sustain multi-storied structure for long periods of time.

Several insects and diseases act as disturbance agents in the watershed. Insect damage has been primarily from the Western spruce budworm (Choristoneura occidentalis). The two dominant root diseases that are widespread in the watershed are Armillaria root rot (Armillaria ostoyae) and laminated root rot (Phellinus weirii). White pine blister rust (Cronartium ribicola) is also present and has significantly reduced the western white pine population in the watershed (UMWA, 1995).

The majority of the harvesting in the watershed, which began in the 1940's, has been clearcutting. As illustrated in table 16 below, about 19% of the watershed has had timber management activities since the 1940's.

Table 16: Watershed Harvest Rates by Decade

Harvest Year	Regeneration harvests on Federal land	Estimated regeneration harvests on private land*	Commercial thinning on Federal land	Acres and total percentage of watershed
1940-1949	448			448 (<1%)
1950-1959	2,540			2,540 (1%)
1960-1969	10,324	3,423	259	14,006 (5%)
1970-1979	5,638	1,206	2,557	9,401 (3%)
1980-1989	12,857	723	343	13,923 (5%)
1990-1999	6,655	243	596	7,494 (3%)
2000+	5177		1,672	6,849 (2%)
Total	43,639	5,595	5,427	54,661 (19%)

*Harvesting on private land was estimated based on aerial photo interpretation.

The disturbance agents have resulted in a mix of structural stages across the watershed and within the planning area.

In 1995, the Upper McKenzie watershed analysis found that the amount of late-successional forests within the landscape is well within the established range of historical conditions. However, the level of fragmentation of late-successional forests may be outside the range, since the pattern created by past clearcutting has caused smaller patch sizes of all seral stages than what historically occurred across the landscape (UMWA, 1995). Table 17 below illustrates the differences in mean patch sizes of various seral stages between historical (1900) and 1995 conditions.

Table 17: Patch size characteristics of seral stages in the Pacific silver fir series within the watershed

Seral Stage	Mean Patch Size (in acres)	
	In 1900	In 1995
Early Seral	148 ac.	69 ac.
Mid Seral	215 ac.	72 ac.
Late Seral	773 ac.	491 ac.

Stand Conditions: The thirty-two stands considered for treatment are plantations created after clearcut harvesting 30-60 years ago. The stands were planted with primarily a mix of Douglas-fir and noble fir. A few units were also planted with some off-site ponderosa pine. A mixture of

other conifer species naturally seeded in and make-up a minor component in the overstory. These minor species include Pacific silver fir, grand fir, western hemlock, western red cedar, incense cedar, Engelmann spruce, western white pine, and lodgepole pine. Most stands were precommercially thinned in the 1970's and 1980's and fertilized with nitrogen 10-15 years later to promote tree growth. Approximately 1/3 of the stands were pruned in 1999-2005 to increase future wood quality.

Today the stands are largely single storied and dominated by Douglas-fir and noble-fir with the minor tree species scattered throughout. The stands are a combination of open patchy areas and densely stocked areas. Only those portions of the stands that were predominantly densely stocked were delineated out and are proposed as commercial thinning units. The understory shrub vegetation includes blue huckleberry, Dwarf Oregon grape, vine maple, ceanothus, Prince's pine, and rhododendron.

The units are considered to be in the stem exclusion stage (Oliver and Larson, 1990) and fall into the mid seral stages described under the landscape conditions. Stem exclusion stands have dense crowns that block out light to the forest floor and limit understory development. Existing trees in these units are competing for sunlight, water, and nutrients causing suppression mortality of the smaller diameter trees and a slowing down of tree growth. Average stand conditions can be found in the below.

Table 18: Average Stand Conditions

	Age (total years)	Overstory diameter (inches)	Overstory height (feet)	Overstory trees per acre	Total canopy closure
Average	49	12.6"	66'	239	80%

Curtis' relative density is the methods used for determining the timing of commercial thinning (Curtis, 1982). Relative densities of 50 or greater are indicative of stocking levels sufficient to cause competition mortality in stands. Recommended relative densities to maximize stand growth and vigor is between 35 to 50. Currently, the relative density of most of the stands is well over 50 and the average for all stands is 56.

Several insects and diseases were identified in these stands. Root rot diseases, primarily annosus root rot (*Heterobasidion annosum*) and armillaria root rot (*Armillaria ostoyae*), are occurring and resulting in tree mortality. This mortality tends to occur in clumps and has likely contributed to the development of the open patchy areas in some of the stands. Mountain pine beetle (*Dendroctonus ponderosae*) is causing mortality in the lodgepole pine and ponderosa pine. White pine blister rust (*Cronartium ribicola*) is causing damage and mortality in the western white pine. The balsam wooly adelgid (*Adelges piceae*), a non-native insect, was identified in one unit and causes gouting of branch tips, top die-back, and mortality of primarily Pacific silver fir and grand fir.

Ponderosa pine is found in four proposed harvest units. These relatively flat units were likely planted with ponderosa pine mixed in because these areas were suspected to be frost pockets. The ponderosa pines tend to occur in small clumps scattered throughout the four units. The planning area is not within the native range of ponderosa pine and the seed source of these trees is unknown. Today, the ponderosa pines are showing signs of maladaption such as mortality, thinning crowns, bole deformities, and susceptibility to insect damage.

Desired Future Condition

General Forest/Matrix/Scenic Allocations: An objective for General Forest, Matrix, and the Scenic allocations is to provide a supply of timber while meeting other resource goals such as maintaining visual quality and biodiversity. The desired future condition for stands within these allocations is to provide healthy, vigorous growing stands that have a diverse native species composition and structure. Stands of various conifer species would predominate with a natural variety of hardwoods, shrubs, herbs, and forbs occurring. The stands would generally consist of a well-developed understory with a scattered mix of large snags and down wood.

Riparian Reserves and Critical Habitat Unit Areas: A desired condition in Riparian Reserves and the designated Critical Habitat Unit is to promote characteristics of late-successional forests which serve as habitat for many species, including the northern spotted owl.

For those stands within these designated areas, the desired future condition is to provide healthy, vigorously growing stands that have a diverse native species composition and structure described above and to have late-successional structural characteristics including large green live trees; multiple canopy layers; and large snags and down woody debris. This is consistent with Objective #8 of the Aquatic Conservation Strategy, which calls for maintaining and restoring the species composition and structural diversity of plant communities in Riparian Reserves (USDA, 1994).

Landscape Conditions: The desired landscape condition would have larger patches in the various seral stages compared to today's pattern. The desired pattern of vegetation patches would be less fragmented and reflective of the larger patch size that historically occurred across the landscape.

Environmental Consequences

Direct and indirect effects of the alternatives are demonstrated using Unit 6. This unit is used as a sample stand because it is considered representative of the other thirty-two units in terms of average diameter, average tree density, and makes up 11% of the total acreage of all units proposed for harvest.

Cumulative effects are addressed in terms of how they have influenced both the individual units and the landscape seral stages.

1) Tree Growth and Vigor (Measurement Criteria: Stand diameter growth)

Table 19 below provides an example of the average overstory stand diameter growth modeled to age 100, between no thinning and thinning treatments.

Table 19: Average Overstory Quadratic Mean Diameter in Unit 6 Over Time

Unit 6	No Thin (259 trees per acre)	Thin to 100 trees per acre	Thin to 70 trees per acre
At age 42 in 2007	12.6" DBH	15.9" DBH	16.7" DBH
At age 100 in 2065	21.6" DBH	26.2" DBH	27.7" DBH

Alternative 1 – Direct/Indirect Effects

The stands would continue to grow, but at slower rates as trees compete for growing space. Diameter growth would decline as this competition increases and the trees would be come less vigorous and more susceptible to insect and diseases.

Alternatives 2 and 3 – Direct/Indirect Effects

The table above shows that diameter growth rates of the overstory would increase as a result of thinning and both action alternatives provide increased tree growth. Thinning accelerates the development of large diameter trees and promotes vigorous growing, healthy stands that are better able to cope with insect and disease activity (Tappeiner et al, 2007).

Conclusion - Both action alternatives increase stand diameter growth and provide more of an opportunity to promote vigorous growing, healthy stands than the No Action alternative.

Table 19 above shows, using Unit 6 as an example stand, that by age 100 the average overstory diameter can be expected to grow nine more inches in the No Action Alternative. By thinning, the average overstory diameter can be expected to grow 10.3 more inches in the thinning with 60% canopy closure and 11 more inches in the thinning with 40% canopy closure.

Alternative 3 has 175 more acres thinned to an average 40% canopy closure than Alternative 2 and therefore offers the greatest opportunity for increased stand growth across the stands.

2) Structural and Species Vegetation Diversity (Measurement Criteria: Overstory canopy closure). Table 20 below demonstrates the average overstory canopy closure between no thinning and thinning treatments.

Table 20: Average Canopy Closure in Unit 6 by Treatment

Unit 6	No Thin (259 trees per acre)	Thin to 100 trees per acre	Thin to 70 trees per acre
Average Overstory Canopy Closure	81%	56%	46%

Alternative 1– Direct/Indirect Effects

As demonstrated in table 20 above, without thinning the average overstory canopy closure is high. This high canopy closure allows minimal light to the forest floor and suppresses vegetation development in the understory.

Alternatives 2 and 3– Direct/Indirect Effects

An immediate direct effect of the action alternatives is reduced overstory canopy closure. As overstory canopy closure is reduced, more light reaches the understory and there is less competition for resources by the overstory. The degree of understory response is proportional to overstory reduction (Bailey et al, 1998). Thinning promotes the development of diverse, multi-layered stands by favoring an understory establishment, and by releasing saplings and intermediate trees in the stand (Bailey and Tappeiner, 1998). Thinning can also maintain or enhance plant species diversity. Studies have shown that total species richness was greater in thinned stands than unthinned stands (Bailey et al, 1998).

Cumulative Effects- Past management practices in the thirty-two units have cumulatively impacted current stand density and the natural vegetation species diversity. The original stands were clearcut in the 1950's, 1960's, and 1970's. Planting during this time was often done to a high density (up to 680 trees per acre) to insure successful uniform regeneration across the stand. Most of these units were planted with a mixture of Douglas-fir and noble fir. In four of the stands, off-site ponderosa pine was also planted. About half of the stands were precommercial thinned in the 1980's and 1990's to a density to a 260-300 trees per acre. Precommercial thinning during this time focused on leaving the larger trees and often eliminated or reduced the amount of the minor tree species that had naturally seeded in. These management activities resulted in stands with large areas of dense, uniform stocking dominated by one or two conifer species. The plant associations identified for the proposed units describe potential natural vegetation pathways that result in stands with more of a variety of conifer trees in the overstory than currently exist (McCain and Diaz, 2002).

Alternative 1: The high overstory canopy closure would continue to suppress understory development and the overstory would continue to be dominated by one or two tree species.

Alternatives 2 and 3: Through thinning, the action alternatives were designed to 1) reduce the dense overstory to provide for understory development, 2) favor minor tree species as leave

trees to enhance overstory species diversity, and 3) favor the removal of off-site ponderosa pine. Both action alternatives provide a reduction in overstory canopy closure and provide more of an opportunity than Alternative 1 for increased development of understory vegetation and stand complexity.

Conclusion - The action alternatives, through thinning, reduce overstory canopy closure and provide a greater opportunity to promote structural and natural vegetation diversity than the No Action alternative. Using Unit 6 as an example stand, the lighter thinning reduces average overstory canopy closure from 81% to 56% while the heavier thin reduces the cover from 81% to 46%. Alternative 3 has 175 more acres thinned to an average 40% canopy closure than Alternative 2 and therefore offers the greatest opportunity to promote structural and natural vegetation species diversity.

The stands' current density and vegetation species diversity have been impacted by past management activities. The cumulative effects of the No Action alternative would be continued high overstory canopy closure within limited understory development and reduced species diversity. The cumulative effects of the action alternatives would be reduced overstory canopy closures allowing increased development of understory vegetation and stand complexity.

3) Timber Production (Measurement Criteria: Board foot volume)

Table 21: Timber Production by Alternative

Alternative 1 – No Action	Alternative 2	Alternative 3
No commercial timber products	9.1 MMBF of volume through commercial thinning	9.3 MMBF of volume through commercial thinning

Conclusion - Both action alternatives provide wood products while the No Action alternative does not. Alternative 3 generates about 0.2 MMBF more volume than Alternative 2.

4) Development of Late-successional Structures (Measurement Criteria: Late-successional Structural Index)

Unit 6 was modeled over a 100-year time frame to show differences between the no thinning and thinning treatments in the development of four key attributes called a late-successional structural index (see table 22 below for definition).

Table 22: Definition of late-successional structure index used for stand modeling

Key Attribute	Definition for Modeling	Reference
Large diameter living trees	At least 8 trees per acre >=31" in diameter	Franklin J.F. et al, 1986. Research Note PNW-447
Multiple canopy layers	At least 12 trees per acre of shade tolerant trees >=16" in diameter	Franklin J.F. et al, 1986. Research Note PNW-447
Large dead trees	At least 18 snags greater than 10" in diameter and at least 8 snags greater than 20" in diameter	Mellen, et al, 2005 DecAID
Large woody material on the forest floor	Greater than 20 tons/acre of large wood that is >6" in diameter	Mellen, et al, 2005 DecAID

Figure 15 below, using the structural index described above, shows how Unit 6 progresses towards achieving all four key late-successional attributes over the next 100 years. The bars reaching the top of the graph attain all four attributes described.

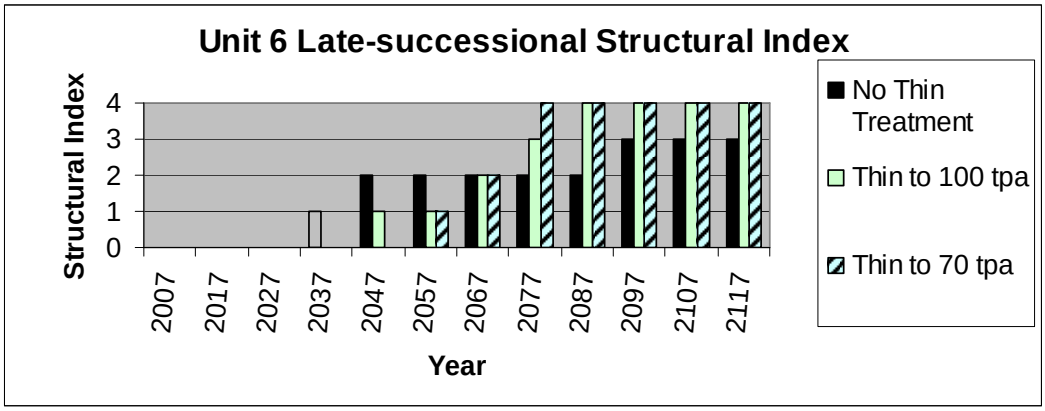


Figure 15: Comparison of development of late-successional attributes over time.

Alternative 1 – Direct/Indirect Effects

The figure above shows that the No Action alternative obtains only three of the four attributes over the next 100 years. This is because the modeling shows that Unit 6 does not develop the multiple canopy layer attribute within that time period. Understory development is delayed due the high overstory canopy closure. The stand would eventually develop all four late-successional attributes but likely beyond the 100 years modeled.

Alternatives 2 and 3 – Direct/Indirect Effects

The thinning treatments would have the indirect effect of accelerating the development of late-successional structures. The figure above shows that reducing stand density accelerates the

development of late-successional structures in Unit 6. Over the 100-year analysis period, both thinning options of the action alternatives obtain all four key attributes sooner than the No Action alternative. The modeling shows that thinning to an average 60% canopy closure reaches all four attributes in 80 years while thinning to an average 40% canopy closure reaches it in 70 years.

Cumulative Effects - Past, present and reasonably foreseeable management activities can alter vegetation patterns across the landscape by 1) changing the distribution of different seral stages, and 2) changing the patch sizes of those different seral stages. Approximately 49,000 acres (17%) of the watershed has been regeneration harvested since the 1940's. In the next 5 years, it is anticipated that approximately 3,400 acres (1%) of that acreage on private land would be harvested again. The current acreage distribution of the vegetation seral stages in the Upper McKenzie watershed, however, is still considered within the range of natural variability for the Pacific silver fir zone (UMWA, 1995). Management activities have, however, changed the patch sizes of the different seral stages from historical conditions. Past and present regeneration harvesting has created small patches of early to mid-seral stands scattered across the landscape. This scattered harvesting pattern has fragmented late seral conditions. Average patch size of late seral stands within the Pacific silver fir zone of the watershed has gone from 773 acres in 1900 to 491 acres in 1995 (UMWA, 1995). The action alternatives propose to commercially thin 1291 acres (0.5% of the watershed). In the past 40 years, 5,400 acres (2%) of the watershed has been commercially thinned. Two additional commercial thinning projects, totaling 2,400 acres (1% of the watershed), are expected to be completed in this watershed (on the McKenzie Ranger District) within the next five years. Thinning changes the density of overstory trees in treated stands, but does not alter a stand's current seral stage. The proposed alternatives would have no cumulative effect on the current seral stage distribution in the watershed.

As shown in the figure above, thinning can accelerate stands towards late seral habitat. The action alternatives propose to accelerate 1291 acres (0.5% of the watershed) towards the late-seral stage in order to begin to provide larger blocks of this seral stage. Stand modeling shows that the thinning treatments could allow the stands to transition into late-successional forest in 70 to 80 years. However, without thinning, the modeling shows that the stands may never develop an adequate understory in the next 100 years to provide late-successional habitat.

Conclusion - The action alternatives accelerate the development of late-successional structures by obtaining the four key attributes sooner than the No Action alternative. Modeling of Unit 6 shows that over a 100-year period, thinning develops all four key attributes in about 80 years for the 60% canopy closure thin and about 70 years for the 40% canopy closure thin. The modeling shows that in the next 100 years, the No Action alternative lack the understory component and never develops all four key attributes.

Alternative 3 has 175 more acres thinned to an average 40% canopy closure than Alternative 2 and therefore offers the greatest opportunity for acceleration of late-successional stand

characteristics to develop larger late seral patch sizes and reduce fragmentation across the landscape.

None of the alternatives have a cumulative effect on the current seral stage distribution or patch size. All of the units would be classified as being the stem exclusion stage before thinning and would remain in this same seral stage after thinning. However, the thinning alternatives can offer the opportunity to accelerate the transitioning of the stand into late-successional stage through increased tree growth and understory development. This acceleration can lead to larger late-successional patch sizes and reduced fragmentation across the landscape.

Vegetation - Sensitive, Rare and Uncommon Botanical Species

Sensitive, rare and uncommon botanical species, including vascular plants, lichens, fungi and bryophytes contribute to the overall diversity of the Parks Smith planning area. Many of these species are considered old-growth related. A number of sensitive, rare and uncommon species, particularly lichens, are disproportionably found on hardwoods and Pacific yew, and most are dispersal limited.

Methodology and Scale of Analysis

All proposed units were surveyed for sensitive, rare and uncommon species using the intuitive controlled method. Surveys were conducted during the summer and fall of 2006 and 2007. ***Measurement criteria*** – Presence/absence. ***Scale of analysis*** for direct/indirect effects and cumulative effects – Distribution within the watershed and range-wide if there may be effects that push a species toward listing under the Endangered Species Act.

Existing Conditions

Prior to the 2006/2007 sensitive species surveys, nine Region 6 sensitive botanical species had been documented in this portion of the Upper McKenzie watershed, along with four rare and uncommon species. All of these populations appear to be stable, and would not be affected by activities within the Parks Smith Thin project area.

Table 23: Sensitive or rare and uncommon botanical species previously documented in watershed

Sensitive Botanical Species			
Botrychium montanum	Vascular plant	*Pseudocyphellaria rainierensis*	Lichen
Romanzoffia thompsonii	Vascular plant	*Nephroma occultum*	Lichen
Schoenoplectus subterminalis	Vascular plant	*Rhizomnium nudum*	Bryophyte
Scheuchzeria palustris	Vascular plant	*Bridgeoporus nobilissimus*	Fungus
Chaenotheca subroscida	Lichen		
Rare and uncommon botanical species			
Albetrellus ellisii	Fungus	*Ramaria celerivrescens*	Fungus
Polyzellus multiplex	Fungus	*Gelatinodiscus flavidus*	Fungus

Seventy-three Region 6 sensitive plant, lichen and fungal species were evaluated to determine if they or their habitat would be impacted by this project. Habitat exists for 49 of the 73 species. Of the 49 species, 17 are fungi for which no surveys were conducted. Fungal surveys are considered impractical because they fruit inconsistently. Surveys were done for the remaining 32 species. Populations of three sensitive species and one rare and uncommon species were located.

Table 24: Sensitive or rare and uncommon botanical species located during surveys of proposed harvest units.

Sensitive Botanical Species			
Bridgeoporus nobilissimus	Fungus	1 population in Unit 6	Large diameter noble fir stumps and snags
Romanzoffia thompsonii	Vascular plant	3 populations in or adjacent to units 1 and 39	Seeps on open south-facing rock gardens.
Chaenotheca subroscida	Lichen	1 population in Unit 27	Pin lichen that grows on hardened snags
Rare and uncommon botanical species			
Helvella elastica	Fungus	1 population in Unit 1	Duff and soil

Further information about these species can be found in the Biological Evaluation in Appendix E.

Desired Future Condition

The desired future condition for rare, uncommon and sensitive botanical species is to maintain existing occurrences and to promote stand structure diversity and complexity that would provide more suitable habitat for many of these species in the future.

Environmental Consequences

Alternative 1 – No Action - Direct/Indirect Effects

Alternative 1 would provide the most benefit to rare and uncommon and sensitive fungi because most of them form mycorrhizal relationships with conifers and thinning has been shown to have negative short term (5-7 years) impacts to fungi (Pilz et al 2003). The effects of not thinning to sensitive and rare and uncommon lichens and bryophytes is less clear. Lichens prefer slow growing substrates that overstocked stands would provide but they also prefer some species such as Pacific yew that would be better developed and more abundant in a thinned stand.

Under Alternative 1, no thinning would occur and the stands would undergo a slow decline before presumably opening up enough to provide an understory. Windthrow, snowdown, and insect and disease pockets would create openings. Coarse woody debris would be abundant as trees die due to overcrowding. Indirect effects to sensitive fungi would likely be minimal.

The proposed stands provide potential habitat for a number of plant species. Three plant species, *Botrychium minganense*, *Botrychium montanum* and *Cimicifuga elata* inhabit forested habitat. Potential habitat for these plants would 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 would be suppressed by the dominant Douglas-fir and would not provide habitat for these species. *Cimicifuga elata* prefers more open stands with a well developed hardwood component. The development of these stand characteristics would be delayed in the absence of thinning.

Alternatives 2 and 3 – Direct/Indirect Effects

Proposed activities with the potential to negatively or positively affect sensitive, rare and uncommon botanical species include: thinning and associated management activities that cause physical disturbance to plants and/or changes in microsite conditions in their habitat.

Persistence of lichen species may be threatened by host tree removal, windthrow, changes in microsite conditions, changes in epiphyte ecology and competition in more open stands, and by dispersal limitations in more widely spaced stands (USDA, USDI 2003). In some cases thinning may be beneficial to these epiphytes by enhancing tree species diversity, including Pacific yew and bigleaf maple, two tree species known for their abundant lichen communities.

The following have been built into the alternative design to ensure compliance with Forest Plan standards and guidelines, laws, regulations and other policies:

Documented sites were evaluated and those deemed at risk from the proposed action would be protected under all alternatives through implementation of no-harvest protection buffers around known populations.

Noble fir would be retained at the expense of other species in Units 5, 6, 7 and 9 in order to create large diameter trees that can serve as hosts to *Bridgeoporus nobilissimus*.

The two action alternatives thin the same number of acres but differ in the intensity of thinning. Alternative 2 thins about 999 acres to an average 60% canopy closure and thins 292 acres to an average 40% canopy closure. Alternative 3 thins about 824 acres to an average 60% canopy closure and thins 467 acres to an average 40% canopy closure.

Due to protection measures designed into the action alternatives, no direct effects to known sensitive species sites are anticipated. It is likely that individual sites of fungi may be negatively affected in the short term by host tree removal, physical disturbance, soil compaction, and disruption of mycelial networks if the fungi are present (Kranabetter and Wylie 1998, Ameranthus and Perry 1994). Twelve of the sensitive fungi are mycorrhizal and require a host plant. Reductions in the number of fruiting bodies of chanterelles, a common mycorrhizal species, have been noted after initial thinning but appear to rebound after several years (Pilz et al 2003). Given this, Alternative 3 would likely have a slightly greater impact on fungi if they occur in these stands because 175 more acres are thinned to an average 40% canopy closure. Although individual and short term impacts may occur, it is not likely to result in a trend toward Federal listing or loss of viability for rare and uncommon and sensitive fungi species.

Indirect effects to rare, uncommon and sensitive species and their habitats vary. Minor forest tree species are favored in the harvest prescription over Douglas-fir. This would lead to an increase in stand complexity and diversity over the long term (20-100 years) that may provide better habitat for sensitive, rare and uncommon species. In the short term, the proposed action may reduce habitat for sensitive mycorrhizal fungi due to host tree removal and a reduction in moisture retention capabilities due to the drying effect of overstory removal. There is an optimal amount of organic debris and of moisture and too little or too much of either can be detrimental (Harvey, et.al. 1981; O'Dell, et.al. 1999). Further, one tree species that is being favored by the thinning prescriptions is western redcedar (*Thuja plicata*) and this species does not support ectomycorrizal species. A large proportion of western redcedar in a stand reduces contact between root systems of host trees (Kranabetter and Kroeger 2001).

Soil compaction resulting from harvesting equipment and the creation of temporary access roads can reduce host tree root growth and root tip availability for fungi (Amaranthus, et.al. 1996; Amaranthus and Perry 1994; Williamson and Neilson 2000). 1.1 miles of new temporary road would be constructed in the action alternatives, 3.8 miles of spur roads used in previous harvest entries would be reconstructed, and 142 landings would be used. Additional compaction may occur during the grapple piling of fuels.

Thinning may also affect lichens by removing substrate and altering the microclimate (Sarr et. al. 2005). Some sensitive, rare and uncommon lichens are thought to be dispersal limited rather than sensitive to microclimatic changes (Sillett 1995). Despite these possible effects, thinning would take place in such a way to enhance late-successional characteristics over the long term. This includes greater diversity in stand structure and stand species. Kranabetter and Kroeger (2001) note that thinning prescriptions that leave some stand basal area with good tree vigor may accommodate both commercial timber harvest and mycorrhizal fungi. The addition of understory

trees and shrubs may benefit the sensitive mycorrhizal species. Duff retention and coarse woody debris creation would benefit both the sensitive mycorrhizal and saprophytic species (Lindblad 1998).

Alternative 3, which thins 175 more acres to an average 40% canopy closure than Alternative 2, may have an increased beneficial effect over the long term because fewer entries into these stands would reduce disturbance. Both action alternatives would benefit *Bridgeoporus nobilissimus*. This species forms a perennial conk on large diameter noble fir stumps and snags. Noble fir would be retained at the expense of other species in Units 5, 6, 7 and 9 in order to create large diameter trees that can serve as hosts to *Bridgeoporus nobilissimus*.

Buffers around sensitive species protect the sites from direct disturbance but may have indirect adverse effects as the trees grow and a dense canopy results.

Cumulative Effects - The area analyzed for cumulative effects was the Upper McKenzie watershed. About 36,000 acres of old-growth forest was clearcut in this watershed in the last 50 years. These forests certainly contained multiple populations of rare, uncommon and sensitive botanical species. Fungal diversity declines with clearcutting and fire (Byrd, et al 2000, Bruns, et al 2002) and most of the stands were burned after harvest. Numerous western redcedar stumps attest to the past presence of a greater amount of cedar that may have provided habitat for the *Botrychium* species. Several timber sales have occurred in this area within the last 10 years. These sales include Browder Cat (40 acres), Browder Kitten (48 acres), Prairie Gate (195 acres), Prairie ATV (119 acres), Prairie Fence (55 acres) and Parks Overstory Removal (216 acres). Despite the large amount of past harvest activity there are 54,400 acres of mature and old-growth forests still remaining in the watershed. These forests serve as refugia for many rare and uncommon and sensitive species that would be able to re-colonize the younger stands as they mature and become more complex is structure and diversity.

Conclusions and rationale for conclusions- In the long-term (20-100 years) habitat for rare, uncommon and sensitive botanical species would be enhanced in the action alternatives. Many species would re-colonize the younger stands as they mature and become more complex is structure and diversity. Habitat for sensitive fungal species would likely be diminished in the short term but may be neutral to beneficial over the long term.

Vegetation – Invasive Plants

An invasive plant is defined as "a non-native plant whose introduction does or is likely to cause economic or environmental harm or harm to human health" (Executive Order 13122). Invasive non-native plants, including noxious weeds, are a threat to native plant communities. These species thrive in a new environment because they arrive without the complement of predators, disease, and other ecosystem components found in their native region of the world. Most of these species take advantage of disturbance gaps such as logged units, roads, rock quarries, burned areas, and trails. Weed seeds and other propagules can be introduced into an area by a variety of agents, most notably wind, highway and off-road vehicles, and construction equipment. They can also disperse by way of water, animals, and humans. Once established, these populations serve as a seed source for further dispersal, generally along roads and trail corridors.

Methodology and Scale of Analysis

Surveys for invasive species, including noxious weeds, were conducted in all stands in concurrence with the sensitive species surveys in 2006 and 2007. Additionally, a survey for non-native blackberries and false brome was conducted in 2005 and 2006 district-wide. Priority treatment sites covered by the Willamette National Forest Integrated Weed Management Plan are mapped in a GIS layer and tracked in a database. These sites are managed cooperatively thorough a Memorandum of Understanding with the Oregon Department of Agriculture.

Measurement criteria – Presence/absence; Type of analysis – Risk Assessment; ***Scale of analysis*** –the Parks Creek, Hackleman Creek, and Smith River subwatersheds of the Upper McKenzie Watershed were used to analyze direct/indirect and cumulative effects.

Existing Conditions – Invasive Plants

Thirty-two invasive weed species have been documented in the watershed. The most serious weed infestations in the area are yellow toadflax (*Linaria vulgaris*), false brome (*Brachypodium sylvaticum*), St. John's-wort (*Hypericum perforatum*) and ox-eye daisy (*Leucanthemum vulgare*).

Populations of yellow toadflax, an introduced ornamental, were found in Units 3 and 41. False brome, a highly invasive grass that has the capability to dominate the forest floor to the exclusion of native species, has been located at two sites in the planning area; both have been hand-pulled. St. John's-wort and ox-eye daisy are well established weeds of roads, meadows, and rocky openings. Both species are found along roads in all of the proposed harvest units and several meadows and other special habitats within the units. This wide distribution is likely due to the initial ground-based harvest, which was extensive and covered areas that would not be considered suitable for that logging system today.

Desired Future Conditions – Invasive Plants

The desired future condition for invasive plants is prevention of new invader establishments and a cessation of established weed spread with a corresponding reduction in established weed presence.

Environmental Consequences

Alternative 1 – No Action – Direct/Indirect Effects

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

Alternatives 2 and 3 – Direct/Indirect Effects

Project activities which can increase the likelihood of introducing invasive species and /or increasing the size of existing weed populations include: disturbance gaps created by thinning; ground-disturbing activities such as ground-based yarding, road construction and reconstruction or subsoiling; and activities which contribute to seed transport such as vehicular traffic.

The following have been built into the alternative design to ensure compliance with Forest Plan standards and guidelines, laws, regulations and other policies:

- Pre-treatment of existing weed sites
- Buffering by 50 feet the yellow toadflax in Units 3 and 41 to prevent weed seed from being transported throughout the harvested area.
- Pressure washing all road construction and logging equipment prior to working in the area.
- Obtaining gravel for road construction and reconstruction from a weed-free rock source.
- Minimizing areas of soil disturbance during all harvest activities including spur road construction and re-opening, road reconstruction, fuels treatment, etc. All disturbed areas would be seeded with native species, including landings and subsoiled skid roads to reduce weed establishment.
- Berming, gating, or ripping and seeding any new roads and re-opened roads to reduce disturbance and incoming seed due to vehicular traffic.
- Survey and control invasive weeds on all harvest units and haul routes in the planning area.
- Surveying to locate invasive weed populations and removing them where possible in harvest units and along adjacent roads.

Allowing for the return of disturbed areas to a more natural condition helps impede noxious weeds from dominating these areas. This condition can be advanced through implementation of

good management practices outlined above; minimizing disturbance where possible; and executing measures such as invasive weed removal and native species re-vegetation.

Direct effects of timber harvest on weed introduction and persistence are due to a combination of soil disturbance and transport of seed. In the proposed action alternatives, the areas that would be permanently opened up to light and disturbance would be most at risk, e.g., roads and landings. These areas are disproportionately subject to ground disturbance and exposure to vehicles and equipment that may bring seed in. Risk decreases in areas where roads and landings are closed, rehabilitated, and seeded with desirable species.

Alternative 3 has a slightly higher risk of increasing weed sites than Alternative 2 because it has 175 more acres being thinned to a lower canopy cover. The lower canopy cover increases the amount of light and most invasive plants thrive in high light environments.

One hundred forty two landings would be used in both action alternatives. In addition, 3.8 miles of existing spur roads would be opened up and 1.1 miles of new, native-surface, temporary spur roads would be constructed. This additional disturbance increases risk of weed establishment. Roads are well documented as vectors of weeds (Parendes 1997). Further, 242 acres would be grapple piled for fuel reduction in the units and 35 acres of roadside would be grapple piled, causing more soil disturbance in an already infested area. Table 25 below illustrates the relative risk of weed introduction potential by alternative.

Table 25: Risk Matrix: Comparison of Invasive Weed Introduction Potential by Alternative

Activity	Alt. 1	Alt. 2	Alt. 3
Acres treated (1291 in Alt. 2 and 3)	0	3	3
Acres by silvicultural prescription (1000 ac. 60%, 290 ac. 40% in Alt.2 and 820 ac.60%, 470 ac.40% in Alt.3)	0	2	3
Construct new native-surface temporary road (1.1 miles in Alt. 2 and 3)	0	2	2
Reopen spur roads used in previous harvest entries (3.8 miles in Alt. 2 and 3)	0	3	3
Road maintenance (45 miles of haul routes for both Alts. 2 and 3)	0	2	2
Subsoil (77 acres in both Alt. 2 and Alt. 3)	0	3	3
Landings, new and existing (142 in Alt 2 and 3)	0	3	3
Acres of grapple piling (277 acres in Alt. 2 and 3)	0	2	2
Totals	**0**	**20**	**21**

Assigned risk values of: 0 = no risk; 1 = small risk; 2 = moderate risk; and 3 = large risk. Derived from relative risk of invasive weed introduction and establishment by alternative based on the level of weed promoting activities within each alternative.

Cumulative Effects - The area analyzed for cumulative effects is the analysis area and the road system accessing the analysis area. Ground-disturbing activities such as ground-based yarding systems used during timber harvest, road construction and reconstruction, vehicular traffic and recreation use contribute to the incremental increase in invasive weeds. Analysis included reviewing all proposed harvest units in the field to determine existing weed infestations. The pattern of known invasive weed sites was then reviewed along with the mechanisms for introduction, establishment and/or expansion of invasive weeds and comparing this with similar past, present and future foreseeable actions to determine potential impacts.

The impact of non-native invasive weeds on native plant communities is cumulative. The more disturbance and activity any given area is subject to, the more the risk of noxious weed introduction, establishment, and/or expansion. Past road construction and maintenance (approximately 159 miles in the analysis area), timber harvest (approximately 36,000 acres in the Upper McKenzie watershed), and recreation use have resulted in numerous weed sites. The prevalence of ground-based harvest in the past likely resulted in numerous weed populations getting established within the stands. This project would open and re-close approximately 3.8 miles of spur roads, construct 1.1 mile of new temporary road, and thin 1291 acres. Road maintenance, vehicular traffic, and harvest on public and private lands would continue in the foreseeable future and may spread or introduce weed seed, leading to new infestations.

Conclusions - The spread of invasive weeds would be minimized through preventative measures taken prior to, during, and after thinning operations. Both action alternatives provide design criteria (table 10) that would reduce the long-term likelihood of expanded weed populations. These include buffers around known weed sites of some species, logging equipment washing, post-treatment survey and control funding, and pretreatment of existing weed sites. The canopy in the treated stands is expected to close in 10 to 20 years, and this would 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 would be required to keep this highly invasive species from overtaking the understory over the long-term. These efforts would be required whether the stands are thinned or not because the species is so tolerant of low light conditions.

Special Habitats

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

Methodology and Scale of Analysis

Special habitats were identified on aerial photos and from the GIS data base and were inventoried during the course of vegetation typing and project area survey for sensitive botanical species in the summer and fall of 2006 and 2007.

Scale of analysis – Distribution within the watershed was the scale used for analysis of direct, indirect and cumulative affects on special habitats. ***Measurement criteria*** – Presence/absence; habitat quality.

Existing Conditions

This portion of the Upper McKenzie watershed has a high diversity of special habitats. There are large subalpine meadow complexes on Browder Ridge, Echo Mountain, Crescent Mountain and the Three Pyramids. Large wet meadows are found in the Parks Creek and Hackleman Creek subwatersheds. Many of the units in Parks Smith Thin contain special habitats. Scattered rock openings, frost pockets, wetlands, and seasonal ponds are the most common special habitats in the area. These special habitats provide habitat for various plant communities and contribute to species diversity of the area, which is otherwise fairly uniform. Two noxious weeds, St. John's-wort and yellow toadflax are colonizing some of the rocky openings.

Table 26: Special Habitats found in proposed harvest units

Unit No.	Special Habitats
1	Rocky seeps along Road 2067-560 provide habitat for Romanzoffia thompsonii
6	Dry-mesic meadow at top of unit
12	Small seep 100' above road and linear seep along road at SW edge
16	Solidago dominated dry meadows in center of unit
19	Two rock gardens at bottom of unit
20	Seasonal pond below the road; rocky opening adjacent to waterfall; another rocky opening east of the first one
21	Many bracken/shrub openings
24	Multiple seeps below the road
25	Seep at lower edge of unit
27	Multiple Alaska yellow-cedar wetlands

Table 26: Special Habitats found in proposed harvest units

Unit No.	Special Habitats
33	Bracken/shrub opening
34	Blue wildrye/shrub opening
36	Sitka alder/vine maple/willow patch in NW corner
37	Multiple rocky openings; rock garden at top of unit
39	Multiple rock gardens above and below Road 1598 with Romanzoffia thompsonii
41	Pacific yew grove

Desired Future Conditions

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

Environmental Consequences – Special Habitats

Alternative 1 – No Action - Direct and Indirect Effects

There would be minimal direct or indirect effects to special habitats under the No Action alternative. Trees in or surrounding the special habitats would continue to grow but at a slower pace than under the action alternatives do to the lack of thinning. Existing weed populations in special habitats would likely continue to spread, altering the plant composition of those sites.

Many of the special habitats in the Parks Smith Thin are adjacent to roads. Past management activities no doubt had an effect on special habitats, including changes to the microclimate and hydrology, soil compaction and introduction of invasive weeds.

Alternatives 2 and 3- Direct and Indirect Effects

Project activities which could affect special habitats include: Thinning and associated management activities which have the potential to modify microclimates and introducing invasive species.

The following have been built into the alternative design to ensure compliance with Forest Plan standards and guidelines, the Special Habitat Management Guide, laws, regulations and other policies:

- Directional falling away from special habitats
- Avoiding placement of equipment, landings, skyline corridors, and designated skid roads through special habitats
- Placing buffers (50 ft) on seeps and small wetlands.

Special habitats are protected from physical disturbance in all action alternatives. Buffers, when prescribed, should be sufficient to protect the microclimate and prevent invasive weed

introduction. Buffers are not prescribed for rock outcrops, talus or other dry, rocky features because the prescription is for thinning and it is unlikely that opening up the canopy would significantly affect the plant community provided that the site is protected from physical disturbance, i.e. cable logging, skyline corridor. Many of the special habitats have invasive species in them and some control measure would be taken with the action alternatives.

Cumulative Effects - Past timber harvest, road construction and associated activities on public and private lands have adversely affected special habitats by introducing invasive weeds and altering the microclimate. Given the protective measures of this action, additional cumulative effects are not anticipated.

Conclusions - Special habitats are protected from physical disturbance in all action alternatives. Buffers, when prescribed, should be sufficient to protect the microclimate and prevent invasive weed introduction. Many of the special habitats have invasive species in them and some control measure would be taken with the action alternatives.

Special habitats in the analysis area have been compromised by past management activities and the introduction of invasive weeds. Given the mitigation measures for special habitats and those for invasive plants, no further degradation would occur as a result of the proposed action.

Terrestrial Wildlife

A. Coarse Woody Debris

Introduction and Analysis Methods

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

Current science suggests that other approaches should be considered when identifying appropriate levels of down wood and snag abundance in addition to the potential population approach as directed by the Forest Plan. One recommended approach is to use DecAID, a repository of information devoted to identifying appropriate levels of down wood and snags in selected habitat types. DecAID is “the decayed wood advisor for managing snags, partially dead trees and down wood for biodiversity in forests of Washington and Oregon” (Mellen et al. 2006). DecAID is based on a synthesis and integration of published scientific literature, research data, wildlife databases, forest inventory databases and expert judgment (Mellen et al. 2006). Although DecAID is known as the best available science, it also has limitations. It should be noted that

DecAID is a tool that can help managers evaluate the effects of forest conditions. It is intended to evaluate across a landscape scale, not to evaluate site specific areas. DecAID also highly recommends that an analysis area should be at least 20 square miles or roughly 12,800 acres in size. The Parks Smith Planning Area is approximately 36,160 acres and meets the criteria when using DecAID to evaluate snag and down wood levels. Proposed acres to be treated are approximately 1,291 in both Alternative 2 and Alternative 3 which impact about 3.6 % of the Planning Area. The Westside Lowland Conifer-Hardwood Forest Habitat Type was chosen, with a Small/Medium Tree Vegetation Condition in the DecAID Repository and all stands within the Parks Smith Planning Area fall into this habitat type.

DecAID provides information on snag and down wood in three tolerance levels, 30%, 50% and 80%. The 30% tolerance level is typically used when considering landscapes that have exhibited extensive harvest activity. The 50% tolerance level is typically used when considering matrix allocations and 80% is typically used when considering late-successional reserves. These considerations are general guidelines and it is the responsibility of the biologist to interpret and use information from DecAID to best fit the needs of the area being examined. The intention of DecAID is to provide information that can supplement current Forest Plan Standards and Guidelines. For this Planning Area, the 50% Tolerance Level suggested by DecAID was used to provide a baseline of information to determine present and future needs. The tables below show the snag and down wood suggestions by DecAID for the various tolerance levels (Mellen et al. 2003).

Table 27: Tolerance Levels for Snag Density suggested by DecAID.

Snag Size	DecAID – WLCH_OCA_S		
	30% Tolerance Level	50% Tolerance Level	80% Tolerance Level
≥ 10” DBH	4-5 Snags/Acre	10-18 Snag/Acre	19-36 Snags/Acre
≥ 20” DBH	1-5 Snags/Acre	1-8 Snags/Acre	2-14 Snags/Acre

Table 28: Tolerance Levels for Down Wood Composition suggested by DecAID

Percent Cover	DecAID – WLCH_OCA_S		
	30% Tolerance Level	50% Tolerance Level	80% Tolerance Level
≥ 5” DBH	2.9% Cover	4.6% Cover	9% Cover

Pre-field exams were conducted in the project area to assess habitat potential. Pre-field exams involved a walk-thru and information was documented on down wood, snag abundance and habitat requirements of wildlife species. Stand exams were also conducted in all proposed units.

This data, along with information from GIS applications were used to evaluate current snag and down wood levels.

Current Conditions – Coarse Woody Debris

Over 50% of the Parks Smith Planning Area is classified as Mid-2 Seral (50-199 years) to Late Seral (200 year +) with the remaining portions of land designated as Early Seral (1-15 years) to Mid-1 Seral (15-50 years) due to private land withholdings and past harvest activity on federal lands. Proposed units in the Parks Smith Planning Area can be characterized as Early to Mid-1 Seral, with stands averaging 30-55 years old. Tree class size range from 9 to 13 inches in diameter and dominate tree species are Douglas fir and noble fir. Sub-dominate tree species include, Pacific silver fir, grand fir, Western hemlock, Western red cedar, incense cedar, Englemann spruce, Western white pine and lodgepole pine. Timber harvest has occurred extensively in the planning area except for lands designated as Scenic Allocations. Previous harvest activity in proposed units has created dense canopy closure and low diameter growth among tree species. Few snags were retained in past harvest units due to broadcast slash burning, which often destroyed any habitat structure that was left after logging activities. Snag levels are currently very low and can be categorized in the 30% tolerance range by DecAID standards. Down wood levels are high in the proposed units and can be categorized well into the 80% tolerance range by DecAID standards. It should be noted, however, that down wood levels in proposed units exhibit low diameter classes and down wood over 12 inches is extremely limited.

Table 29: Current Snag Conditions in relation to DecAID Standards*

Snag Size	Current Snags/Acre	DecAID – WLCH_OCA_S	
		Snag Density Range	Tolerance Level
≥ 10" DBH	~ 5 Snags/Acre*	4-5 Snags/Acre	30% Tolerance Level
≥ 20" DBH	~ 1 Snag/Acre*	1-5 Snags/Acre	30%Tolerance Level

*Field Recon and Stand Exam data used to determine Snags/Acre average.

Table 30: Current Down Wood Percent Cover in relation to DecAID Standards*

Percent Cover	DecAID – WLCH_OCA_S		
	30% Tolerance Level	50% Tolerance Level	80% Tolerance Level
≥ 6" DBH			11.6% Cover**

**Percent Cover is misrepresented in the true data, since down wood levels were comprised of small diameter classes and down wood over 12 inches was extremely limited.

*Field Recon and Stand Exam data used to determine percent cover.

Desired Future Conditions - Coarse Woody Debris

Past management activities in the Parks Smith Planning Area have resulted in overstocked second growth stands that are exhibiting increased mortality due to lack of nutrients and sunlight. This single story structure has also led to poor habitat conditions for many wildlife species. In a landscape that once exhibited diverse vegetative composition and heterogeneity, the need for large down wood, snag and understory structure is crucial for species persistence.

Desired future conditions for this area should strive to meet Forest Standard and Guidelines at a minimum. Further effort should be taken with the consideration of the best available science and recommendations from DecAID. As forest conditions become more complex and diversified, so would wildlife species composition. Creating and retaining decayed wood elements along with the thinning of overstocked stands would in the long term provide a more diversified landscape for wildlife species. DecAID categorizes 3 tolerance levels to describe stand conditions in both snag retention and down wood percent cover. Goals to meet the 50% tolerance level for snags would be appropriate for proposed units in this Planning Area since snag density is currently at the 30% tolerance level. At the 50% tolerance level, DecAID recommends retaining a snag density range of 10-18 snags per acre ≥ 10" DBH and 1-8 snags per acre ≥ 20" DBH.

Data from DecAID shows that down wood cover used by wildlife at the 50% tolerance level ranges from 3-10% cover. DecAID also showed that at or above the 50% tolerance level, a vast majority of wildlife species were associated with percent cover (Mellen et al 2003). Since this area exhibits young trees 9-13" DBH on average and average percent cover is in the 80% tolerance level, maintaining current down wood levels would be appropriate for proposed units in this Planning Area. Providing additional down wood trees of larger diameter would also be recommended to increase wildlife species diversity and use. Terrestrial salamanders, such as the Oregon Slender Salamander, tend to utilize down wood of large diameter due to moist micro-climate conditions that exist (Csuti et al. 1997). Since the proposed units have limited structural potential, several attempts would be needed to achieve a vegetative diversity at this level.

Overall, the goal of this area should reflect a change in management that produces a more heterogeneous forest structure. Developing variability in forest structure is crucial to maintaining wildlife populations and reducing the threat of fire. Using DecAID as a guideline to create and maintain down woody debris along with Forest Standards and Guidelines can improve diversity and forest health in the long term. Consequently, limitations are present due to stand age, tree diameter and down wood components. These limitations would require attention to variable density thinning, possible future entries and time to achieve a more complex, multi-story heterogeneous stand structure along the landscape.

Environmental Consequences - Coarse Woody Debris

Alternative 1- No Action- Direct and Indirect Effects

This alternative would not modify or disturb snag or down wood levels within the proposed units. Natural processes over time would eventually increase both snag and down wood densities.

Under Alternative 1, all conditions of the Parks Smith Planning Area would remain the same without any management activities or modifications.

Alternatives 2 & 3- Direct and Indirect Effects

Alternatives 2 and 3 would involve thinning to various intensities and would briefly degrade habitat by reducing the canopy closure in treated areas to 40-60%. Remnant old-growth trees (trees over 30 inches DBH, if present and are not considered hazardous or a safety issue) would be retained along with current down wood. Creating additional snags and down wood where needed would improve habitat for coarse woody debris dependent species and cavity excavators as the canopy increases. It is estimated that in about 10 years, the tree growth as a result of thinning would increase tree diameter, height and canopy closure. This would result in improved habitat over current conditions. Design criteria measures (table 10) to increase snag and large diameter down wood levels would be employed as required by current Standards and Guidelines and recommendations from DecAID where applicable. Currently, recommendations from DecAID to meet the 50% tolerance level may be obtained in proposed units. Future entries would be needed to achieve higher tolerance levels. Snag and down wood levels as required by the Forest Plan Standards and Guidelines could be achieved in proposed units of the Parks Smith Planning Area. Both Alternatives 2 and 3 would leave at a minimum, 5 wildlife trees (2 snags & 3 down wood pieces) per acre or 6,455 trees in treated units across the landscape to meet Forest Plan Standards and Guidelines. In addition, recommendations from DecAID to increase snag and down wood levels may be employed if resources become available.

Therefore, Alternatives 2 or 3 may impact individuals or their habitat, but proposed actions would not likely contribute to a trend towards federal listing or loss of viability to a population or species. Both Alternatives would benefit most species' habitat in the foreseeable future due to increased down wood and snag conditions.

Cumulative Effects- Coarse Woody Debris - The area analyzed for cumulative effects was the Parks Smith Planning Area and proposed harvest units. Past timber harvest, road construction, fire suppression and road maintenance activities have contributed to cumulative effects of this area. Timber harvest, road building and natural disturbances have all impacted the amount of snags and down wood habitat within the Parks Smith Planning Area. Currently, the proposed units in the Parks Smith Planning Area show high down wood levels in diameter classes less than 12 inches and low snag levels at all size classes. Past timber harvest and road building have reduced snag and down wood habitat while natural disturbances typically have increased snag and down wood levels. Current harvest prescriptions designed for these alternatives may initially reduce canopy closure; however, thinning treatments would promote forest vigor and health over time. Proposed actions would also create more down wood and snags within the project area through design criteria efforts to meet desired future conditions, Forest Plan Standards and Guidelines and recommendations from DecAID where applicable. Both Alternatives 2 and 3

would leave at a minimum 5 wildlife trees (2 snags and 3 down wood pieces) per acre or 6,455 trees in treated units across the landscape to meet Forest Plan Standards and Guidelines. In addition, recommendations to increase snag and down wood levels from DecAID may be employed if resources become available.

In the reasonable foreseeable future, there are no additional habitat altering projects identified at this time within the Parks Smith Planning Area.

B. Threatened and Endangered Species

Introduction– Threatened and Endangered Species

Table 31 summarizes the list of terrestrial Threatened and Endangered species which may have habitat present within the project area and the results of the surveys, risk assessment, the effects determination for the Action Alternatives and consultation status. The proposed actions of the Parks Smith Thinning Project comply with the Record of Decision and the Standards and Guidelines of the Northwest Forest Plan (USDA and USDI 1994a), as amended by the Land and Resource Management Plan for the Willamette National Forest.

Table 31: Biological Evaluation process for Willamette Threatened and Endangered Species Associated with Potential Effects from the Action Alternatives

SPECIES	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
	Pre-field Review	Field Recon	Risk Assessment	Analysis Significance	USFWS Review
	Habitat Present (B, R, F, D)*	Occupancy Status	Conflicts with Action Alternatives	Effects or Impacts from Action Alternatives	Consultation
Northern Spotted Owl *Strix occidentalis caurina* STATUS: THREATENED	B, R, F, D	Occupied	No Potential Conflict	Not Likely to Adversely Affect (NLAA)	March 2008
* B = Breeding (nesting/denning) habitat R = roosting/cover habitat F = Foraging habitat D = dispersal habitat					

For more information see Wildlife Report and the Biological Evaluation (BE) (Young 2008) in the project record on file at the Sweet Home Ranger District.

1. Northern Spotted Owls – *Strix occidentalis*

Analysis Methods - Northern Spotted Owl

Using GIS and VEGIS applications, aerial photography and field visits, suitable northern spotted owl habitat was determined in the analysis area. Proposed harvest units were reviewed on-the-ground to verify tree size, canopy closure and existing snag and down wood levels. In

addition, proposed activities in association to the proximity of known and predicted nest sites were analyzed for potential impacts as well.

Current Conditions – Northern Spotted Owl

The northern spotted owl is listed as a Threatened species and is also a Management Indicator Species (MIS) for the Willamette National Forest. This species is typically associated with old-growth forested habitats throughout the Pacific Northwest. Past management activities, such as timber harvest, have reduced or fragmented northern spotted owl habitat throughout its range. As a result, overall population densities have decreased, specifically in areas where habitat reduction is concentrated (USDA 2008). Northern spotted owls have been documented in a variety of forest types, primarily Douglas-fir (USDA 2008). Nest sites and roost sties are typically found in forests that exhibit complex structure and heterogeneity. These habitats are multi-storied with large diameter trees (20 DBH and greater) and high canopy closures (greater than 60 percent). Most spotted owls are territorial and dispersal of young depends on availability of suitable habitat.

Two types of nest sites have been identified in the current Biological Assessment and Biological Opinion for CY/FY2008. ***Known Owl Sites*** are sites that were or are occupied by a pair or resident single as defined by protocol, 1990-2007 (USDA 2008). ***Predicted Owl Sites*** were developed by USFWS as a result of insufficient data across the landscape. These sites were determined based on an area that is able to support resident spotted owls (i.e. a potential breeding pair) in the absence of inventory data (USDA 2008). There are 15 known owl activity centers and 2 predicted sites within the Parks Smith Planning Area project boundary; however, those within 1.2 miles of proposed activities will be discussed in this analysis. Some sites within the project boundary are within 1.2 miles of proposed activities, while others lie outside of the project boundary. As a result, there are 18 known owl activity centers and one predicted site within 1.2 miles of proposed activities and are within the influence of the proposed action. It should be noted that predicted sites act as known owl sites and will therefore be analyzed in the same fashion. No proposed activities will take place within 200 meters of any known or predicted owl site.

Suitable Habitat for the northern spotted owl has three main components: nesting, roosting, and foraging (NRF) habitat. In general, suitable habitat is conifer dominated, 80 years of age or older, multi-storied with canopy closures exceeding 60 percent and with sufficient large snags and down wood to provide opportunities for nesting, roosting, and foraging (USDA 2008). Late-seral forest is superior habitat and preferred by spotted owls over other habitat conditions (Thomas et al. 1990). There are 18 known owl sites and one predicted site that have suitable habitat present within 1.2 miles of proposed activities. Suitable habitat availability of known and predicted owl sites is shown in Table 32 below. No proposed activities will take place in suitable owl habitat.

Table 32: Known Owl Sites and Predicted Sites within 1.2 miles of Proposed Activities

Known Owl Sites	Predicted Owl Sites	Total Acres within 1.2 mile radius of activity center	Threshold Acres of Suitable Habitat Needed within 1.2 mile radius of activity center	Actual Acres of Suitable Habitat within 1.2 mile radius of activity center	Percent of Area in Suitable Habitat in activity center
0013		2895	1182	1563	54%
0123		2895	1182	1071	37%
0664		2895	1182	1737	60%
0672		2895	1182	1824	63%
0673		2895	1182	1969	68%
0699		2895	1182	1563	54%
0821		2895	1182	1245	43%
0827		2895	1182	1042	36%
1322		2895	1182	1448	50%
2027		2895	1182	1621	56%
2445		2895	1182	1361	47%
2956		2895	1182	1274	44%
2964		2895	1182	1766	61%
2965		2895	1182	1303	45%
2972		2895	1182	1650	57%
4099		2895	1182	1911	66%
4197		2895	1182	1824	63%
4396		2895	1182	1303	45%
	345	2895	1182	1216	42%
18 Sites Total	**1 Site Total**			**Average = 1510**	**Average = 52%**

Dispersal Habitat allows spotted owl movement across the landscape between stands of suitable habitat and for juveniles to disperse from natal territories. This habitat generally lacks the optimal characteristics to support nesting and typically lacks multi-storied canopies, large trees or large snags and down wood. Dispersal habitat generally consists of mid-seral stands between 40 and 80 years of age with canopy closures of 40% or greater and trees with a mean diameter of 11 inches or more (USDI 2005). Most managed or natural forest stands 35-40 years old begin to develop dispersal habitat conditions. All proposed units within dispersal habitat of the Parks Smith Planning Area exhibit poor habitat conditions regardless of the land designation. Proposed units are 30-55 years old with previous harvest activity. This activity has produced a high overstocking of trees, dense pole tree conditions and low levels of coarse woody debris. Dispersal

conditions are possible through this area and proposed units; however, the likelihood of owls using this area as functional dispersal habitat is low due to the poor quality of the area.

The Parks Smith Project Area is 36,160 acres and proposed activities fall into 88% Matrix and 12% Riparian Reserve land allocations. Approximately 1,291 acres are proposed for commercial thinning in both action alternatives and are located in stands that are classified as dispersal or unsuitable northern spotted owl habitat. Three known owl sites and one predicted owl site are located in the Area of Concern (AOC). Eight known owl sites and one predicted owl site are located in northern spotted owl Critical Habitat Units (CHU).

Area of Concern (AOC)- The Willamette National Forest has identified an Area of Concern (AOC) that encompasses portions of the Sweet Home, Detroit and McKenzie River Ranger Districts. The land allocation is matrix and is unable to fully facilitate dispersal requirements of northern spotted owls (USDA 2008). This area has been considered to be a potential biological bottleneck area where dispersal to the north/south and east/west is difficult due to the lack of primary constituent elements. Approximately 13,369 acres of AOC are present in the Parks Smith Planning Area. Approximately, 696 acres are proposed to be treated and are considered unsuitable habitat or serve as dispersal habitat in poor condition.

Critical Habitat Unit (CHU)- Critical Habitat Units were intended to provide large blocks of suitable habitat along the landscape that would provide the necessary elements to maintain stable, viable and interconnected populations of northern spotted owls. The physical and biological features of critical habitat essential to species conservation are identified as primary constituent elements (USDA 2008). These elements are features that support nesting, roosting, foraging and dispersal conditions. Old-growth forest habitat is typically the most suitable habitat to provide such conditions. Approximately 18,957 acres of CHU are present in the Parks Smith Planning Area and are only located in OR-15. The proposed acres to be treated (841 acres) do not currently function as nesting, roosting or foraging habitat (*suitable habitat*). In addition, these acres do not serve as functional dispersal habitat due to the overstocking of trees and crowding in the understory and can be further classified as poor in quality.

Desired Future Conditions – Northern Spotted Owl

Desired future conditions for the northern spotted owl should strive for a well distributed network of high quality habitat on a landscape scale. High quality habitat should include a multi-story stand structure with old growth quality and canopy closures of at least 60%. Snag and down wood components should also be present to provide habitat for nesting, roosting and prey availability. Forest conditions are not static; therefore, future management activities should involve the enhancement of single story stands that exhibit a lack of structural diversity.

Forest Plan Standards and Guidelines outline four major structural components of old growth Douglas fir forests, which is the preferred habitat of the northern spotted owl. These attributes include the following: live old growth trees, standing dead trees (snags), fallen trees or logs on the

forest floor and logs in the streams (USDA 1994). In addition, canopy gaps and patchy understories are important elements in the composition of old growth forests.

AOC- Desired future conditions for this area should strive to maintain dispersal characteristics of at least 40% canopy closure and foraging potential in at least 50% of each quarter township with trees 11 inches DBH and greater. Dispersal conditions are crucial to maintaining connectivity between higher quality areas. This area is currently poor in quality due to past management practices on private and public allocations that have led to overstocking of trees, small diameter trees, low down wood (of larger diameter classes) and snag levels, along with high canopy closures. Future activities should focus on managing for connectivity between varying habitat quality and improving the existing conditions of habitat areas in poor quality. In addition, goals should lean towards maintaining dispersal conditions at a minimum but also managing for more old growth conditions as time allows, promoting connectivity.

CHU- Desired future conditions for this area should strive to maintain habitat that provides opportunity for nesting, roosting and foraging, as defined in the habitat objectives of the Northwest Forest Plan (USDA 1994). Past management activities have created low quality Critical Habitat Units. Future goals should focus on reducing or avoiding adverse effects of current management activities and lean towards practices that develop characteristics of suitable northern spotted owl habitat. These conditions would include creating a multi-story canopy structure with an increased down wood and snag component. In addition, stands should have minimal edge effect and canopy gaps should be created to provide habitat variability. Stands should be at least 80 years old with canopy closures exceeding 60% with large overstory trees and a well developed shrub layer.

Environmental Consequences - Northern Spotted Owl

Northern spotted owls may be affected if habitat is modified within their median home range (1.2 mile radius around the nest tree) or activity center. Habitat modification may occur in three different ways: (1) habitat degradation which affects the quality of suitable or dispersal habitat without altering the functionality of such habitat, (2) habitat downgrading which alters the functionality of suitable habitat so that it no longer supports nesting, roosting, and foraging, and (3) habitat removal which alters suitable or dispersal habitat to such an extent that the habitat no longer supports nesting, roosting, foraging, or dispersal (See Table 33).

Direct effects are considered short-term (< 10 years) in this context and are generally considered to range from insignificant and discountable negative effects to no effect as described below when applied to habitat modification and disturbance. Indirect effects are considered long-term (generally > 10 years) in this context and are considered to range from none to beneficial for this proposed project.

Table 33: Affected Acres of Dispersal Habitat

Known Owl Site	Predicted Owl Site	Acres of Dispersal Habitat within 1.2 Miles of an Owl Site	Affected Acres of Dispersal Habitat within 1.2 Miles of an Owl Site by Proposed Activities								
			Alternative 1			Alternative 2			Alternative 3		
			Acres Removed	Acres Downgraded	Acres Degraded*	Acres Removed	Acres Downgraded	Acres Degraded*	Acres Removed	Acres Downgraded	Acres Degraded*
0013		555	0	0	0	0	0	8.4	0	0	8.4
0123		210	0	0	0	0	0	7.8	0	0	7.8
0664		270	0	0	0	0	0	13.6	0	0	13.6
0672		103	0	0	0	0	0	0.58	0	0	0.58
0673		32	0	0	0	0	0	0	0	0	0
0699		285	0	0	0	0	0	10	0	0	10
0821		51	0	0	0	0	0	0	0	0	0
0827		685	0	0	0	0	0	90	0	0	90
1322		60	0	0	0	0	0	1.5	0	0	1.5
2027		494	0	0	0	0	0	44	0	0	44
2445		286	0	0	0	0	0	40	0	0	40
2956		687	0	0	0	0	0	4	0	0	4
2964		235	0	0	0	0	0	0	0	0	0
2965		289	0	0	0	0	0	64	0	0	64
2972		363	0	0	0	0	0	25	0	0	25
4099		89	0	0	0	0	0	42	0	0	42
4197		99	0	0	0	0	0	36	0	0	36
4396		269	0	0	0	0	0	149	0	0	149
	345	393	0	0	0	0	0	35	0	0	35
Totals		**5455**						**570.9**			**570.9**

*Degrade is temporary and forest stand characteristics will be temporarily altered but still maintain the components of spotted owl habitat within the stand such that spotted owl life history requirements are supported. In this case, dispersal habitat will be temporarily altered; however, the characteristics will be maintained post-silvicultural activities to adequately provide for spotted owl dispersal (USDA 2008).

Table 34 that follows summarizes effects to suitable, dispersal and unsuited habitat in the project area, in the AOC and in the CHU by alternative.

Table 34: Comparison of Habitat Affected by Alternative

	Alternative 1 – No Action			Alternative Two – Proposed Action					Alternative Three				
	Suitable Habitat	Dispersal Habitat	Unsuited Habitat	Suitable Habitat	Dispersal Habitat		Unsuited Habitat		Suitable Habitat	Dispersal Habitat		Unsuited Habitat	
Habitat Modification													
Canopy Closure %	NA	NA	NA	NA	40%	60%	40%	60%	NA	40%	60%	40%	60%
Leave trees per acre	NA	NA	NA	NA	60-80	90-110	60-80	90-110	NA	60-80	90-110	60-80	90-110
Acres of Habitat Degraded	0	0	0	0	191	728	101	271	0	319	600	147	225
Acres of Habitat Downgraded	0	0	0	0	0		0		0	0		0	
Acres of Habitat Removed	0	0	0	0	0		0		0	0		0	
Effects Determination	No effect	No effect	No effect	No effect	May affect, but not likely to adversely affect		No effect		No effect	May affect, but not likely to adversely affect		No effect	
AOC													
Canopy Closure %	NA	NA	NA	NA	40%	60%	40%	60%	NA	40%	60%	40 %	60%
Leave trees per acre	NA	NA	NA	NA	60-80	90-110	60-80	90-110	NA	60-80	90-110	60-80	90-110
Acres of Habitat Degraded	0	0	0	0	55	580	0	61	0	282	353	52	9
Acres of Habitat Downgraded	0	0	0	0	0		0		0	0		0	
Acres of Habitat Removed	0	0	0	0	0		0		0	0		0	
Effects Determination	No effect	No effect	No effect	No effect	May affect, but not likely to adversely affect		No effect		No effect	May affect, but not likely to adversely affect		No effect	

Table 34: Comparison of Habitat Affected by Alternative

	Alternative 1 – No Action			Alternative Two – Proposed Action					Alternative Three				
	Suitable Habitat	Dispersal Habitat	Unsuited Habitat	Suitable Habitat	Dispersal Habitat		Unsuited Habitat		Suitable Habitat	Dispersal Habitat		Unsuited Habitat	
CHU Habitat Units													
Canopy Closure %	NA	NA	NA	NA	40%	60%	40%	60%	NA	40%	60%	40 % c	60%
Leave trees per acre	NA	NA	NA	NA	60-80	90-110	60-80	90-110	NA	60-80	90-110	60-80	90-110
Acres of Habitat Degraded	0	0	0	0	55	617	43	119	0	319	353	147	15
Acres of Habitat Downgraded	0	0	0	0	0		0		0	0		0	
Acres of Habitat Removed	0	0	0	0	0		0		0	0		0	
Effects Determination	No effect	No effect	No effect	No effect	May affect, but not likely to adversely affect		No effect		No effect	May affect, but not likely to adversely affect		No effect	

Alternative 1- No Action – Direct and Indirect Effects

Habitat Modification, Area of Concern (AOC) and Critical Habitat Unit (CHU)

- This alternative will not modify suitable, dispersal or other land designations related to northern spotted owl habitat, including habitat in the AOC or CHU. Under Alternative 1, all conditions of the Parks Smith Planning Area will remain the same without any management activities or modifications.
- Indirect effects associated with the no action alternative are considered disadvantageous to improving existing conditions of the Parks Smith Planning Area, including AOC and CHU. This alternative will allow existing levels of small diameter down wood, low levels of snags, dense canopies and overstocking of trees to persist. Overtime, this area could exhibit extensive tree mortality, decreased habitat quality and decreases wildlife population levels for certain species. The progression of late-successional habitat will be delayed.

All action alternatives – Direct and Indirect Effects

Habitat Modification, Area of Concern (AOC) and Critical Habitat Unit (CHU)

- Current canopy closures are 95% and greater in proposed units. Proposed thinning activities will not reduce the canopy closure below 40%. All proposed thinning activities will take place in dispersal or unsuitable habitat only. Dispersal habitat would not be downgraded or removed. There will be no treatments within 200 meters of any known or predicted owl site. In addition, during road maintenance along haul route approximately 5 hazard trees in Matrix-Riparian Reserve may be removed. All proposed activities that take place within the CHU are in CHU #OR-15.
- Indirect effects associated with habitat modification are considered beneficial for spotted owls for the following reasons: Estimates of snag distribution for the project area when compared to DecAID data (Mellen et al. 2006) reveal that conditions are at the 30 percent tolerance level throughout the area. Data are limited but suggest that dispersal habitat throughout the project area could approach suitability as foraging habitat through thinning activities. Implementing the silvicultural prescription as proposed would result in accelerating the transition from dispersal to foraging habitat as released trees respond by increasing size and structural diversity and as additional levels of snags continue to form.

Alternative 2 – Direct and Indirect Effects

Habitat Modification, AOC and CHU - Suitable Habitat

- Northern spotted owl suitable habitat would not be modified or affected by the proposed actions of Alternative 2. All proposed thinning activities would take place in dispersal or unsuitable habitat only.

Habitat Modification - Dispersal Habitat

- Dispersal Habitat Degraded: Dispersal habitat proposed for thinning is 919 acres, with 191 acres thinned to 40% canopy closure (60-80 TPA) and 728 acres thinned to 60% canopy closure (90-110 TPA).
- Proposed habitat modifications from Alternative 2 would provide 1291 acres of improved habitat in dispersal and unsuitable habitat conditions. Based on the silvicultural prescription and growth response projections, dispersal capability in thinned stands across the project area should recover within approximately 10 years.

Habitat Modification - Unsuitable Habitat

- Unsuitable habitat proposed for light thinning is 372 acres, with 101 acres thinned to 40% canopy closure (60-80 TPA) and 271 acres thinned to 60% canopy closure (90-110 TPA).

AOC Dispersal Habitat

- Dispersal Habitat Degraded: AOC dispersal habitat proposed for light thinning is 635 acres, with 55 acres thinned to 40% canopy closure (60-80 TPA) and 580 acres thinned to 60% canopy closure (90-110 TPA).
- Proposed habitat modifications from Alternative 2 would provide 696 acres total of improved habitat in AOC dispersal (635 acres) and unsuitable (61 acres) habitat conditions. Based on the silvicultural prescription and growth response projections, dispersal capability in thinned stands across the project area should recover within approximately 10 years.

AOC Unsuitable Habitat

- Unsuitable habitat in the AOC proposed for light thinning is 61 acres, with 0 acres thinned to 40% canopy closure (60-80 TPA) and 61 acres thinned to 60% canopy closure (90-110 TPA).
- Proposed habitat modifications from Alternative 2 would provide 696 acres total of improved habitat in AOC dispersal (635 acres) and unsuitable (61 acres) habitat conditions. Based on the silvicultural prescription and growth response projections, dispersal capability in thinned stands across the project area should recover within approximately 10 years.

CHU Dispersal Habitat

- Dispersal Habitat Degraded: CHU dispersal habitat proposed for light thinning is 672 acres, with 55 acres thinned to 40% canopy closure (60-80 TPA) and 617 acres thinned to 60% canopy closure (90-110 TPA).
- Proposed habitat modifications from Alternative 2 would provide 834 acres total of improved habitat in CHU dispersal (672 acres) and unsuitable (162 acres) habitat conditions. Based on the silvicultural prescription and growth response projections, dispersal capability in thinned stands across the project area should recover within approximately 10 years.

CHU Unsuitable Habitat

- Unsuitable habitat in CHU OR-15 proposed for light thinning is 162 acres, with 43 acres thinned to 40% canopy closure (60-80 TPA) and 119 acres thinned to 60% canopy closure (90-110 TPA).
- Proposed habitat modifications from Alternative 2 would provide 834 acres total of improved habitat in CHU dispersal (672 acres) and unsuitable (162 acres) habitat conditions. Based on the silvicultural prescription and growth response projections, dispersal capability in thinned stands across the project area should recover within approximately 10 years.

Alternative 3– Direct and Indirect Effects

Habitat Modification , AOC and CHU - Suitable Habitat

- Northern spotted owl suitable habitat will not be modified or affected by the proposed actions of Alternative 3. All proposed thinning activities will take place in dispersal and unsuitable habitat only.

Habitat Modification -Dispersal Habitat

- Dispersal Habitat Degraded: Dispersal habitat proposed for light thinning is 919 acres, with 319 acres thinned to 40% canopy closure (60-80 TPA) and 600 acres thinned to 60% canopy closure (90-110 TPA).
- Proposed habitat modifications from Alternative 3 would provide 1291 acres of improved habitat in dispersal and unsuitable habitat conditions. Based on the silvicultural prescription and growth response projections, dispersal capability in thinned stands across the project area should recover within approximately 10 years.

Habitat Modification - Unsuitable Habitat

- Unsuitable habitat proposed for thinning is 372 acres, with 147 acres thinned to 40% canopy closure (60-80 TPA) and 225 acres thinned to 60% canopy closure (90-110 TPA).

AOC Dispersal Habitat

- Dispersal Habitat Degraded: AOC dispersal habitat proposed for thinning is 635 acres, with 282 acres thinned to 40% canopy closure (60-80 TPA) and 353 acres thinned to 60% canopy closure (90-110 TPA).
- Proposed habitat modifications from Alternative 3 would provide 696 acres total of improved habitat in AOC dispersal (635 acres) and unsuitable (61 acres) habitat conditions. Based on the silvicultural prescription and growth response projections, dispersal capability in thinned stands across the project area should recover within approximately 10 years.

AOC Unsuitable Habitat

- Unsuitable habitat in the AOC proposed for light thinning is 61 acres, with 52 acres thinned to 40% canopy closure (60-80 TPA) and 9 acres thinned to 60% canopy closure (90-110 TPA).

- Proposed habitat modifications from Alternative 3 would provide 696 acres total of improved habitat in AOC dispersal (635 acres) and unsuitable (61 acres) habitat conditions. Based on the silvicultural prescription and growth response projections, dispersal capability in thinned stands across the project area should recover within approximately 10 years.

CHU Dispersal Habitat

- Dispersal Habitat Degraded: CHU dispersal habitat proposed for light thinning is 672 acres, with 319 acres thinned to 40% canopy closure (60-80 TPA) and 353 acres thinned to 60% canopy closure (90-110 TPA).
- Proposed habitat modifications from Alternative 3 would provide 834 acres total of improved habitat in CHU dispersal (672 acres) and unsuitable (162 acres) habitat conditions. Based on the silvicultural prescription and growth response projections, dispersal capability in thinned stands across the project area should recover within approximately 10 years.

CHU Unsuitable Habitat

- Unsuitable habitat in CHU OR-15 proposed for light thinning is 162 acres, with 147 acres thinned to 40% canopy closure (60-80 TPA) and 15 acres thinned to 60% canopy closure (90-110 TPA).
- Proposed habitat modifications from Alternative 3 would provide 834 acres total of improved habitat in CHU dispersal (672 acres) and unsuitable (162 acres) habitat conditions. Based on the silvicultural prescription and growth response projections, dispersal capability in thinned stands across the project area should recover within approximately 10 years.

Direct and Indirect Effects - Disturbance

The northern spotted owl breeding season generally extends from March 1 to September 30 with March 1 to July 15 considered to be critical from a disturbance perspective. Activities that generate noise above ambient levels have the potential to disturb nesting spotted owls and may result in the incidental take of young and adult birds. The Biological Opinion received (USDI 2008) identifies two types of disturbance levels.

Disturbance distance is the distance from the project boundary which associated activities are likely to cause a northern spotted owl, if present, to be distracted from its normal activity. This disturbance distance extends the entire breeding season (March 1 to September 30).

Disruption distance is the distance from the project boundary where associated activities are likely to cause a northern spotted owl, if present, to be distracted to an extent as to significantly disrupt its normal behavior and create the likelihood of harm or loss of reproduction. The disruption distance is a subset of the disturbance distance and such activities are listed in Table 35 and show the minimum distances associated with disturbance activities. The unit wildlife biologist may increase or decrease these disturbance distances according to the best available scientific information and site-specific conditions.

Table 35: Minimum Disturbance and Disruption Distances for Activities Affecting Northern Spotted Owls during the Breeding Season (USDA 2008). Unit biologist may increase these disturbances during the Critical Breeding Season

Source of Disturbance//Disruption	Disturbance Distance	Disruption Distance	
	Entire Breeding Season (March 1-September 30)	Critical Breeding Season (March 1-July 15)	Late Breeding Season (July 16-September 30)
Blasting	1, 760 yards (1 mile)	1, 760 yards (1 mile)	440 yards (0.25 mile)
Burning	440 yards (0.25 mile)	440 yards (0.25 mile)	0 yards
Chainsaw Use	440 yards (0.25 mile)	265 yards	0 yards
Hauling on Open Roads	0 yards	0 yards	0 yards
Heavy Equipment	440 yards (0.25 mile)	235 yards	0 yards
Helicopter – Type 1[1]	880 yards (0.50 mile)	440 yards (0.25 mile)	440 yards (0.25 mile)
Helicopter – Other[2]	440 yards (0.25 mile)	220 yards	0 yards
Rock Crushing	440 yards (0.25 mile)	380 yards	0 yards

[1]Type I helicopters seat at least 16 people and have a minimum capacity of 5,000 lbs. Both a CH-47 (Chinook) and UH-60 (Blackhawk) are Type I helicopters.
[2] Kmax helicopters are considered “other” for the purposes of disturbance.

Table 35 lists the minimum disturbance and disruption distances for proposed activities. In the Park Smith Planning Area, three northern spotted owl known nest sites are located within 0.25 miles of proposed activities. All other known and predicted sites are located greater than 0.25 miles from proposed activities of the Parks Smith Planning Area. Proposed units located with 0.25 miles of a known or predicted owl site will be delayed until July 15th or later to minimize disturbance to nesting birds. This is due to the site potential of the area, suitable habitat conditions and the likelihood of successful breeding birds in the area. Proposed units that are located greater than 0.25 miles from a known or predicted owl site can proceed with proposed activities during the general and critical breeding season, except those activities that involve blasting and helicopter use.

Therefore, project activities that occur between March 1 and July 15th that are 0.25 miles or greater (except blasting) from a known or predicted owl site **may affect** (but are) **not likely to adversely affect** northern spotted owls in regards to the disruption distance. Project activities that occur between July 16 and September 30 and are greater than 0.25 miles (including blasting and Type I Helicopter use) of a known or predicted owl site **may affect** (but are) **not likely to adversely affect** spotted owls in regards to disruption distance. Disturbance from proposed actions conducted outside of the breeding period (October 1-February 28) would have **no effect** on northern spotted owls.

Table 36 lists known and predicted owl sites potentially affected by disturbance from proposed activities of the Parks Smith Planning Area. For this project, there will be a seasonal restriction of March 1st to July 15th for any proposed activities in association with the Parks Smith Planning Area that are within 0.25 miles of a known or predicted site unless such sites can be verified to be unoccupied by protocol surveys.

Table 36: Known and Predicted Owl Sites in Relation to Proposed Activities

Known Owl Sites	Predicted Owl Sites	Sites within 1.0 Miles of Proposed Units	Sites within 0.5 Miles of Proposed Units	Sites within 0.25 Miles of Proposed Units	Seasonal Restriction of March 1-July 15th
0013		X			No
0123		X			No
0664		X			No
0672		X			No
0673		X			No
0699		X			No
0821		X			No
0827		X			No
1322		X			No
2027		X			No
2445		X	X	X	Yes
2956		X			No
2964		X			No
2965		X	X		No
2972		X	X	X	Yes
4099		X			No
4197		X	X	X	Yes
4396		X			No
	345	X			No
18 Sites Total	**1 Site Total**	**19 Sites Total**	**4 Sites Total**	**3 Sites Total**	

Alternative 1- No Action – Direct and Indirect Effects

This alternative would not disturb any known or predicted owl sites for northern spotted owls in the Parks Smith Planning Area. Under Alternative 1, all conditions of the Parks Smith Planning Area would remain the same without any management activities or modifications.

Effects Determination: This alternative would have **no effect** to disturbance associate with northern spotted owls.

Alternatives 2 and 3 – Direct and Indirect Effects

Direct effects associated with project activities that may result in disturbance to spotted owls are considered as short-term and summarized as follows:

- Any activity proposed in the Parks Smith Planning Area resulting in disturbance between October 1 and February 28, or conducted beyond disturbance distances described in the Provincial BA (USDA et al. 2008), would have **no effect** on spotted owls. In addition, no blasting or helicopter activity will be conducted at any time for this project. Prescribed under burning will take place outside of the northern spotted owl breeding season.
- Disturbance activities such as use of chainsaws, heavy equipment, hauling and rock crushing (except blasting) associated with proposed thinning activities that are greater than 0.25 miles from a known or predicted owl site are considered to **may affect**, but are **not likely to adversely affect (MA-NLAA)** northern spotted owls if conducted from March – September 30 within the disturbance distances described in the Provincial BA and increased distance buffers by the unit biologist listed above (USDA et al. 2008). Several proposed units are within a 0.25 mile buffer of 3 known owl sites and as a result will receive a seasonal restriction of March 1-July 15, unless those sites are verified unoccupied by protocol surveys.
- No disturbance activities will be conducted between March 1 and July 15 within the minimum disturbance distances described in the Provincial BA which are listed in Table 35 for the Parks Smith Planning Area (USDA 2008). As a result, there would be **no effect** to northern spotted owls concerning disturbance activities or prescribed under burning during this timeframe.
- Indirect effects to northern spotted owls from disturbance associated with the Parks Smith Project may occur as a result of design criteria measures (table 10) to improve habitat conditions and resource opportunity projects. Design criteria measures such as soil tillage, snag and down wood creation and other projects such as firewood cutting and stream enhancement could result in disturbance if conducted within the defined disturbance distance during the spotted owl breeding season (USDA 2008). Related activities would not be conducted within the defined disruption distance during the breeding season. As a result, there would be **no effect** to northern spotted owls concerning disturbance activities or prescribed under burning during this timeframe.

Cumulative Effects- Northern Spotted Owl - New information from the 5-year species status review has updated our current knowledge of the northern spotted owl and the effects of climate change on range-wide population decline, regional vegetation patterns, sudden oak death syndrome, West Nile virus and barred owls as presenting individual and cumulative threats to the species (USDI 2004a, Anthony et al. 2004, Courtney et al. 2004).

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

have also benefited from fragmentation and there is raised concern about potential hybridization between barred owls and northern spotted owls. Hybridization levels may increase if northern spotted owl population levels decrease significantly (Courtney et al. 2004).

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

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

The area analyzed for cumulative effects was the Parks Smith Planning Area and proposed harvest units. Past timber harvest, road construction, fire suppression and road maintenance activities have contributed to cumulative effects. Timber harvest, road building and natural disturbances have all impacted the amount of snags and down wood habitat within the Parks Smith Planning Area. Past timber harvest and road building have reduced snag and down wood habitat while natural disturbances typically have increased snag and down wood levels. Current harvest prescriptions designed for these alternatives may initially reduce canopy closure; however over time, thinning treatments would promote forest vigor and health. Proposed actions would also create more down wood and snags within the project area through design criteria efforts to meet desired future conditions, Forest Plan Standards and Guidelines and recommendations from DecAID where applicable. In the reasonable foreseeable future, there are no additional habitat altering projects identified at this time within the Parks Smith Planning Area.

Conclusion-Environmental Consequences to Northern Spotted Owl and Associated Habitat - Past management activities, such as timber harvest, have reduced or fragmented northern spotted owl habitat throughout its range. As a result, overall population densities have decreased, specifically in areas where habitat reduction is concentrated (USDA 2006). The Parks Smith Project Area has been identified as having an overstocking of young successional stands with poor habitat conditions. Proposed thinning activities are predicted to improve the area on a landscape level. No suitable habitat would be modified through proposed activities and those activities would instead focus on dispersal habitat in poor condition and unsuitable habitat.

In conclusion, there would be **no effect** to northern spotted owl suitable habitat in any land designation, including the Area of Concern, Critical Habitat Units, Known Owl Sites or Predicted Sites. Modification of

dispersal habitat in the Area of Concern, Critical Habitat Units and surrounding Known Owl Sites or Predicted Owl Sites in proposed thinning activities of the Parks Smith Planning Area **may affect**, but are **not likely to adversely affect** northern spotted owls or dispersal habitat. Thinning activities would improve existing conditions and provide an opportunity for the landscape to shift towards more suitable foraging and dispersal habitat for northern spotted owls.

C. Sensitive Wildlife Species

Introduction and Analysis Methods – Sensitive Species

Analysis methods included field reconnaissance, habitat determination based on historic data and the use of current data and GIS applications.

Current Conditions- Sensitive Species

Nineteen sensitive wildlife species in the R6 FS Sensitive program were evaluated to determine if individuals or habitat would be impacted by the Parks Smith Planning Area activities (see table 37 below). Those with habitat and/or documented species presence are evaluated below.

Note: The **Northern Bald Eagle (*Haliaeetus leucocephalus*)** was de-listed as a Threatened species under the Endangered Species Act on August 9, 2007 and will no longer have Federal protection under this Act. The northern bald eagle will, however, remain protected under the Bald Eagle and Golden Eagle Protection Act which prohibits the harassment and take of such birds. This species will also remain listed as a Management Indicator Species (MIS) and as a Sensitive Species according to Forest Service 2670 Manual (FSM) direction (USDA 1999, USDI 2007). As a result, this species will be analyzed in this section of this document and referenced in the MIS section.

Table 37: Sensitive Wildlife Species on the Willamette National Forest

Species	Suitable Habitat Present in Parks Smith Planning Area?	Species Documented in Parks Smith Planning Area?
Amphibians		
Cascade Torrent Salamander	Yes	No
Foothill Yellow-legged Frog	No	No
Oregon Slender Salamander	Yes	Yes
Oregon Spotted Frog	Yes	No
Birds		
American Peregrine Falcon	Yes	No
Black Swift	No	No
Bufflehead	Yes	Yes
Harlequin Duck	Yes	Yes
Least Bittern	Yes	No
Northern Bald Eagle	Yes	No

Species	Suitable Habitat Present in Parks Smith Planning Area?	Species Documented in Parks Smith Planning Area?
Yellow Rail	Yes	No
Invertebrates		
Mardon Skipper	Yes	No
Mammals		
Baird's Shrew	Yes	No
California Wolverine	Yes	Yes
Pacific Fisher	Yes	No
Pacific Fringe-tailed Bat	Yes	No
Pacific Shrew	Yes	No
Mollusks		
Crater Lake Tightcoil (also a Rare and uncommon species)	Yes	Suspected
Reptiles		
Northwestern Pond Turtle	No	No

Desired Future Conditions- Sensitive Species

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

To maintain populations of snag-dependent wildlife, snags need to be provided in each successional stage of a plant community (Brown 1985). The significance of snags and down wood providing habitat for cavity dependent species has become an increasingly important issue as new information becomes available. Brown creepers and bushy-tailed woodrats maintained stable cumulative species composition as snag density (snags $\geq$ 10" DBH) increased (Mellen et al. 2006).

Due to the over-stocking of tree species and over all low structural diversity of the Parks Smith Planning Area, future conditions should strive to obtain at least a 50% tolerance level described in the DecAID model. This would require multiple entries over time. Desired future conditions would also include developing high diversity areas with a multi-story canopy structure, abundant snag and down wood levels, along with enhancing habitat richness and connectivity. In addition, desired future conditions for this project area would

be to maintain at least Forest Plan Standards and Guidelines with consideration of DecAID information to further mitigate actions where applicable.

Table 38: Direct and Indirect Effects - Sensitive Species

Species	Alternative 1		Alternative 2		Alternative 3	
	No Impact	May impact individuals or their habitat temporarily	No Impact	May impact individuals or their habitat temporarily	No impact	May impact individuals or their habitat temporarily
Amphibians						
Cascade Torrent Salamander	X		X		X	
Foothill Yellow-legged Frog	X		X		X	
Oregon Slender Salamander	X			X		X
Oregon Spotted Frog	X		X		X	
Birds						
American Peregrine Falcon	X		X		X	
Black Swift	X		X		X	
Bufflehead	X		X		X	
Harlequin Duck	X		X		X	
Least Bittern	X		X		X	
Northern Bald Eagle	X		X		X	
Yellow Rail	X		X		X	
Invertebrates						
Mardon Skipper	X		X		X	
Mammals						
Baird's Shrew	X			X		X
California Wolverine	X			X		X
Pacific Fisher	X			X		X
Pacific Fringe-tailed Bat	X		X		X	
Pacific Shrew	X			X		X
Mollusks						
Crater Lake Tightcoil (also a Rare and Uncommon species)	See discussion under rare and uncommon species					
Reptiles						
Northwestern Pond Turtle	X		X		X	

Alternative 1- No Action – Direct and Indirect Effects

No habitat exists for the foothill yellow-legged frog, black swift or the northwestern pond turtle therefore there would be no impact on any of these species.

The No Action Alternative would not modify any habitat within the proposed units. All conditions in the planning area would remain the same without any management activities or modifications.

Alternatives 2 & 3– Direct and Indirect Effects

Alternatives 2 and 3 would involve thinning in the Parks Smith Planning Area and would briefly degrade habitat for some sensitive species by reducing the canopy closure in treated areas to 40-60%. Protection buffers, avoidance of habitat areas and other design criteria (discussed below) to meet Standards and Guidelines would help to ensure persistence of **cascade torrent salamander, spotted frog, bufflehead, harlequin duck, northern bald eagle, yellow rail and mardon skippers**:

- No-harvest protection buffers of at least 60 feet on all perennial and intermittent water sources in and adjacent to proposed harvest units would result in little to no impact to stream temperatures that could affect the cascade torrent salamander.
- Large bodies of water would not be altered thus avoiding impacts to bald eagles
- Meadow habitat would not be altered thus avoiding impacts to least bittern, yellow rail or northwestern pond turtle.
- All grassland meadows would have protection buffers of at least 50 feet. As a result, no grassland meadow habitat would be altered that would affect the mardon skipper.

The above measures would result in Alternatives 2 or 3 having **no impact** to cascade torrent salamander, spotted frog, bufflehead, harlequin duck, northern bald eagle, yellow rail and mardon skippers or their associated habitat.

Retaining remnant old-growth trees (trees over 30 inches DBH, if present), current down wood and creating additional down wood where needed would improve habitat for the **Oregon slender salamander, Baird's shrew, California wolverine, Pacific fisher,** and **Pacific shrew**, over time. It is estimated that in about 10 years, tree growth as a result of thinning would increase tree diameter, height and canopy closure. This would result in improved habitat and microclimate conditions. Design criteria to increase down wood levels would be employed as required by current Standards and Guidelines and recommendations from DecAID. Therefore, Alternatives 2 and 3 may impact individuals or their habitat temporarily, but the action would not likely contribute to a trend towards federal listing or loss of viability to the population or species.

No known sites or designated management areas existing for the **Peregrine falcon** in the planning area so Alternatives 2 and 3 would have no impact on the peregrine falcon or associated habitat.

Proposed thinning activities in Alternative 2 or 3 would not modify or disturb any habitat associated with **bat roosts**. No caves, abandoned mines, wooden bridges or buildings were found in the proposed units of the Parks Smith Planning Area that would provide suitable bat habitat. Design criteria to ensure the persistence of bats would be employed as required by current Standards and Guidelines; therefore, Alternative 2 or 3 would have **no impact** to the **Pacific fringe-tailed bat** or associated habitat.

Cumulative Effects- Sensitive Species - Past management actions related to timber harvest activity are generally responsible for the current condition of habitat throughout the project area. These actions have affected the overall diversity of forested habitat largely by reducing the amount of old growth and increasing the amount of early to mid-seral habitat. There are no foreseeable actions that would negatively affect old growth habitat in this area. The activities associated with Parks Smith would improve existing seral conditions and guide managed stands towards an old growth regime. The effects from this project on seral stage development that influences suitability for sensitive species such as those dependent on down wood and decayed ground litter would be inconsequential relative to the cumulative effects from past actions. Current science, the changing trend in timber management and activities associated with this project should improve habitat conditions in the long term.

The area analyzed for cumulative effects was the Parks Smith Planning Area and proposed harvest units. Past timber harvest, road construction, fire suppression and road maintenance activities have contributed to cumulative effects. Timber harvest, road building and natural disturbances have all impacted the amount of snags and down wood habitat within the Parks Smith Planning Area. Past timber harvest and road building have reduced snag and down wood habitat while natural disturbances typically have increased snag and down wood levels. Current harvest prescriptions designed for these alternatives may initially reduce canopy closure; however over time, thinning treatments would promote forest vigor and health. Proposed actions would also create more down wood and snags within the project area through design criteria efforts to meet desired future conditions, Forest Plan Standards and Guidelines and recommendations from DecAID where applicable. In the reasonable foreseeable future, there are no additional habitat altering projects identified at this time within the Parks Smith Planning Area.

Consistency with Direction and Regulations – Sensitive Species - This project is consistent with current standards established for projects that would specifically affect sensitive species and associated habitat. The activities associated with this project are consistent with direction and regulations outlined in the Regulatory Framework, Management Direction and Guidance section of the Wildlife Specialist Report in the project record (available at Sweet Home Ranger District).

D. Rare and Uncommon Species

Introduction and Analysis Methods – Rare and Uncommon Species

The following species listed in table 39 below were compiled from the 2003 Annual Species Review (IM-OR-2004-034) and incorporates those vertebrate and invertebrate species whose known or suspected range includes the Willamette National Forest.

Table 39: Rare and Uncommon Species associated with the Sweet Home Ranger District.

Species	Category	Survey Triggers			Survey Results			Site Mgmt
		Within Range of the Species?	Project Activities Occur in Suitable habitat?	Project may negatively impact species/ habitat?	Surveys Required?	Survey Date	Sites Known or Found?	
Vertebrates								
Great Gray Owl (*Strix nebulosa*)	A	Yes	No	No	No[1]	N/A[2]	No	N/A
Red Tree Vole (*Arborimus longicaudus*)	C	Yes	No	No	No[3]	N/A	No	N/A
Crater Lake Tightcoil (*Pristiloma arcticum crateris*)	A	Yes	No	No	No[4]	N/A	No	N/A

1= Surveys are not required. No proposed activities would take place in great gray owl habitat.
2= Not applicable
3= Surveys are not required. No proposed activities would take place in red tree vole habitat.
4= Surveys are not required. No proposed activities would take place in Crater Lake tighcoil habitat.

Current Conditions- Rare and Uncommon Species

1. **Great Gray Owl (*Strix nebulosa*)-** The great gray owl is most common in coniferous forests adjacent to meadows. Surveys to determine occupancy are required in habitat that is above 3000 feet in elevation, with adjacent mature stands greater than 60% canopy cover and within 1000 feet of meadows larger than 10 acres. Pre-disturbance surveys are practical if habitat is present.

   Suitable habitat for great gray owls exists within the Parks Smith Planning Area; however, the nearest meadow occurs over 0.5 miles from any proposed unit. One great gray owl nest site exists in the Parks Smith Planning Area; however, this nest site has not been active since 2004. Pre-disturbance surveys and nest checks have not documented any activity since 2004.

2. **Red Tree Vole (*Arborimus longicaudus*)-**The red tree vole is endemic to moist coniferous forests of Western Oregon and extreme Northwest California. Old growth forest conditions with Douglas fir as the dominate tree species tends to be the preferred or optimal habitat of red tree voles (Biswell et al. 2002). The Parks Smith Planning Area is within the Northern Mesic Zone where habitat disturbing activities require surveys if the stand or a portion of the stand has a QMD (Quadratic Mean Diameter) of 16 inches DBH or greater and if the stands are greater than 80 years old. No proposed units in the Parks Smith Planning Area have QMD levels of 16 inches DBH or greater and are less than 80 years old; therefore, these units are not considered suitable red tree vole habitat.

3. **Crater Lake Tightcoil (*Pristiloma arcticum crateris*)-** The Crater Lake tightcoil is typically found within 10 meters of perennially wet areas surrounded by mature conifer forests. Pre-disturbance surveys are practical if habitat is present. Suitable habitat for this species exists in numerous locations throughout the Parks Smith Planning Area. Suitable habitat is defined as perennially wet areas within riparian reserves (USDA, USDI 2003). No cut buffers of 60 feet in these areas provide design criteria efforts to protect the species and to avoid disturbance by maintaining microclimate conditions. Surveys are not required in suitable habitat areas if the no cut buffer is employed or if suitable habitat elements are not present such as culverts with intermittent water flow, lack of suitable vegetation and lack of mature forest conditions (USDA, USDI 2003). Culvert replacement or repair is anticipated to occur in intermittent water sources in the Parks Smith Planning Area. In addition, skyline yarding would take place in intermittent class 4 streams.

4. **Other ROD Species and Habitat**

Cavity nesting birds (white-headed woodpecker, pygmy nuthatch and flammulated owl)

These species occur primarily on the eastern slope of the Cascade Range in Washington and Oregon and on the periphery of the northern spotted owl distribution range. These species are not typically associated with westside Oregon Cascade habitat but rather inhabit dry open ponderosa forests (Csuti et al. 1997, Marshall et al. 2003). Therefore, these species are not considered to have the potential to occur in the Parks Smith Planning Area.

Bat roosts (caves, mines and abandoned wooden bridges and buildings)

Sites commonly used by bats for roost sites and hibernacula include caves, mines, snags and decadent trees, wooden bridges and old buildings. Provisions for retention of large snags and decadent trees are included in the Standards and Guidelines for green tree patches in the Matrix. Caves and abandoned mines, wooden bridges and buildings require additional protection measures to ensure their habitat value is maintained. No suitable bat habitat was identified within proposed units of the Parks Smith Planning Area.

Desired Future Conditions – Rare and Uncommon Species

Due to the over-stocking of tree species and over all low structural diversity of the Parks Smith Planning Area, future conditions should strive to obtain at least a 50% tolerance level described in the DecAID model (See Coarse Woody Debris Section). This may require multiple entries over time. Desired future conditions would also include developing high diversity areas with a multi-story canopy structure, abundant snag and down wood levels, along with enhancing habitat richness and connectivity. These species are expected to be impacted on a minimal level. Suitable habitat for Great gray owls, red tree voles, cavity nesters and bats do not exist in proposed units. Any suitable habitat for the Crater Lake tightcoil will have a minimum buffer of 60 feet. Therefore, desired future conditions for this project area would be to maintain at least Forest Plan Standards and Guidelines with consideration of DecAID information to further mitigate actions where applicable.

Alternative 1- No Action – Rare and Uncommon Species – Direct and Indirect Effects

This alternative would not modify or disturb any habitat associated with great gray owls, red tree voles, Crater Lake tightcoils, cavity nesting birds, or bat roosts nor impact any individuals. Under Alternative 1, all conditions of the Parks Smith Planning Area would remain the same without any management activities or modifications.

Alternatives 2 & 3 – Direct and Indirect Effects

Proposed thinning activities in Alternatives 2 or 3 would not modify or disturb any habitat associated with great gray owls, red tree voles, cavity nesting birds (*white-headed woodpecker, pygmy nuthatch and flammulated owl*) or bat roosts.

- All suitable habitat for great gray owls is located more than 0.5 miles from proposed units;
- All proposed units within the Parks Smith Planning Area do not meet the required Quadratic Mean Diameter (QMD) which determines suitable red tree vole habitat. All units are located in stands that have a QMD lower than 16 inches DBH and are less than 80 years old.
- Cavity nesting birds (white-headed woodpecker, pygmy nuthatch, and flammulated owl are not typically associated with Westside Oregon Cascade habitat, therefore, these species are not considered to have potential habitat in the planning area.
- No caves, abandoned mines, wooden bridges or buildings were found in the planning area that would provide suitable bat habitat.

Therefore, Alternatives 2 or 3 would have no impact on great gray owls, red tree voles, cavity nesting birds mentioned above, or bats.

Proposed thinning activities in Alternatives 2 and 3 may modify or disturb habitat associated with Crater Lake tightcoil. Culvert replacement in intermittent water sources is anticipated on 10 sites that may affect Crater Lake tightcoil individuals if perennial water exists. Surveys are currently not required for culvert replacement/repair or on skyline yarding in intermittent stream channels as supported by the current survey protocol for terrestrial mollusk species (USDA, USDI 2003). All perennial water sources in proposed units of

the Parks Smith Planning Area have protection buffers of at least 60 feet, which meet current Standards and Guidelines. Therefore, Alternatives 2 or 3 **may impact** (*Crater Lake tighcoil*) individuals or their habitat temporarily, but the action would **not likely** contribute to a trend towards federal listing or loss of viability to the population or species.

Cumulative Effects – Rare and Uncommon Species - Past management actions related to timber harvest activity are generally responsible for the current condition of habitat throughout the project area. These actions have affected the overall diversity of forested habitat largely by reducing the amount of old growth and increasing the amount of early to mid-seral habitat. There are no foreseeable actions that would negatively affect old growth habitat in this area. The activities associated with Parks Smith would improve existing seral conditions and guide managed stands towards an old growth regime. The effects from this project on seral stage development that influences suitability for rare and uncommon species such as the red tree vole and the great gray owl would be inconsequential relative to the cumulative effects from past actions. Rare and uncommon species, such as the Crater Lake tighcoil, that are dependent on perennially wet areas surrounded by mature conifer forest may experience a temporary impact through culvert replacement intermittent water sources, but those impacts are of short duration and would not likely lean towards a loss of population viability. Current science, the changing trend in timber management and activities associated with this project should improve habitat conditions in the long term.

The area analyzed for cumulative effects was the Parks Smith Planning Area and proposed harvest units. Past timber harvest, road construction, fire suppression and road maintenance activities have contributed to cumulative effects. Timber harvest, road building and natural disturbances have all impacted the amount of snags and down wood habitat within the Parks Smith Planning Area. Past timber harvest and road building have reduced snag and down wood habitat while natural disturbances typically have increased snag and down wood levels. Current harvest prescriptions designed for these alternatives may initially reduce canopy closure; however over time, thinning treatments would promote forest vigor and health. Proposed actions would also create more down wood and snags within the project area through design criteria efforts to meet desired future conditions, Forest Plan Standards and Guidelines and recommendations from DecAID where applicable. In the reasonable foreseeable future, there are no additional habitat altering projects identified at this time within the Parks Smith Planning Area.

Consistency with Direction and Regulations – Rare and uncommon Species - This project is consistent with current standards established for projects that would specifically affect Rare and uncommon species and associated habitat. The activities associated with this project are consistent with direction and regulations outlined in the Regulatory Framework, Management Direction and Guidance section outlined in the Wildlife Specialist Report in the project record (available at the Sweet Home Ranger District) .

E. Terrestrial Management Indicator Species

Introduction and Analysis Methods – Terrestrial Management Indicator Species

The Willamette National Forest Plan has identified a number of terrestrial wildlife species with habitat needs that are representative of other wildlife species with similar habitat requirements for survival and reproduction. These species have been chosen due to specific habitat requirements that may be significantly influenced by management practices, and therefore, can facilitate in providing guidance to maintain viable populations of other species in similar habitat (Table 40). These Management Indicator Species (MIS) include Northern spotted owl, bald eagle, peregrine falcon, cavity excavators, pileated woodpecker, American marten, and big game (mule deer, black-tailed deer and elk) and can be found in the Willamette NF FEIS Land and Resource Management Plan Chapter III, page 69 (USDA 1990). These species have the potential to occur in or near the Parks Smith project area. Northern spotted owls, bald eagles and peregrine falcons are addressed in the Threatened and Sensitive Species section.

Pre-field reviews, field reconnaissance surveys and stand exams were conducted to analyze current conditions. An estimate of the current DecAID tolerance level was made based on the general stand age, harvest history and fire regime history. DecAID was also used to provide recommendations for appropriate future levels of snags and down wood in the Parks Smith Planning Area. The Westside Lowland Conifer-Hardwood Forest Habitat Type was chosen as the appropriate habitat type and Small/Medium Tree Vegetation Condition as the appropriate tree size in the DecAID model.

Tabel 40: Willamette NF Management Indicator Species (Terrestrial only)

Indicator Species	Habitat Features	Selection Criteria
Northern Spotted Owl (see T and E section)	Old-growth and mature conifer	- Ecological Indicator - Represents limited habitat - Federal Register of Threatened and Endangered Species
Bald Eagle (see sensitive species section)	Old-growth conifers near large bodies of water	- Represent limited habitat - Sensitive Species listing due to de-listing in August 2007.
Peregrine Falcon (see sensitive species section)	Cliff nesting habitat near abundant prey.	- Ecological Indicator - Represents limited habitat
Cavity Excavators	Dead and decaying trees	- Ecological Indicator - Represents limited habitat
Pileated Woodpecker	Old-growth and mature conifer	- Ecological Indicator - Represents limited habitat
American Marten	Old-growth and mature conifer	- Ecological Indicator - Represents limited habitat
Big Game (Deer and Elk)	Winter Range	- Commonly hunted

Current Conditions – Terrestrial Management Indicator Species

1. **Primary Cavity Excavators and Pileated Woodpeckers** - Avian species that are dependent on dead and decaying trees are referred to as cavity excavators or nesters. Snags (dead and dying trees) and down wood are important structural components of forest communities and are used by avian species in a variety of ways. Hollow trees and snags are uncommon but are especially valuable habitat, providing thermally regulated nest sites, over-wintering enclosures and food storage sites. Primary cavity excavators require dead and defective trees for nesting, roosting and foraging. Cavities constructed and abandoned by primary cavity excavators can be later used by other species known as, secondary cavity nesters (western bluebirds, tree swallows and violet-green swallows).

   Primary cavity excavator species identified as ecological indicators on the Forest are listed in table 41 below. The red-breasted nuthatch, northern flicker, hairy woodpecker, red-breasted sapsucker and pileated woodpecker were observed in field reconnaissance of 2007. Other species have the potential to occur within the Parks Smith Planning Area due to similar habitat requirements.

Table 41: Willamette NF Primary Cavity Excavators

Primary Cavity Excavator Species	Found on the Sweet Home Ranger District?	Observed within the Parks Smith Planning Area?	Potential to occur within the Parks Smith Planning Area?
Red-breasted Nuthatch	Yes	Yes	Yes
Northern Flicker	Yes	Yes	Yes
Hairy Woodpecker	Yes	Yes	Yes
Downy Woodpecker	Yes	No	Yes
Lewis' Woodpecker	Yes	No	Yes
Black-blacked Woodpecker	Yes	No	Yes
Three-toed Woodpecker	Yes	No	Possible
Red-breasted Sapsucker	Yes	Yes	Yes

The pileated woodpecker has been selected from the group of primary cavity excavators as "Featured" species based on a higher selection of habitat needs (USDA 1990). The pileated woodpecker is the largest of woodpeckers, and due to its large size, requires trees 24 inches DBH and larger to accommodate nesting efforts (Csuti et al. 1997). Pileated woodpeckers have large home ranges of 1000 acres or more and may forage in open areas (Mellen 1987). This species requires older forests to persist and tends to inhabit stands 70 years or older (Csuti et al. 1997). Habitat for the pileated woodpecker has been designated in the form of a Management Area (9b) on the Willamette National Forest and is 9,513 acres in size. This area has been designated to provide stands of mature forest habitat necessary for viable pileated woodpecker populations and species with similar habitat needs (USDA 1990). The Parks Smith Planning Area lies outside of the designated pileated woodpecker Management Area (9b). There are no known nest sites within any proposed harvest units.

Proposed units in the Parks Smith Planning Area can be characterized as Early to Mid-1 Seral, with stands averaging 30-55 years old. Tree class size range from 9 to 13 inches in diameter and dominate tree species are Douglas fir and noble fir. Timber harvest has occurred extensively in the planning area except for lands designated as wilderness. Previous harvest activity has created dense canopy closure and low diameter growth among tree species. Private inholdings are numerous in the Parks Smith Planning Area and also exhibit an extensive harvest history. Few snags or down wood were retained in past harvest units. Broadcast slash burning in these units often destroyed any habitat structure that was left. Snag levels are very low and can be categorized in the 30% tolerance range by DecAID standards.

The Willamette Forest Plan requires snags be retained in harvest units and throughout the drainage to maintain at least 40% of the potential population of cavity excavators. Snags in decay classes I, II, or III and greater than 20 feet tall should be considered when meeting Forest Plan requirements. Snags in decay class IV and V should be retained whenever possible. For green-tree and snag retention patches on Matrix lands, the Forest Plan requires a minimum 15% of regeneration harvest unit acres be retained over multiple rotations for species that require very old forests. This standard does not apply to commercial thinning units. The Forest Plan also requires 240 linear feet of downed logs per acre, at least 20 inches in diameter and greater than 20 feet long, be retained in harvest units on Matrix lands.

2. **American Marten (*Martes pennenati*)**- American martens are associated with forested habitats of any elevation and typically do not inhabit woodland areas. The American marten relies on mature and old-growth forests to provide feeding, resting and breeding areas (USDA 1990). Although mature forests with closed canopies are preferred, openings in the forest with sufficient down wood would also be utilized as habitat (Csuti et al 1997). Habitat for the American marten has been designated in the form of a Management Area (9c) on the Willamette National Forest and is 14,568 acres in size. This area has been designated to provide stands of mature forest habitat necessary for viable American marten populations and species with similar habitat needs (USDA 1990). The Parks Smith Planning Area lies outside of the American marten Management Area (9c). In addition, there are no known records of sightings within any proposed harvest units.

   Proposed units in the Parks Smith Planning Area can be characterized as one age class, with stands averaging 30- 55 years old. Tree class size ranges from 9 to 13 inches in diameter and dominate tree species are in the Douglas fir and noble fir series. Timber harvest has occurred extensively in the planning area except for lands designated as wilderness. Previous harvest activity has created dense canopy closure and low diameter growth among tree species. Private in holdings are numerous in the Parks Smith Planning Area and also exhibit an extensive harvest history. Few snags or down wood were retained in past harvest units. Broadcast slash burning in these units often destroyed any habitat structure that was left. Down wood retention levels are low in the larger size classes even though the area can be categorized in the 30% tolerance range by DecAID standards. Large down wood pieces that are representative of older stands are absent from proposed units. The Willamette Forest Plan requires 240 linear feet of downed logs per acre, at least 20 inches in diameter and greater than 20 feet long, be retained in harvest units on Matrix lands.

3. **Big Game** - Big game species within the planning area include Roosevelt elk, black-tailed deer and mule deer. Roosevelt elk and black-tailed deer use the area from spring through early winter or until the snow depth drives them out. Mule deer migrate from the east side of the Cascades during the early summer and return in late fall. Roosevelt elk, black-tailed deer and mule deer utilize similar habitats on the forest. All three species migrate using summer and winter ranges. Elk appear to be more sensitive to the effects of forest management and are used to represent the habitat requirements of all three species (USDA. 1990, p. III-76). Deer and elk use natural openings (such as wet meadows) extensively for foraging, breeding and calving. To function as prime habitat, these openings must be surrounded by sufficient cover to offer security from predation, inclement weather and human disturbance. Most big game use of openings occurs within 300 feet of hiding cover and most big game use of hiding cover occurs within 900 feet of forage areas (Wisdom, et al. 1986). As such, small openings scattered across a forested landscape create the most secure habitat for big game.

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

   Habitat for big game has been designated in the form of Emphasis Areas on the Willamette National Forest and management objectives for habitat quality have categorized in 3 levels: low, moderate and high (USDA 1990). Low emphasis areas require no specific management practices and quality would depend on other management activities. Moderate emphasis levels require that some management practices may be evaluated for their effect on elk and subsequently, some activities may be needed to maintain habitat quality. Activities may include road closures and forage improvement. High emphasis areas are sites that have less than 1.5 miles of road per section. These areas have high quality forage and are typically evenly distributed. Intense management is recommended and maintaining optimal cover in the winter range may be required some land allocations (USDA 1990). Winter range areas are typically below 3500ft in elevation and are areas where elk congregate during the cold season.

   The Parks Smith Planning Area contains all or a portion of five Big Game Emphasis Areas (Table 42). In addition, the Parks Smith Planning Area contains winter range as designated in the Forest Plan. All proposed harvest units currently provide thermal and hiding cover for deer and elk. This project has the potential to modify big game habitat effectiveness through the placement of harvest units, prescriptions and management of new or existing roads. These HEI indices would be used as criteria to compare alternative effects on big game habitat effectiveness.

Table 42. Big Game Emphasis Areas in the Park Smith Planning Area.

Big Game Emphasis Area (BGEA)	BGEA Total Acres	Area Percentage within the Planning Area	Emphasis Level
Browder	5356	95 %	Moderate
Frost	13,804	30%	Moderate
Hackleman	21,860	60%	High
Maude	7358	95%	High
North Fork Parks	5965	100%	High

A Model to Evaluate Elk Habitat in Western Oregon (Wisdom, et al. 1986) is used to evaluate elk habitat quality and project effects on this quality. Habitat values considered in the model are forage quality, cover quality, open road density and the spacing of forage and cover areas. A mathematical equation is then used to integrate the four habitat variables to obtain an overall value of habitat effectiveness (HEI). Habitat effectiveness scores for individual variables and for overall effectiveness indices are given 5 ratings of habitat condition (see Table 43).

Table 43: Habitat Effectiveness (HEI) Definitions

Habitat Effectiveness Scores for Individual Variables	Habitat Condition
1.0	Optimal
0.6 - 0.9	Highly Viable
0.4 - 0.5	Viable
0.2 - 0.3	Marginal
0.05 - 0.1	Possibly Non-Viable

Table 44: Current Habitat Effectiveness Values-Summer

Big Game Emphasis Area	Size & Spacing (HEs)	Road Density (HEr)	Cover Quality (HEc)	Forage Quality (HEf)	Habitat Effectiveness Index (HEI)
Browder	0.91	0.50	0.67	0.59	0.65
Frost	0.81	0.52	0.83	0.29	0.56
Hackleman	0.88	0.41	0.72	0.49	0.60
Maude	0.88	0.33	0.64	0.47	0.54
North Fork Parks	0.92	0.37	0.65	0.48	0.57

Table 45: Current Habitat Effectiveness Values-Winter

Big Game Emphasis Area	Size & Spacing (HEs)	Road Density (HEr)	Cover Quality (HEc)	Forage Quality (HEf)	Habitat Effectiveness Index (HEI)
Browder	0.87	0.40	0.60	0.46	0.56
Frost	N/A	N/A	N/A	N/A	N/A
Hackleman	0.86	0.42	0.77	0.45	0.60
Maude	1.00	0.10	0.71	0.05	0.25
North Fork Parks	N/A	N/A	N/A	N/A	N/A

Browder BGEA- Current summer HE values for Browder BGEA are variable. Sizing and spacing and cover quality are considered highly viable. Forage quality and road density are viable. In addition, the overall HE rating is 0.65, indicating highly viable habitat conditions. Winter HE values are of similar quality and the overall habitat condition rating is viable. Most available forage within the management area occurs in managed stands that were clear-cut 20 years ago. Forage quantity would decline as these stands grow into hiding cover (See Tables 44 and 45 above for BGEA comparisons).

Frost BGEA- Current summer HE values for Frost BGEA are variable. Sizing and spacing and cover quality are considered highly viable. Forage quality drives down the overall HE rating and is of marginal condition. The overall rating of this BGEA is 0.56, indicating that habitat conditions are viable. Winter range ratings were not available for analysis. Open road density within this management area is currently 0.52 (See Tables 44 and 45 for BGEA comparisons).

Hackleman BGEA- Current summer HE values for Hackelman BGEA are also quite variable due to private land allocations. Sizing and spacing and cover quality are highly viable while road density and forage quality are viable. The overall habitat condition of this BGEA is 0.60, indicating a highly viable habitat condition. Winter range habitat conditions are similar to summer conditions with an overall habitat condition of 0.60, indicating highly viable habitat quality. Open road density within this management area is currently 0.42 indicating viable condition (See Tables 44 and 45 for BGEA comparisons).

Maude BGEA- Current summer HE values for this BGEA are slightly variable with size and spacing and cover quality in highly viable condition. Road density is marginal, whereas forage quality is viable. The overall habitat condition of this area is 0.57 and viable. Winter HE values are lower in condition quality with a HEI of 0.25, indicating marginal conditions (See Tables 44 and 45 for BGEA comparisons).

North Fork Parks BGEA- Current summer HE values for this BGEA are slightly variable with size and spacing and cover quality in highly viable condition. Road density is marginal, whereas forage quality is viable. The overall habitat condition of this area is 0.54 and viable. Winter HE values were not available for this analysis (See Tables 44 and 45 for BGEA comparisons).

Desired Future Conditions - Terrestrial Management Indicator Species

1. **Primary Cavity Excavators and Pileated Woodpeckers-** To maintain populations of snag-dependent wildlife, snags need to be provided in each successional stage of a plant community (Brown 1985). The significance of snags and down wood providing habitat for cavity dependent species has become an increasingly important issue as new information becomes available.

   Due to the over-stocking of tree species and over all low structural diversity of the Parks Smith Planning Area, future conditions should strive to obtain at least a 50% tolerance level described in the DecAID model in the future. This would not be possible in a single entry due to the overstocking of small diameter trees. Desired future conditions would also include developing high diversity areas with a multi-story canopy structure, abundant snag and down wood levels, along with enhancing habitat richness and connectivity. In addition, desired future conditions for this project area would be to maintain at least Forest Plan Standards and Guidelines with consideration of DecAID information to further mitigate actions where applicable.
2. **American Marten (Martes pennenati)-** The significance of down wood habitat has become an increasingly important issue as new information becomes available. DecAID shows that as down wood percent cover increases throughout a habitat type (Westside Lowland Conifer-Hardwood Forest Western Cascades, Small/Medium Tree condition was used for analysis purposes) there is a general increase in cumulative wildlife species composition. Northern flying squirrels, Townsend's chipmunk and Western red-backed salamanders were several species that showed a notable increase in cumulative species composition, indicating that down wood percent cover can be an integral part of maintaining species viability (Mellen et al. 2006). DecAID also shows that cumulative species composition did not significantly change as down wood composition increased in tolerance levels for certain species. Pacific shrew, Trowbridge's shrew, and Townsend's vole showed a relatively stable cumulative species composition as tolerance levels increased (Mellen et al. 2006).

   Due to the over-stocking of tree species and over all low structural diversity of the Parks Smith Planning Area, future conditions should strive to obtain at least a 50% tolerance level described in the DecAID model. This would require multiple entries over time. Desired future conditions would also include developing high diversity areas with a multi-story canopy structure, abundant snag and down wood levels, along with enhancing habitat richness and connectivity. In addition, desired future conditions for this project area would be to maintain at least Forest Plan Standards and Guidelines with consideration of DecAID information to further mitigate actions where applicable.
3. **Big Game** - Habitat would be managed to maintain viable populations. Distribution of habitat would provide for species viability and maintenance of populations throughout their historic range on the Forest. Currently, the Parks Smith Planning Area is composed of 41% Optimal Habitat, with 24% Thermal, 13% Hiding and the remaining portions in other habitat types. Future management activities should focus on maintaining all cover and foraging types. This would involve decreasing open road mileage and shifting dominate cover types, such as hiding and thermal, to more optimal cover type conditions.

Direct and Indirect Effects- Terrestrial Management Indicator Species

1. **Primary Cavity Excavators and Pileated Woodpeckers**

Alternative 1- No Action

This alternative would not modify or disturb snag or down wood levels within the proposed units. Under Alternative 1, all conditions of the Parks Smith Planning Area would remain the same without any management activities or modifications.

Alternatives 2 & 3

Alternative 2 and 3 would involve thinning in the Parks Smith Planning Area and would briefly degrade habitat by reducing the canopy closure in treated areas to 40-60%. Retaining remnant old-growth trees (trees over 30 inches DBH, if present), current snags and down wood and creating additional snags and down wood where needed would improve habitat for the pileated woodpecker and other cavity excavators as the canopy increases. It is estimated that in about 10 years, the tree growth as a result of thinning would increase tree diameter, height and canopy closure. This would result in improved habitat over current conditions. No proposed actions would take place in the 9b Pileated Woodpecker Management Area. Design criteria to increase snag and down wood levels would be employed as required by current Standards and Guidelines and recommendations from DecAID. Therefore, Alternative 2 or 3 may impact individuals or their habitat temporarily, but the proposed actions would not likely contribute towards a loss of viability to the population or species.

2. **American Marten (Martes pennenati)**

Alternative 1- No Action

This alternative would not modify or disturb snag or down wood levels within the proposed units. Under Alternative 1, all conditions of the Parks Smith Planning Area would remain the same without any management activities or modifications.

Alternatives 2 & 3

Alternative 2 and 3 would involve thinning in the Parks Smith Planning Area and would briefly degrade habitat by reducing the canopy closure in treated areas to 40-60%. Retaining remnant old-growth trees (trees over 30 inches DBH, if present), current snags and down wood and creating additional snags and down wood where needed would improve habitat for the pine marten as the canopy increases. It is estimated that in about 10 years, the tree growth as a result of thinning would increase tree diameter, height and canopy closure. This would result in improved habitat over current conditions. No proposed actions would take place in the 9c American Marten Management Area. Design criteria to increase snag and down wood levels would be employed as required by current Standards and Guidelines and recommendations from DecAID. Therefore, Alternative 2 or 3 may impact individuals or their habitat temporarily, but the proposed actions would not likely contribute towards a loss of viability to the population or species.

3. **Big Game**

Alternative 1- No Action

The quality of thermal cover in proposed units would eventually increase under Alternative 1 as natural mortality thins the dense stocking levels, releases dominant trees and allows a shrub/herbaceous

layer to develop in small openings. Thermal cover is most valuable to big game when stand canopies are dense enough to intercept and hold a substantial amount of snow with dispersed openings for secluded foraging.

Road densities would remain the same as they are currently, but some local roads may close over time through vegetative growth and lack of maintenance. This alternative would also result in less forage than the action alternatives because the dense canopy closure does not allow light to the forest floor to produce abundant forage.

Alternative 2 & 3

Alternatives 2 & 3 provide an opportunity to improve big game hiding and thermal cover by reducing tree density and allowing more structural diversity to develop sooner than could be expected in Alternative 1. Reducing the canopy cover allows more sunlight to reach the forest floor to promote shrub and herbaceous vegetation growth. The development rate of complexity is greater in action alternatives than would occur naturally under Alternative 1 barring any major natural disturbance. Either Alternative would improve habitat conditions in the long term. In addition, approximately 14 miles of open road would be decommissioned, thus further improving the overall habitat quality for elk. Therefore, Alternative 2 or 3 would have no impact to big game in the Parks Smith Planning Area.

Cumulative Effects- Terrestrial Management Indicator Species - Past management actions related to timber harvest activity are generally responsible for the current condition of habitat throughout the project area. These actions have affected the overall diversity of forested habitat largely by reducing the amount of old growth and increasing the amount of early to mid-seral habitat. There are no foreseeable actions that would negatively affect old growth habitat in this area. The activities associated with Parks Smith would improve existing seral conditions and guide managed stands towards an old growth regime. The effects from this project on seral stage development that influences suitability for management indicator species such as those dependent on down wood and decayed ground litter would be inconsequential relative to the cumulative effects from past actions. Current science, the changing trend in timber management and activities associated with this project should improve habitat conditions in the long term.

The area analyzed for cumulative effects was the Parks Smith Planning Area and proposed harvest units. Past timber harvest, road construction, fire suppression and road maintenance activities have contributed to cumulative effects. Timber harvest, road building and natural disturbances have all impacted management indicator species habitat within the Parks Smith Planning Area. Current harvest prescriptions designed for these alternatives may temporarily impact management indicator species habitat; however over time, thinning treatments would promote forest vigor and health. Proposed actions would also create more stand structural diversity within the project area to meet desired future conditions and Forest Plan Standards and Guidelines.

Consistency with Direction and Regulations – Management Indicator Species - This project is consistent with current standards established for projects that would specifically affect Management Indicator Species and associated habitat. The activities associated with this project are consistent with direction and

regulations outlined in the Regulatory Framework, Management Direction and Guidance section outlined in the Wildlife Specialist Report in the project record (available at the Sweet Home Ranger District).

F. Migratory Birds

Introduction and Analysis Methods – Migratory Birds

The Pacific Northwest supports the highest abundance of birds in any coniferous forest system in North America (Altman 1999). Neo-tropical migrants comprise the largest portion of the bird community and have been absent from resource management plans (Altman 1999). Past management activities have created homogeneity across the landscape and as a result, neo-tropical migrant populations have been on the decline. In addition, fire suppression has added to the decrease in habitat variability. Species such as the olive-sided flycatcher, western wood pewee, brown creeper and varied thrush have exhibited significant population decline as a result of habitat loss and fragmentation (Altman 1999).

Land bird species exhibit a dramatic response to the height, seral stage, canopy structure and spatial distribution associated with forest habitat where greater numbers of birds are associated with more complex heterogeneous forested landscapes (Altman 1999). In addition, the importance of habitat associated with hardwood trees and shrubs has been widely documented in published literature as one of the leading factors influencing bird community composition in conifer-dominated landscapes that typify the Parks Smith Planning Area (Csuti et al. 1997, O'Neil et al. 2001, Marshall et al. 2003). Such habitat in this project area is generally located in riparian reserves, but is scattered across upland settings as well.

No formal surveys were completed to assess neo-tropical migrant populations. GIS applications were used to assess habitat and literature was researched to obtain recent studies in the Pacific Northwest that would reflect the same conditions as the Parks Smith Planning Area. Hagar et al. (2004) analyzed survey data that documented the presence of associated species during an intensive young stand study (YSS) that included Douglas fir dominated managed stands in an area similar to the Parks Smith Planning Area. Data analysis (YSS) revealed the following for neo-tropical migrants:

Bird species richness (number of species/stand) was positively affected by thinning and increased to the greatest extent in stands that were moderately thinned.

No species regularly detected prior to thinning were absent during post-treatment surveys regardless of thinning intensity.

Current Conditions- Migratory Birds

The Parks Smith Planning Area has undergone extensive management activities which have left the area in a homogenous state. Along with large amounts of private land allocations, this area exhibits a high overstocking of trees with tree mortality on the rise. Stands across the landscape are less than 80 years old and have canopy closures of 80% or greater with an average DBH of 9-11 inches. Northern flickers, dark-eyed juncos, hermit warblers, varied thrushes, winter wrens and yellow-rumped warblers were among the species observed in the Parks Smith Planning Area.

Desired Future Conditions- Migratory Birds

Desired future conditions for migratory birds would involve management practices that ensure long-term viability of healthy populations. Identifying areas that express extreme homogeneity and employing management activities that would introduce variability across the landscape would be the first step in maintaining viable populations. Efforts should focus on creating a multi-story, complex canopy structure with habitat components such as, down wood, snags and small openings. Maintaining meadow and riparian areas should be a primary focus as well. A strategy should be implemented that takes into consideration the recommendations from the Partners in Flight Conservation Strategy which has identified at least 20 focal species.

Alternative 1- No Action - Direct and Indirect Effects- Migratory Birds

This alternative would not modify or disturb any habitat associated with migratory birds, including snag or down wood levels within the proposed units. Under Alternative 1, all conditions of the Parks Smith Planning Area would remain the same without any management activities or modifications.

Alternatives 2 & 3 - Direct and Indirect Effects- Migratory Birds

Alternative 2 and 3 would involve thinning in the Parks Smith Planning Area and would briefly impact habitat by reducing the canopy closure in treated areas to 40-60%. Retaining remnant old-growth trees (trees over 30 inches DBH, if present), current snags and down wood and creating additional snags and down wood where needed would improve habitat for certain migratory species. It is estimated that in about 10 years, the tree growth as a result of thinning would increase tree diameter, height and canopy closure. This would result in improved habitat over current conditions and create a more heterogeneous condition across the landscape. Such habitat is thought to benefit a greater number of migratory species (Marshall et al 2003).

In addition, design criteria to increase snag and down wood levels for such dependent species would be employed as required by current Standards and Guidelines and recommendations from DecAID. Therefore, Alternative 2 or 3 may impact individuals or their habitat, but the proposed actions would not likely contribute towards a loss of viability to the population or species.

Cumulative Effects- Migratory Birds - Past timber management within the Parks Smith Planning Area has resulted in homogeneity across the landscape. As a result, there has been a significant decrease in some species of neo-tropical migrants. The Parks Smith Thinning Project would create more diversity across the landscape and allow more species to utilize the increased variety of habitats. This diversity would involve creating an open forest canopy with a multi-story structure to encourage a shrub/herbaceous layer. Disturbance in these areas, however, would be spatially distributed across the project area and temporally distributed throughout multiple breeding seasons further reducing the likelihood of disturbance to individuals.

The area analyzed for cumulative effects was the Parks Smith Planning Area and proposed harvest units. Past timber harvest, road construction, fire suppression and road maintenance activities have contributed to cumulative effects. Timber harvest, road building and natural disturbances have all impacted the amount of snags and down wood habitat within the Parks Smith Planning Area. Past timber harvest and road building have reduced snag and down wood habitat while natural disturbances typically have increased snag and down

wood levels. Current harvest prescriptions designed for these alternatives may initially reduce canopy closure; however over time, thinning treatments would promote forest vigor and health. Proposed actions would also create more down wood and snags within the project area through design criteria efforts to meet desired future conditions, Forest Plan Standards and Guidelines and recommendations from DecAID where applicable. In the reasonable foreseeable future, there are no additional habitat altering projects identified at this time within the Parks Smith Planning Area.

Consistency with Direction and Regulations – Migratory Birds - This project is consistent with current standards established for projects that would specifically affect migratory bird species and associated habitat. The activities associated with this project are consistent with direction and regulations outlined in the Regulatory Framework, Management Direction and Guidance section outlined in the Wildlife Specialist Report in the project record (available at the Sweet Home Ranger District).

Fire/Fuels

Methodology and Scale of Analysis

Analysis was done to predict post-harvest fine fuel loads in the planning area. Pre & post harvest fuel load predictions were obtained using digital photos, stand exam data & ocular methods. Fine fuel loadings were measured against the guidelines levels established in FW-252. Forest Plan Update No. 2 (10/18/1993) clarified that tons per acre of fuel established in FW-252 were not an acre by acre or unit level standards, but thresholds for a certain level of fire intensity.

Consequences were analyzed using a combination of fire and fuels modeling/assessment tools. The following is a list of analysis methods and their uses:

- *BeHave* by Remsoft: software predicting a range of factors related to fire behavior.
- *Fire Regime Condition Class* (FRCC): framework for evaluation/quantification of stand health relative to historic conditions.
- *Fire Behavior Prediction System Fuel Models* (FBPS): standardized fuel models for predicting fire behavior characteristics.
- *Forest Vegetation Simulator* (FVS/FFE): model used for predicting & simulating forest stand and fuel dynamics.
- *First order Fire Effects Model* (FOFEM): software for predicting a range of fire effects, including mortality and smoke emissions.
- *Fuels Management Analyst Suite* (FMAPlus): for evaluation, quantification and prediction of the effects of a range of fuel treatment activities.
- *Geographic Information Systems* (GIS): mapping/evaluation of spatial characteristics of fire and fuels information/data.

Table 46 shows the ***scale of analysis*** and ***measurement criteria*** used to evaluate effects proposed project actions on fuels and the potential for wildfire.

Table 46: Scale of Analysis and Measurement Criteria

Scale of Analysis	Resource Effect	Measurement Criteria
Proposed harvest units	Fuel loading	Tons/acre
Planning area	Departure from the natural fire regime	Vegetation characteristics, fuel composition, fire frequency, fire severity within range of natural conditions

Existing Conditions – Fire/ Fuels

The planning areas is in a combination of mixed and high severity fire regimes with fire return intervals in the majority of the area ranging from 100 to 400 years. Most (about 90%) of the area has not departed from the natural fire regime. So vegetation characteristics, fuel composition, fire frequency, fire severity, burn patters, and associated disturbances are within the range of natural/historical variability. The remaining 10% of the planning area has moderately departed from the natural fire regime.

Fires history records between 1970 and 2003 indicate that approximately 95 fires caused by lightning, humans and escaped debris burns were reported and suppressed within or immediately adjacent to the planning area boundary. These fires were scattered across the landscape and ranged in size from 0.1 to 47 acres, with the majority of fires 0.1 acres or less.

Fuel, especially fine fuels, are required for fires to spread and gain the intensity needed to ignite heavier fuels. Table 47 illustrates the current fuel loadings in the project area.

Table 47: Current Fine (0-3") and Coarse (>3") Fuel Loadings (in mean tons/acre)

0-3" Fuels	3-6" Fuels	6-12" Fuels	>12" Fuels	Total Fuel Load
3.7	14.5	2.9	10.6	32.7

Fuel models predict that fires are generally not very intense in most of the planning except under severe weather conditions involving high temperatures, low humidity and high winds do the fuels pose fire hazards. For a small portion of the planning area, fires are predicted to burn with greater intensity and have a higher probability of developing into crown fires which may lead to large fires with significant mortality when hot, dry and windy conditions persist.

Desired Future Conditions – Fire/Fuels

Forest Plan Standards and Guideline for "Hazard Reduction Specifications," state that the desired condition for management activity-created fuels should be maintained at or below 7-11 tons/acres for 0-3" fuels. This range represents the upper limit of our ability to safely and effectively handle a wildfire with ground forces and to keep resource impacts within acceptable levels. These desired fuel loadings are somewhat flexible to meet other resource requirements.

The desired condition for Fire Regime Condition Class (FRCC) in treated stands in the project area is to be within the range of natural/historical variability of vegetation characteristics, fuel composition, fire frequency, fire severity, and associated disturbances.

Environmental Consequences – Fire/Fuels

Alternative 1 – No Action – Direct and Indirect Effects

Under **Alternative 1**, no fuels would be generated from harvest activity and forested stands would continue on a path of natural succession. However, modern fire suppression policies would continue to dictate fire exclusion from the project area. A lack of significant disturbance would mean that stands that were previously managed would continue growing into an overstocked condition. Slow growing and weakened trees would die and contribute to the fuel build-up on the forest floor. The natural fire regime would begin to move outside of the range of natural/historical conditions with changes in one or more of the following: vegetation characteristics, fuel composition, fire frequency, fire severity, burn patters, and associated disturbances. Over time, the increasing fuel loads could be associated with greater fire intensity, severity and rates of spread. Fire occurrence on the landscape would continue only under uncontrolled wildfire situations.

Due to the **cumulative effects** of fire suppression, the build-up of fuels in previously un-thinned stands would become a more significant problem over the next 50 years. Increasing stand density and the accumulation of fuels would inevitably lead to a wildfire that is much more difficult to control than a fire in a thinned stand. Condition class would continue to worsen until future treatments are accomplished or a stand destroying wildfire occurs. A severe, large wildfire may not occur in the project area for 50 years or more, but natural combinations of weather and fuel conditions would ensure that it would happen eventually.

Alternatives 2 and 3 – Direct and Indirect Effects

Project activities that have the potential to affect fuel loadings and fire risk include the amount and density of thinning, the creation of fine fuels when logs are felled and limbed, and proposed fuel treatments.

The following have been built into the alternative design to ensure compliance with Forest Plan standards and guidelines, laws, regulations and other policies:

- Various fuel treatments would be done to reduce the majority of fine fuels to 7-11 tons per acre after harvest activities are completed especially in high risk areas such as along well-traveled roads, in areas adjacent to heavy recreation use or in areas adjacent to other property owners.

The proposed commercial thinning would open the stands, creating a forest canopy less susceptible to sustaining a crown fire. Ladder fuels would be reduced as harvest operations remove the vertical fuel continuity. Because stands thinned to an average 40% canopy closure would have fewer residual trees and more crown spacing, these stands would be less susceptible to crown fires than stands thinned to an average 60% canopy closure.

The proposed treatments for the action alternatives include roadside grappling and burning, removal of tops and limbs and unit grapple piling with burning. The amount of harvest-related slash remaining in a unit depends primarily on the pre- existing surface fuel load and the number of trees to be harvested. In the Park

Smith Thin project area, stands that have been previously thinned would require harvest of fewer trees than stands that have never been thinned (assuming similar prescriptions). As a consequence, harvest generated slash would generally be heavier in previously unthinned units. In addition, previously unthinned stands in the project area generally have heavier pre-existing surface fuel loadings. This is true because there are more crowns to shed needles/twigs/branches, and because unthinned stands tend to have more dead and dying trees.

Under Alternative 2 & 3, grapple piling and burning (or equivalent treatment) would occur on 242 acres within the units and along designated roads. Removal of tops and limbs would occur on approximately 240 acres. All units with harvest activities would have landing piles burned following harvest. As a result of these treatments, residual fuel loadings in approximately 80% of the project area would be within forest standards and guidelines for 0-3" fuels. Fuel loadings in approximately 20% of the project area would be at or below forest standard and guidelines while residual slash decomposes. Alternative biomass utilization would occur if the market exists for wood fiber or firewood.

Increased surface fuel loads affect fire behavior by temporarily increasing fire intensity and rate of spread. The increase in fuel loading is temporary because moderate to heavy precipitation in the western Cascades Mountains accelerates the decomposition processes, especially for fine fuels. As a result, fire danger in an untreated stand would be highest 1-5 years after thinning and would decrease significantly thereafter. Studies done by Fahnestock and Dieterich have shown that Douglas fir slash decomposes to approximately 79 % of its original volume after 5 years (Fahnestock). Field observations on the Willamette have indicated that Douglas-fir and Western hemlock slash decomposes to approximately 50 % of its original volume after 10 years; observations have found that less than 10% of residual slash remains after 20 years. This indicates that all harvest units in the Park Smith Thin area would be within Willamette National Forest Standards and Guidelines for 0-3" fuels after 10 years. Because fire spread is primarily driven by 0-3" fuels, standards and guidelines for 0-3" fuels are used to determine when slash loadings are above acceptable levels.

Cumulative Effects - As already noted, fire suppression practices during the past 50 years have caused the greatest consequences with regard to fuels in the project area. Past timber management of the Park Smith Thin planning area has been a secondary factor influencing cumulative effects on the forest fuel loadings. This has resulted in surface fuel loads and crown densities that are generally low-moderate in about 34% of the planned harvest area; these areas are represented mostly by fuel model 8. Surface and crown fuel loads in approximately 25% of the planned harvest area are generally moderate, and are mostly represented by a fuel model 5 & 8. Since 1970, several timber sales have had a secondary benefit of mitigating the effects of fire suppression by reducing stand densities on more than 5,000 acres within the 36,170 acre Park Smith Thin area. Past timber harvests that have occurred within the Park Smith Thin planning area have included Parks Overstory Removal, Browder Cat & Kitten, Toad Prairie Salvage, Dane Timber Sale and most recent Prairie Fence. Of the 36,170 acres, 1470 acres are privately owned and have had timber harvested over the years. A considerable amount of acres within the planning area have not been managed with timber harvests. Many of these acres are within dispersed recreation allocations or special habitat delineations. A wildfire in these stands has the potential to become larger and cause more tree mortality than a fire in thinned stands. With recommended fuel treatments, areas that currently have low fuel loadings are expected to be within forest

standards and guidelines after treatments are completed. From a fire danger perspective, this means that post-treatment fire risk in these areas would be typical of other healthy stands found on the Willamette National Forest. Thinning would produce the secondary benefit of long-term resistance to crown fire development and stand destroying fires in the project area. Main roads and spur roads within the project area where residual fuels have been thoroughly removed would serve as access points for firefighters and fuel breaks to reduce continuity of remaining slash. After thinning and slash treatments, if a fire were to start in the remaining fuels, it would be more likely to exhibit lower fire intensity due to lower crown density and lighter fuel loads, especially as residual slash decomposes (Sources; GTR-INT-122, Willamette NF GIS timber sale data, and field obs.)

Air Quality

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

Existing Conditions

The Oregon Smoke Management Plan has established designated areas that are principal population centers and Class I airsheds, including wildernesses and other sensitive airsheds. One purpose of the Oregon Smoke Management Plan is to protect air quality in these high priority areas. The closest Class I airsheds are the Mt Jefferson wilderness 2 miles to the east and the Mt Washington wilderness 12 miles to the south.

Desired Future Conditions

Meet the requirements set by the 1990 Clean Air Act and the 1977 Clean Air Act and its amendments by following the Oregon Smoke Management Plan.

Environmental Consequences – Air Quality

Alternative 1 – No Action - Direct and Indirect Effects

There would be no immediate impacts to air quality as a result of the No Action Alternative. However, the stands would continue to store biomass as they grow and postpone the release of smoke. The build-up of fuels represents a threat of the uncontrolled release of large amounts of emissions in the event of a wildfire. As noted earlier, fire exclusion has exacerbated the build-up of fuels in the project area and has made the potential for a large wildfire more likely the longer the forests go unthinned.

Eventually a large fire would occur during summer months when fuels are the driest, resulting in high fuel consumption and large amounts of smoke. Smoke from such wildfire could blanket Sisters, the Bend Designated Area or one of the nearby wildernesses. This would amount to a significant, negative effect on air quality and visibility in the affected area. The most likely time for a large wildfire to occur would be between July 1 through September 15, coinciding with outdoor recreation activities and high public use of the wilderness.

While there is no evidence to suggest such a release of pollutants would be of any harm to general air quality, it is clear such an event could have significant impacts on air quality to sensitive areas. Table 48 gives an indication of the volume of common pollutants that would be released in the event of a wildfire.

Table 48: Project Area Burning Emissions Estimates (tons/acre)

Emission Type	Wildfire ++
PM 2.5	337
PM 10	398
PM Totals	735

++Based on wildfire burning on approximately 1291 acres, late summer conditions.

Alternative 2 – Proposed Action – Direct and Indirect Effects

Project activities that have the potential to affect air quality include proposed slash burning. The following have been built into the alternative design to ensure compliance with Forest Plan standards and guidelines, laws, regulations and other policies:

- Prescribed burning would occur during fall and winter months according to limitations established by Oregon Smoke Management System forecaster.

Air quality in the designated areas could be affected by fuel treatments that include pile burning. Table 49 illustrates the estimated totals of PM 2.5 and PM 10 emissions (particulate matter 2.5 and 10 microns) according to treatment type and compares them to wildfires.

Table 49: Burning Emissions Estimates (tons/acre)

Emission Type	Alternatives 2 and 3	Wildfire ++
PM 2.5	112	337
PM 10	133	398
PM Totals	245	735

**Based on burning approximately 1032 acres of machine piles (landing and grapple piles).*
++Based on wildfire burning on approximately 1291 acres, late summer conditions.

Prescribed pile burning would occur during fall and winter months according to limitations established by Oregon Smoke Management System forecaster. By adhering to the smoke management daily forecast, smoke impacts on sensitive areas should be negligible. (Source: Oregon Smoke Management Emissions Estimates).

No long term, consequences to air quality are anticipated due to burning associated with this project. All burning would be completed within two years of harvest, and would create far fewer emissions than a wildfire occurring in an area of equivalent size. In order to protect air quality, the Oregon Smoke Management instructions would be strictly adhered to. The Santiam River Zone (Detroit Sweet and Home Ranger Districts) fire and fuels fire management strategy for prescribed burning is to avoid large, uncontrolled releases of

smoke that are produced during large wildfires. By burning slash fuels in one timber sale area at a time, residual fuels are treated gradually and in a controlled manner. For this reason, emissions from prescribed burning are not greater than emissions caused by natural wildfires. The Santiam River Zone currently burns 700 acres of logging slash per year. Fire history records for the district from 1970-2001 indicate that wildfires burned 3611 acres on district lands or an average of 120 acres per year. Natural fire return intervals on most of the 490,000 acre Santiam River Zone are 100-200 years (INFMS mapping). If we assume (as the established fire regimes suggest) that all lands on the district burn at least once every 200 years, we can determine that the historical (pre-suppression era) average annual acres burned was 2540 acres (490,000 divided by 200- see FRCC Guidebook) In other words, natural wildfires that occurred prior to the modern fire suppression era created a higher quantity of pollutants than are created by prescribed burning on the district today.

Soils

Methodology and Scale of Analysis

Methods: The soils/geology information was obtained from intensive field reconnaissance of proposed harvest units as well as the terrain surrounding those units. Field work was conducted intermittently through the fall of 2006 and the winter, spring, summer and fall of 2007. The major portion of the field work involved site-specific evaluation of existing conditions within each of the proposed harvest units. In almost all units where ground-based harvest methods were proposed, transects were taken to measure the amount of existing soil compaction as a percentage of the transect distance.

A minor portion of the field investigation was directed at distinguishing the various identifiable landtype components within the study area and mapping them on the photo overlays. As part of the landtype mapping process unsuited and unmanageable landtypes were delineated within the project area (FW-180). This information was used during sale planning so these areas could be avoided when designing proposed harvest units. Much of the landtype analysis was originally conducted for previous timber sale planning activities in this area. In general, this field investigation confirmed previously mapped work and most of the original 1973 Soil Resource Inventory (SRI) landtype designations for this area.

The field investigation of landtypes and the determination of the impacts from prior management activities formed the basis for the site-specific recommendations and mitigations as well as determination of effects of proposed activities on the soil resource.

Scale of Analysis - The scale of analysis for direct, indirect and cumulative effects was the “harvest unit”, i.e. the stand polygon proposed for silvicultural treatment. Impacts are generally the same in any given unit for all action alternatives, unless otherwise noted in the discussion that follows. The unit of measure for evaluating those effects is generally considered the percent of the “unit” affected. The harvest unit was selected because it is the area where impacts occur to the soil resource.

Desired Future Condition

Forest Plan "objectives for ground-disturbing projects are to prevent significant changes to soil productivity and to mitigate or restore degraded soils to the conditions that existed prior to the management activity if preventive measures cannot be applied during the project" (Chapter IV, p. 13 LMRP).

In most situations, preventing soil impacts is the most effective and feasible way of ensuring long-term soil productivity.

The following are desired conditions for soil productivity, detrimental soil conditions, soil erosion, nutrient cycling and instability:

- *Soil Productivity* - "Land management activities shall be planned and conducted to maintain or enhance soil productivity and stability." (FW-079) and shall "meet or exceed the stated objectives in the Organic Administration Act of 1897, the Multiple Use Sustained Yield Act of 1960, NFMA of 1976, FSM 2550 , and FSM 2520 R-6, Supplement 50." (FW-080).
- *Detrimental Soil Conditions*- The total area of cumulative detrimental soil conditions should not exceed 20% of the total acreage within the activity area, including roads and landings. Detrimental soil conditions include compaction, displacement, puddling, and severely burned soil layers." (LMRP IV-60 ….FW-081)
- *Soil Erosion*- To minimize off-site movement of soil, management activities shall be planned to retain the soil duff and litter (as outlined in the LMRP on page IV- 60)(FW-084).
- *Nutrient Loss*- Management activities shall be planned to maintain enough large woody material (dead and down) to maintain a healthy forest ecosystem and ensure adequate nutrient cycling (FW-085)
- *Mass Movement* (Instability) - Mass movement shall be managed to meet Forest standards for soil productivity, water quality, riparian condition, and to protect public safety, roads, and facilities (FW – 086).

Existing Condition

Compaction – The major source of compaction (and also much soil disturbance) in this planning area has been ground-based yarding equipment used during harvest operations.

Field investigation conducted on proposed harvest units, especially those that had been yarded with ground-based equipment in the past, indicated that none of the units as a whole exceeded the Willamette National Forest (FW-081) standard of 20% of an activity area impacted by compaction. However, the central portion of Unit 27 (which is divided into three distinct parts) is currently at 20%, which is the threshold of concern for the standard. The north and south portions respectively are at 8-10% and 10-12%. In addition, some individual transects on other units, such as Unit 5 and Unit 9 approach the standard. However, these two units on average are sufficiently below the threshold not to be considered a concern (see Soils Specialist Report in the project record (available at Sweet Home Ranger District) for transect data which investigates compaction on these units.

Displacement- The major source of soil displacement from management activities is yarding (especially ground-based yarding), mechanical slash treatment, and road building/maintenance. These items were assessed to determine the current condition of soil displacement in the planning area

Yarding activities that have occurred in this area in the past, for the most part, occurred with appropriate log suspension requirements to prevent soil displacement.

Mechanical slash treatments – Activity-created slash on some of the oldest managed stands may have been tractor piled which can result in both excessive displacement and compaction. Whether yarding and mechanical slash treatment resulted in moderate to major detrimental impacts to soil productivity in some units is difficult to determine. Tractor piling has not been considered acceptable as a management tool for over 20 years on the Willamette National Forest. Stand, shrub and brush growth, as well as duff accumulation over the decades has provided an effective ground cover. At this point in time, little physical evidence can be found in any unit to indicate whether these two timber management activities resulted in significant, long-term detrimental soil displacement or off-site soil movement.

Soil puddling- Soil puddling in this area is generally the result of compaction (in wet conditions) which is discussed above.

Severely burned soil layers- There is no visible evidence of severely burned soils in proposed harvest units within the project area.

Because the side slopes are relatively gentle and overland flow is limited throughout this project, erosion from roads is not generally considered a concern, except in a few localized areas.

Decomposing organic matter contributes to soil nutrients. Consequently, an analysis of the soil duff layer and availability of down woody material gives an indication of the soil nutrient condition.

The primary mechanism for excessive soil nutrient loss is uncontrolled wild fire at high fuel loadings, low fuel moistures, and adverse weather conditions. Wildfire consumes much of the down woody material and duff, especially under extreme conditions.

Most of this project area was burned by either natural or aboriginal fires that were likely prevalent and carried through much of the project area in the last several hundred years. Many areas may have been underburned instead of stand replacing fires. Consequently, natural accumulations of down woody debris may not have been prevalent in many parts of this project area, or all of the accumulating down woody debris was removed by the fires. These conditions vary across the landscape, depending on aspect, elevation, and slope position.

Many of the managed stands also had the initial harvests when Piling Unmerchantable Material (PUM) standards were in effect. This required that larger waste material (usually 8 inches wide and 10 feet long or greater) be removed from harvest units to reduce fire intensity. These piles were often burned, after firewood was removed, thus removing a source of soil nutrients from the units.

In addition, most managed stands were clearcut and broadcast burned which removed additional amounts of above-ground organic matter. Past slash treatments usually maintained some amount of duff, though the current duff retention standards may not have been achieved. Consequently across numerous older managed stands, management-generated, down woody debris or slash is at low levels, likely replicating the natural condition in many areas.

On the other hand, younger plantations retained much more slash and large woody debris as was the current Forest plan direction.

As a result of management history and fire intensity, there is currently a wide range in the above-ground tonnage of decomposing organic matter (soil nutrients) both within and between harvest units.

Environmental Consequences

Alternative 1 – No Action

Compaction- Evidence of soil compaction from previous harvest entries remains in most units that were yarded with ground-based equipment. Over time, the soil building process, cycles of wetting and drying, freezing and thawing, plant growth and microbial activity would continue to return the soil in these areas to near pre-harvest conditions.

This alternative would not allow the opportunity to speed up the process of reducing existing compaction levels on about 74 acres of these previously harvested units through the use of subsoiling. This could potentially prolong the impacts of soil compaction which include: restricted root growth, reduced rainfall infiltration rates, and increased overland flow and runoff in some areas.

Displacement - There is little evidence of past soil displacement from yarding since, for the most part, these activities occurred with appropriate suspension requirements to prevent displacement. In the areas where soil may have been displaced by previous yarding or mechanical slash treatment during the initial harvest entries, over time the soil building process would continue to return the soil to near pre-harvest conditions.

Soils displaced by previous road development would remain unchanged in the No Action alternative.

In these overstocked stands, densities would increase, growth would slow and mortality would rise. Fuel accumulations from blowdown, snowdown and bug kill would provide an ever increasing amount of fuel and increase the potential for wildfire. Duff layers would accumulate and expand from annual needle fall as well as suppressed conifer and brush mortality. In the short term, nutrient levels would rise with the resulting decomposition of biomass. However, wildfires under dry moisture regimes and heavy slash accumulations would remove the expanding duff layer and volatilize the near surface organic material in the soil, resulting in a overall loss of nutrients detrimental impacts to long-term soil productivity.

Intense rainstorms for 1996 to 2000 produced essentially no road failures in the northern part of the project area, and only a few sidecast road failures in the southern portion of the project where the terrain is much steeper.

Alternatives 2 and 3

Compaction - - The major activities contributing to soil compaction include yarding, mechanical slash treatment, roading, and subsoiling. Each of these are analyzed in the following discussion.

Yarding – Ground-based - The silty nature of these 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 excessive soil compaction and/or disturbance for this harvest entry. For this reason the design of both action alternatives includes the requirement for pre-designated skid roads and reuse of

previously compacted areas (existing skid roads) as much as possible when using ground-based yarding equipment in order to minimize the area of soil compaction. Monitoring has also 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 13% of the acreage of any particular harvest unit.

Capturing water and routing it down a different path could occur from the use of ground-based yarding equipment, processor forwarder, tractor, or shovel on approximately 612 acres. Ground-based systems tend to have a higher risk of encountering ground water and bringing it to the surface than aerial yarding systems. The designs of units 12, 20, and 25 (a total of 69 acres) have this potential and could result in the creation of additional wet areas. These effects would be reduced through the utilization of Best Management Practices that designate skid trails and season of operations.

Yarding – Skyline - Skyline yarding with one-end suspension is proposed on about 679 acres. Most of these units had low existing compaction levels at generally less than 5% in the skyline areas. Past experience with skyline operations in thinning units with small wood and intermediate supports usually impacts less than 1% of the unit area with respect to soil compaction. So the combination of existing compaction with projected compaction from proposed harvest activities would result in about 6% compaction for these units. This is well below the Forest Plan standard of 20%. Skyline landings are primarily planned at old existing landings, road turnouts, and road junctions. Consequently, significant cumulative effects from existing compaction and skyline yarding are not anticipated.

Grapple piling - Grapple piling occurs with a grapple not with a dozer brush rake. Grapple piling requires only one pass of the machine across the landscape, and the machine works while sitting on slash. Extensive monitoring of grapple machine piling operations indicates that little or no additional compaction occurs with this method of slash treatment.

Roading- All temporary roads would be decommissioned and subsoiled following use.

Subsoiling- Since past unrestricted tractor yarding and/or mechanical slash treatment are still contributing to soil compaction in portions of most ground-based harvest units, it is possible that cumulative compaction in the central portion of Unit 20 may exceed the Forest Plan threshold of 20% compaction at the completion of proposed harvest activities. Consequently, subsoiling is required mitigation on about one acre in the central portion of this unit to insure that cumulative soil compaction levels remain below the 20% standard. Based on previous experience, this mitigation effort should be successful. For example in previous activities with other units with past subsoiling, the overall compaction was reduced by up to 10% from initial levels.

Enhancement funds collected as a result of implementing action alternatives provides the opportunity to subsoil existing skid roads and landings as much as is practical in order to reduce compaction to lower levels. Subsoiling may be curtailed in some areas in order to reduce the amount of root pruning of leave trees and to avoid excessive amounts of exposed soil. Units 3-9, 12-17, 21, 22, 25, 27, 32, 34 and 40 total about 740 acres. About 612 of the 740 acres in these units would be logged using ground-based yarding equipment. Assuming approximately 10% reduction in compaction for all 740 acres, the equivalent of 74 acres could be subsoiled in both action alternatives. Because timber markets have been down recently there is some uncertainty as to whether or not sufficient enhancement funds would be available for the 74 acres of subsoiling. If sufficient

enhancement funds are not available for all units, then the dollars that are available would be distributed on a priority basis to the units with the greatest level of initial compaction, receiving the most attention. Even if the equivalent of all 74 acres cannot be subsoiled because of lack of available money, compaction levels on these units would be within forest plan standards and guidelines.

With the above sale design criteria and mitigation, the use of designated skid roads, one-end suspension in skyline units, the reuse of the existing skid road system, and the subsoiling of primary landings and skid roads, compaction is not anticipated to exceed the 20% threshold value in any unit and should be below the 15% level (or lower) in most units. These compaction values are less than standards and guidelines for soil compaction analyzed in the Willamette Forest Plan 1990 as amended and are therefore not cumulatively significant.

Displacement- The major activities contributing to soil displacement include yarding, mechanical slash treatment, road building, and maintenance.

Ground-based Yarding – To minimize soil displacement on 612 acres where ground-based yarding is proposed, sale design criteria include the following: a) employing ground-based yarding on portions of harvest units where slopes are gentle enough (generally 30% or less); locating ground-based yarding well away from active drainages, or having skid roads cross ephemeral swales only during dry periods and at right angles; c) requiring the B6.422 contract clause (pre-deisignated skid roads) be strictly adhered to, and/or implementation of line pulling and directional falling, as appropriate, and d) use of existing skid or haul roads before any additional new skid or forwarder roads are developed.

Skyline Yarding – On the 679 acres proposed for skyline yarding, sale design criteria requires implementation of the logging suspension requirements mandated in the Land and Resource Management Plan to protect the soil from excessive disturbance or displacement (FW-107 and BMP T-12) (see Implementation Plan in Appendix A). 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 (MA-15-27).

With appropriate suspension during yarding operations, soil disturbance is minimal and off site erosion is essentially non-existent. During harvest, the retention of stream adjacent trees and the requirement of full suspension yarding over or away from stream courses would minimize or eliminate off-site erosion.

Given the design criteria for both ground-based and skyline logging, it is expected that soil displacement would be well within Regional and Forest standards and significant adverse impacts are not anticipated.

Mechanical Slash Treatment –Grapple piling requires only one pass of the machine across the landscape, and the machine works while sitting on slash. Extensive monitoring of grapple machine piling operations indicates that little or no additional compaction or displacement occurs as a result of this action.

Roading- Approximately 14 of the proposed harvest units may require temporary roads to access suitable landing sites for either ground-based or skyline yarding systems. In all cases, temporary roads are located on gentle stable side slopes in common material. No full bench construction is required and for the most part, no active drainages are crossed. Some units are accessed by opening old logging roads constructed many decades ago. In most cases, use of these old roads would allow for drainage structure improvements and fill

stabilization. Some units are accessed by using newer Forest Service roads that now require some additional work to maintain adequate road drainage and surface integrity.

In summary, development of the transportation system for this sale would maintain slope stability, would produce little or no off site erosion, and would provide opportunity to rehabilitate old road courses.

Potential cumulative effects from displacement with previous management were not observed in the field reconnaissance.

Duff would be retained on harvest units to help control nutrient loss. Objectives for duff retention are outlined on a unit-by-unit basis in the Soils Report in the project record.

Another aspect of long term nutrient availability and ectomycorrhizal formation is the amount of larger woody material retained on site. Management activities are planned to maintain enough large woody debris (dead and down) to provide for a healthy forest ecosystem and ensure adequate nutrient cycling (FW-085). At this time, site specific needs are considered commensurate with wildlife objectives as outlined in FW-212a and FW-213a (as amended).

For all action alternatives, within the managed plantations, slash would be piled and burned. Piling would occur with a grapple machine. In a typical thinning these piles occupy about 1.8% to 2% of an acre. In many cases only a few acres of any particular unit are piled. Burning the piled slash may develop sufficient heat to affect the underlying soil. However, pile burning is usually done in the fall or winter months when duff and soil moistures are higher, and this helps reduce the downward heat effects to the soil. Consequently, pile burning is considered a minor effect and not cumulative because of the limited overall acreage involved.

Furthermore, reducing stocking improves stand health and vigor resulting in less mortality which also reduces fire risk.

Given duff and large woody material retention, in combination with reduction in wildfire risk, it is not anticipated that there would be any detrimental effects to soil nutrients from this action. Furthermore potential cumulative effects from nutrient loss were not observed during field reconnaissance.

Approximately 3.8 miles of spur roads would be reopened and 1.1 miles of new temporary roads would be constructed to access suitable landing sites for either ground-based or skyline yarding systems in 14 units proposed for harvest in this project. In all cases, these temporary roads are located on gentle stable side slopes in common material. No full bench construction is required and for the most part, no active drainages are crossed.

Some units are accessed by using newer Forest Service roads that now require some additional work to maintain adequate road drainage and surface integrity. In summary, development of the transportation system for this sale would maintain slope stability, would produce little or no off site erosion, and would provide opportunity to rehabilitate old road courses.

Potential slope instability with proposed management is not considered a concern. No specific mitigation is proposed for these units, as none is needed.

Conclusions - Soils design criteria and mitigation measures are intended to maintain long term soil productivity and provide a level of erosion control that is consistent with the standards and guidelines of the Willamette National Forest's Land and Resource Management Plan (1990) and Oregon State Department of

Environmental Quality guidelines. All prescriptions or mitigation measures are designed to meet or exceed the requirements outlined in the General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988). Prescriptions for soil protection and watershed considerations take into account past and predicted future land management activities. Standard contract language should provide 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).

At this time, no single unit 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, including mitigation measures and design standards, 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 would 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.

Transportation

Methodology and Scale of Analysis

The road system was analyzed both in the office and in the field. First roads were analyzed on 1979 aerial photographs and using GIS to determine slope position, steepness, number of stream crossings and proximity to fish-bearing streams. The roads were then investigated in the field to determine road conditions such as potential for culvert failures, plugged ditches, and other road-related aquatic concerns. In addition, haul routes, as well as landing and temporary road location needs (new construction and reopening of existing spur roads) were examined. For each road along the haul routes, specific road construction, reconstruction and pre-haul maintenance needs were determined.

Primary information sources used to describe the existing condition and to analyze alternative differences include the following: INFRA Travel Routes; Roads GIS Layer; VEGIS GIS Layer; Stream GIS Layer; and Sweet Home Ranger District Roads Map.

The scale of analysis was the system and non-system roads within the project area. ***Measurement criteria:*** 1) total road miles, 2) number of stream crossings, 3) miles of roads in Riparian Reserves, and 4) miles of road construction/reconstruction/pre-haul maintenance.

Existing Condition

Primary access to the Parks Smith planning area is provided by State Highways 20 and 22, mainline roads 1500, 1598, 2672, and 2067. The mainline roads are a higher level single-lane road with turn outs; all of which are gravel surfaces except for the beginning of 1500 and 2067 which are asphalt-surfaced for short

sections. All other roads tributary to these major access roads are primarily single-lane gravel, pit-run, or native-surfaced roads with turnouts which have been built and maintained primarily for timber harvest activities. Most of these roads are termed local roads.

There are about 159 miles of system roads and an unknown number of non-system roads in the project area. Approximately 33 miles of these roads are located within Riparian Reserves.

Roads are split almost evenly between the northern and southern parts of the project area. Roads in the north are generally located on stable, flat ground and tend to not be a threat to aquatic resources, although some roads here have experienced damage from ditch drainage. Those in the southern portion tend to be on steeper ground and some show evidence of cut and drainage failures.

Most of the major road systems in the project area were constructed in the 1960s and 1970s with older road construction standards. The amount of newer road construction slowed considerably in the late 1980s, and with subsequent harvest entries, reconstruction began to dominant. Newer roads, when required, were constructed to better fit the terrain. Cuts and fills were minimized, and drainage controls were added to promote long-term slope stability.

The following fish passage barriers in the project area have been identified by a forest-wide survey in 2000 are included in table 50 below. Barriers to other forms of aquatic life have not yet been identified.

Table 50 - Fish Passage Barriers as identified by "Willamette National Forest Fish Passage Inventory"

Road	Milepost	Stream_Name	Project Haul Route
2672	2.70	Unnamed	Yes
1598	0.40	Browder Creek	Yes
1598	2.75	Gate Creek	No
1598	7.50	Smith River	No
1598-212	3.05	Wildcat Creek	No
2067	1.30	Maude Creek	Yes
2067-560	2.80	North Fork Parks Creek	No

Road maintenance activities are variable within the project area. The main roads have generally been maintained with some consistency while many of the smaller, spur roads have not had regular road maintenance. About 20% of the roads are officially closed as maintenance level 1 roads. Many other roads are currently closed, inaccessible due to down trees, or grown closed with vegetation. Although these roads are officially or effectively closed, nothing has been done to hydrologically stabilize them for storage. They are effectively abandoned, in some cases because of lack of funding for maintenance. For example near the end of road 2672 406 the entire road fill has washed away and a bare culvert is now standing in the streambed. When the road fill washed away, it resulted in a large flush of sediment to Hackleman Creek.

About 10-20% of the roads in the project area have old culverts that are deteriorating. In addition, an estimated 5% of culverts are plugged leading to ditches and runoff streams being diverted into the roadbed. The diverted water runs down the road and then runs off onto native soil, resulting in gully erosion. This is the case in the northern portion of the 2067 560 road between proposed harvest units 1 and 2. Diverted water

along this section of road 2067 560 has resulted in gulley erosion about 1000 feet long through deep rich soil. There are roads where this effect has not happened yet, but there is potential for it to happen if the roads are left in their current state.

Most of the roads accessing proposed harvest units which would be used as haul routes are owned and maintained by the U.S. Forest Service (about 25 miles); while about 20 miles are Cost Share Roads (used by multiple landowners). For the most part these roads are generally in good condition due to light traffic volumes and seasonal access. Needed road work includes brushing, blading, ditch reconditioning, spot surfacing placement, danger and downed tree removal, culvert inlet and outlet cleaning, and occasional replacement of damaged culverts to facilitate haul.

Desired Future Condition

Hydrologically, the desired future condition for the road system with respect to aquatic resources is a road network that:

- minimizes disruption of natural hydrologic flow pathways, including diversion of streamflow and interception of surface and subsurface flow;
- minimizes sediment delivery to the drainage network; and
- provides and maintains aquatic species passage at all road/stream crossings.

From the transportation system perspective, table 51 depicts forest roads within the Parks Smith planning area that are designated as Key Forest Roads according to the Willamette National Forest Roads Analysis (January 2003) (*see also figure 9 Key Forest Roads*). Key Forest Roads are perceived to be the minimum system of routes needed to meet anticipated forest management objectives and public access needs. Key Forest Roads are the roads most traveled to sites within the forest. They provide the majority of forest visitor, administrative, commercial and research travel needs. These roads are identified as the key roads to important destination points and provide a network of vital inter-forest connections.

Table 51: Key Forest Roads

Road Number	Objective Maintenance Level
1500000	4 – Moderate Degree of User Comfort
1500080	2 – High clearance vehicles
1598000	3 – Suitable for Passenger cars
2067000	3 – Suitable for Passenger cars
2067508	2 – High clearance vehicles
2067560	3 – Suitable for Passenger cars
2266 317	2 – High clearance vehicles
2672000	3 – Suitable for Passenger cars

These key forest roads "should be operated and maintained to standards consistent with its road maintenance objective. The public would be encouraged to use the system of Key Forest Roads for access into and through the Forest." Willamette National Forest Roads Analysis (January 2003).

Environmental Consequences

Alternative 1 – No Action – Direct and Indirect Effects

Road conditions would remain unchanged. Road maintenance activities would occur according to established patterns of routine maintenance. No additional road maintenance, reconstruction, or construction would occur with this alternative.

Existing roads, especially those that are effectively closed and have not been hydrologically stabilized for storage, have in some cases intercepted water and re-routed it down different pathways than would have occurred naturally. Diversion of stream flow would continue and create additional sites of accelerated erosion, over time, if roads are not hydrologically stabilized or maintained. Interrupting these natural hydrologic flow pathways can change the timing and quantity of water historically delivered to streams. This can result in erosion and sediment delivery to streams, which can affect aquatic species and their habitats.

Some existing roads have intercepted subsurface flow, which can affect water storage and the metering of base flows. In this alternative, the existing road network would continue to intercept subsurface groundwater flow. These changes in the flow of water off the landscape lead to similar effects described above.

Furthermore, there are some existing roads, which are inhibiting passage of fish and other aquatic species at road/stream crossings. These passage barriers would continue to be an issue. This has the effect of reducing the available habitat and potentially affecting species viability, at least locally.

Alternatives 2 and 3 – Direct and Indirect Effects

In this alternative project activities that could affect transportation and associated hydrologic/aquatic resources include: hauling on 45 miles of road; reconstruction and maintenance on the 45 miles of haul routes; five culvert replacements; re-opening 3.8 miles of spur roads; construction 1.1 miles of new temporary roads; restoration of fish passage on road 2672, and numerous skid roads on 612 acres of harvest units that would be yarded with ground-based systems.

Sale design criteria to lessen road-related hydrologic flow impacts includes: Spatial and temporal controls over road activities, design, construction, and maintenance that stem from 23 Road related Best Management Practices (BMP). These practices were developed to address the best science available to protect water quality. By utilizing these BMP's the state of Oregon has agreed to our meeting the intent of the Clean Water Act in the protection of the waters of the State. Implementing these BMP's will include:

- Decommissioning all temporary roads following harvest activities to reduce compaction and improve water infiltration thus reestablishing natural drainage patterns as much as possible;
- Replacing three damaged ditch-relief culverts and two culverts on live streams to ensure that culverts are less likely to fail or plug in the future leading to impacts to the natural hydrologic system.
- Dry season restriction for use of temporary roads and road maintenance/reconstruction

- Work would be required on 45 miles of the existing road system either as a) reconstruction, b) pre-haul maintenance, c) during-haul maintenance or d) post-haul maintenance in order to facilitate haul during the recommended season of use, to comply with the current Road Management Objectives, and to improve road drainage. The Forest Development Roads to be used for hauling activities for the Parks Smith Planning area are shown in Appendix F, along with identified work needed (reconstruction or pre-haul maintenance) required for project use.

Under Alternatives 2 and 3, the proposed development for the Parks Smith Planning Area would utilize but not expand the existing Forest Development Road system. With the reconstruction and maintenance planned, these routes would serve the public, permit holders, and employees as access to the National Forest while reducing impacts to the environment.

For a short period of time following road work there is potential to introduce fine sediment into the system during the first fall flush. Restoration of fish passage at the stream crossing on Road 2672 would also likely introduce sediment. The resulting sedimentation to streams is expected to be of low magnitude and short duration (the first storm in the fall that creates runoff). Long-term sediment delivery due to roads would over time decrease because of road work planned as part of this planning effort.

There would be a net decrease in diversion of stream flow from natural pathways because some roads would be treated to restore hydrologic connectivity through road reconstruction and maintenance activities.

The existing road network would continue to intercept subsurface groundwater flow and bring it to surface flow. Since there is no planned new system road construction or re-contouring road restoration, there is no expected additional effect due to this project.

There is no new road construction over fish bearing streams. Fish passage would be restored on road 2672 at a site that was identified as one of seven fish passage barriers in the project area.

It is expected that there would be a net decrease in aquatic impacts from the road system for Alternative 2 because the design criteria implemented as part of this project and proposed post-sale activities to decommission and storm-proof roads would reduce the impact of the road system by re-establishing natural drainage patterns that are disrupted by roads.

Cumulative Effects - The scale of analysis for cumulative effects was the planning area. Past activities that are still contributing to road-related hydrologic impacts include 159 miles of system roads and an unknown quantity of temporary and skid roads within the project area that have the potential to alter natural hydrologic flow pathways. There are also at least 20 miles of system roads that are closed, or are potentially not being maintained and have not been hydrologically stabilized. In addition, there is a mix of private land in the planning area with roads that have the potential to contribute to fine sediment delivery to streams and lakes. Diversion of surface flow and diversion of subsurface flow also occurs as the result of theses roads.

Reasonably foreseeable actions that also contribute to road-related hydrologic impacts on aquatic resources include road restoration such as decommissioning and storage of roads as identified in the table 52 below.

Table 52: Proposed road storage, decommissioning, and drivable stormproofing.

Road	Treatment	# live stream culverts pulled	Road Miles
2672-410	Storage *	1	1.2
2672-406	Storage*	1	0.7
1500-080	Storage*	2	2.1
1598-265	Storage*	0	0.5
2067-560	Storage*	0	1.5
Total miles of road storage			**6.0 miles**
*non-system to Unit 36	Decommission**	1	0.4
Total miles of road decommissioning			**0.4 miles**
2672-425	Drivable stormproofing***	1	1.4
1598-240	Drivable stormproofing***	0	1.1
1598-170	Drivable Stormproofing***	0	2.2
1598-212	Drivable Stormproofing***	0	3.3
Total miles of drivable stormproofing			**8.0 miles**
Total miles of road storage, decommissioning and stormproofing			**14.4 miles**

- ***Road storage*** *consists of pulling all culverts (including ditch relief culverts), installing waterbars, as needed, and placing a large impassable berm at the beginning of the road.*

** ***Road decommissioning*** *consists of all the components of road storage plus bucket ripping to 30" depth and tree planting.*

*** ***Roads to remain drivable*** *will have drivable dips installed over live streams where needed as determined by district hydrologist. Waterbars (where necessary for road maintenance) will consist of minimum 10"deep and maximum 200' spacing, and be drivable.*

These future actions would help to stabilize these roads and their drainage pathways. It would also eliminate the potential for storm damage and the need for road maintenance on these treated roads.

Effects of Alternative 2, private roads and other roads not used as part of this project combine to create more disruption of natural hydrologic flow pathways than this project would alone (see discussion in existing condition). There will be an additional 4.9 miles (*3.8 miles of existing spur roads and 1.1 miles of new temporary roads*) of temporary roads during the project implementation that will add to the total of 159 miles of roads in the project area. Temporary roads would be decommissioned and subsoiled following project activities. Of the 45 miles of road used by this project, approximately 14.4 miles will be treated to reduce their effect on aquatic resources. Overall, including the road treatments of storage and decommissioning, this project is expected to lead to a net improvement to the natural hydrology in the planning area.

The Forest Service does not anticipate any future timber sale or public works projects to be conducted within the Parks Smith planning area that could result in adverse conditions or cumulative effects for timber sale haul or other activities associated with this planning effort.

Alternative 3

Road-related hydrologic effects are similar between Alternatives 2 and 3. Slightly more volume would be hauled in Alternative 3 (9.3 MMBF) than in Alternative 2 (9.1 MMBF). In addition, the number of loads hauled down various stretches of haul routes may vary slightly because of differences in thinning intensities between harvest units in the action alternatives, but otherwise effects are the same.

Conclusions - The road system in the planning area does have aquatic risk roads that pose a threat to stream ecosystems and soils. The project would not create any new system roads and temporary roads would be decommissioned following use. Due to hydrologically stabilizing 14.4 miles of roads, this project is expected to improve the overall condition of road impacts on the aquatic resource.

Aquatic Resources

Methodology

Analysis of the project area involved both an office review of existing information and a field review of the proposed harvest units and surrounding areas and streams by a geologist, hydrologist and fisheries biologist. The field review included walking through and around the perimeter of the proposed units, as well as walking through streams and wet areas in the vicinity of proposed harvest units. Riparian condition was also evaluated during these surveys. Locations of streams within the project area were documented on maps and photos and streams were sampled to confirm existing fish distribution records, confirming fish presence/absence, and species composition. Stability, slope, soil types, vegetation type, aspect, and juxtaposition of the units were considered in developing prescriptions to protect and/or enhance the hydrology, stream channels, water quality, fishery, and Riparian Reserves found within the project. Opportunities for restoration and habitat enhancement were also identified (see Aquatics Report in project record for more detailed information).

Existing Condition

There are **six fish-bearing** streams within the project area that have the potential to be affected by this project. They include Browder Creek, Gate Creek, Smith River, Hackleman Creek, Park Creek, and Crescent Creek. All of these streams are documented to be utilized by cutthroat trout. Field surveys have confirmed that Hackleman Creek and Park Creek also contain brook trout. Other resident fish species including mountain whitefish, redside shiner, speckled dace, brook lamprey, torrent sculpin, mottled sculpin, shorthead sculpin, and Paiute sculpin may be present in the project area but were not specifically observed during field reconnaissance.

Region 6 level II surveys of Park Creek (1993 & 2006) documented the presence of sculpins (species unknown) in addition to cutthroat trout.

These local populations are resident fish and are derived from natural reproduction. The origins of the brook trout are unknown, and during field surveys for this project they were observed in Hackleman and Park Creeks.

Cutthroat trout were observed consistently in Parks, Hackleman, Browder, and Crescent Creeks during field surveys in the summer of 2007. Sculpins were observed occasionally. Macroinvertibrate populations appear normal in density and diversity as compared to other streams in this watershed. Stone flies (Plecoptera), may flies (Ephemeroptera), and caddis flies (Tricpotera), especially case- making caddis, were consistently observed to be the dominant invertebrates present. No fresh water clams or mussels (Bivalvia) were observed. No specific sampling was conducted for fresh water clams or mussels as it is not indicated for this project area.

Browder Creek is the southern most creek in the project area. It drains towards the east in a southward direction into the Smith River. It joins the Smith River approximately 1 mile upstream of Smith Reservoir. Field reconnaissance during the planning phase showed fish presence up to FS road 1598. The culvert on FS road 1598 is perched and presents a passage barrier. This creek is characterized by good cover, and small gravels with areas of bedrock in the area of the harvest units. There is one proposed unit that is adjacent to, or within the Riparian Reserve of this creek.

Gate Creek flows towards the east and then turns south as it flows into the Smith River. A 1996 R6 Level II stream inventory showed presence of salmonids of unknown species in this creek. There are no proposed harvest units adjacent to, or within the Riparian Reserve of Gate Creek.

Smith River flows from the west then turns south and is the major stream to which Browder Creek, Gate Creek, and other smaller tributaries drain to in the Smith River 6th field sub watershed. In the project area it is a relatively small river but as you proceed downstream towards Smith Reservoir (approximately 0.5 miles downstream of the project boundary) the river gains in size and has a higher diversity of fish species than the other creeks in the project area. Cutthroat trout, Rainbow trout, Brook trout, Mountain Whitefish, and Sculpin spp. are documented (Stillwater Sciences, 2006). There are no proposed harvest units adjacent to, or within the Riparian Reserve of Smith River.

Hackleman Creek originates in Tombstone Prairie and descends in an eastern direction for approximately 7.2 miles before discharging into Fish Lake. Field reconnaissance during the planning phase showed fish presence consistent with WNF GIS data. Cutthroat trout, Eastern Brook trout, and sculpins were observed during sampling. There is reference to a large presence of shorthead sculpins from a 1993 survey. This sub-watershed and its cutthroat trout are spatially isolated from the rest of the McKenzie River as a result of geologic formations. There are no proposed harvest units adjacent to, or within the Riparian Reserve of Hackleman Creek.

Park Creek begins at the confluence of North Fork Parks and South Fork Parks creeks. It flows in a southeasterly direction for approximately two miles prior to an almost direct south flow pattern that ultimately empties into Lava Lake. Field reconnaissance during the planning phase showed fish presence consistent with WNF GIS data. Cutthroat trout and Eastern Brook trout were observed during sampling as well as sculpins (species unknown). This is a population of spatially-isolated fish as there is no surface connectivity with the McKenzie River or any of its tributaries. There are no proposed harvest units adjacent to, or within the Riparian Reserve of Parks Creek.

There is one proposed unit within the Riparian Reserve of a tributary to North Fork Parks Creek. There is no previous documentation of fish presence in this tributary, but a fish (species unknown) was observed by

the hydrologist during field work while in the planning phase. The extent of distribution is unknown on this tributary, and the species of the fish was not identified. It was assumed to be a salmonid.

There is also one proposed unit within the Riparian Reserve of another tributary to Parks Creek. This unit is adjacent to and within the Riparian Reserve of Crescent Creek. Cutthroat trout were documented in the area of the proposed unit and distribution is expected to extend approximately 4 miles upstream of the unit on Crescent creek.

Ikenick Creek flows northward and ultimately into Clear Lake. There is documented presence of eastern Brook trout although none were observed during field sampling. Cutthroat trout were observed as well as sculpin. There are no proposed harvest units adjacent to, or within the Riparian Reserve of Ikenick Creek, but there is a unit that is in the Riparian Reserve of a fish bearing tributary to Ikenick Creek. There is no previous record of fish presence in this small tributary but juveniles were observed during field surveys. The upper limit of distribution on this creek has not been identified. There is an upstream migration barrier caused by the road crossing on this tributary on FS 2672 road. The downstream population of Ikenick Creek has connectivity with Clear Lake.

Table 53: Type of fish in Creeks

Stream	rainbow	cutthroat	brook	dace sp. ukn.	sculpin sp. Unk.	shiner sp. unk
Parks Creek		X	X		X	
Hackleman Creek		X	X		X	
Browder Creek		X	X			
Smith River		X				
Crescent Creek		X			X	
Ikenick Creek		X	X			

Distribution of fish species by creek as confirmed by field surveys during planning phase or through previously documented observations.

Desired Future Condition

Continue to provide adequate water quality and habitat conditions necessary for continued utilization by MIS fish species. Follow watershed analysis recommendations and upgrade or remove the existing fish passage barrier culverts.

Environmental Consequences

Alternative 1 - No Action

Fish would likely continue to use the streams within the project area. The existing barrier culvert limiting upstream movement of cutthroat trout would likely remain in place.

Alternatives 2 & 3

Fish would likely continue to use the streams within the project area, with similar species distribution. Adverse effects to fish habitat would be localized, and minor in magnitude, with no long-term loss of habitat.

The existing barrier culvert on the 2672 would be replaced, removing the isolation barrier, potentially benefiting the genetic health of the previously isolated group of cutthroat above the existing barrier.

Fish Habitat Condition, Refugia

- **Watershed Disturbance**: Disturbance from harvest activities began in the 1940's in the Upper McKenzie watershed. Approximately 24% of the watershed has been disturbed through **harvest** activities, most of which (about 90%) was regeneration harvest. Approximately 5% of the Riparian Reserves in the Parks/Lost Lake, Hackleman, and Smith 6th field subwatersheds have been harvested. Sometimes harvest occurred down to the creek's edge which decreased contribution of woody debris into creeks resulting in decreased habitat quality, abundance, and availability for fish.

  There are no areas that are currently recovering from any recent intense **fires** in the project area.

  There are no **dams** in the project area but there are five dams on the Upper McKenzie 5th field waterhshed. Smith Carmen dam is on the Smith River and limits fish distribution within the 6th field Smith River subwatershed.

  Historic **landslide instability** is present in some of the subwatersheds, including areas of mass wasting. Hackleman Creek is most notable. Landslides and mass wasting events deliver sediment to streams. Increases in fine sediment can cause loss of interstitial space and reduce spawning habitat. Increases in fines can also reduce the viability of invertebrate populations. During field reviews spawning gravels were within the natural range of variability for these subwatersheds as were invertebrate populations.

  Past **grazing** allotments have caused disturbance in Lava Lake and Fish Lake. Both allotments have been discontinued and those lake areas are recovering. The compaction that occurred as a result of the grazing has degraded the lake beds which are naturally dewatered during the summer. This degradation has contributed to a decrease in braided channels, loss of channel complexity and increase in bank erosion and fine sediment deposition in Parks Creek and Hackleman Creek as they enter into the lake bed areas. The decrease in braided channels decreases fish habitat area. The increase in fine sediment contributions from bank erosion decreases spawning habitat availability. As the banks continue to erode the creeks in these areas are becoming wider and more shallow reducing cover, and increasing temperature loading.

- **Road System**: There is evidence of past failure at a road culvert which resulted in a large flush of fine sediment into Hackleman Creek. This sediment entered the creek in an area that is within the documented distribution of fish and is likely to be causing site-specific degradation in conditions for fish here.

  In addition, there was a large flush of fine sediment delivered to a small unnamed tributary of North Fork Park Creek in the past. This sediment contribution resulted in poor spawning habitat and changes to the channel that are not beneficial to the fisheries resource.

  Generally speaking, the project area has had variable road maintenance activities. The main roads have generally been maintained with some consistency while many of the smaller, spur roads have not had regular road maintenance. A variety of road-related hydrologic impacts have contributed to increased delivery of fine sediments to fish-bearing streams and their tributaries. This delivery of fine sediments has

had site-specific negative impacts on fish including: decreases in spawning habitat quality and quantity due to increased substrate embeddedness; decreases in invertebrate population viability; temporary increases in turbidity; and temporary displacement and reduction in feeding behaviors in fish.

In addition, there are seven identified **fish passage barriers** in the project area.

- **Stream Flow:** Existing flow levels are likely near natural rates. Fish are not affected.
- **Riparian Reserves:** Previous management in Riparian Reserves has contributed to the interruption of wood delivery and stream shading processes in the 5th field Upper McKenzie watershed and the three smaller 6th field subwatersheds in the project area. The interruption of shading process contributes to alterations in the natural temperature regimes found in streams.
- **Temperature**: Data collected from one year in 1997 showed a seven-day rolling maximum temperature in Hackleman Creek of 65^0F, which exceeded the 64°F (17.8^0C) threshold established by the Oregon Department of Environmental Quality (DEQ). Stream temperature is very important to the aquatic communities' diversity and structure. Water temperature can mediate competitive interactions between fish species. Reeves et al. (1987) found that the interactions between redside shiners and juvenile steelhead were influenced by temperature. At temperatures of 19^OC to 22^OC shiners displaced trout through exploitive competition (i.e. more efficiently obtaining food), whereas, trout are dominant at temperatures of 12^OC to 15^OC because of interference competition (i.e. preventing access to food by defending territories). Alterations in environmental conditions like temperature may reduce habitat suitability for some species but increase it for others. In addition to the importance of temperature on community structure and diversity there are consequences of elevated temperatures for fish. Individual species have differing levels of tolerance for temperature fluctuations and the resulting physical conditions that occur if a fish must remain in an unsuitable area where the temperature is too high or to low for their particular tolerance. Commonly the problem observed for trout is unsuitably high temperatures during the low flow periods of summer. During these times resident fish must find cool water refuge in order to maintain metabolic processes. If there is no refuge, as the temperature increases, metabolic processes become stressed and can ultimately lead to mortality. Refuge can typically be found in deep pools, areas of subsurface cool water influence in the channel where there is enhanced hyporheic connectivity, and areas where flows from cool water springs emerge into an active channel. Fish would relocate themselves to these areas when possible and remain until temperature conditions become more favorable.
- **Turbidity and Substrate**: Currently there are few areas where substrate embeddedness or high percentages of surface fines exist. Channels scoured to bedrock are occasionally present in the project area, and these areas do not provide quality fish habitat. The historic morphological characteristics of stream valleys in the project area are similar to existing conditions. Site-specific changes have occurred as a result of past management activities including sediment pulses resulting from road related issues as described above. Turbidity levels for the project area are historically low. Larger juvenile and adult fish typically are little affected by episodic increases in turbidity; however there may be some reduction in use when turbidity levels exceed 70 NTUs (Bisson and Bilby, 1982), and

fry and young juvenile fish may be affected when turbidity levels exceed 25 NTUs (Sigler et al., 1984).

- **Chemical Contamination**: No sources of contamination are present.
- **Wood:** The quality, complexity, and function of fish habitat are often affected by the level of instream large woody debris (LWD). LWD influences the size and distribution of stream habitat units (Bilby and Ward, 1991); provides cover from predators; provides refugia habitat by deflecting stream flow; provides scour points for pool creation and/or maintenance; shades the water surface; and increases the sorting of substrate providing suitable spawning areas. LWD is instrumental in nutrient retention by capturing and storing allochthonous materials, a primary energy source for smaller rivers and streams (Gregory et al., 1991), and other organic matter (Bilby and Ward, 1989). Fish populations are typically larger in streams with plenty of LWD than in streams with little wood (Naiman and Bilby, 1998). Decreases in fish abundance have been documented following wood removal from channels throughout the Pacific Northwest (Lestelle 1978, Bryant 1983, Dolloff 1986, Elliot 1986). In the project area decreased levels of wood have resulted in decreased habitat complexity and availability for the resident fish populations.
- **Channel Complexity**: Channel complexity is variable across the project area. There is decreased complexity in the areas of Fish Lake and Lava Lake as an artifact of past grazing activities as described above. Decreases in channel complexity result in less quality habitat available for fish.

Desired Future Condition

- Fish habitat conditions within the project area that continue to be maintained or improved through time. Follow watershed analysis recommendations and restore degraded habitat.
- Water quality within the range that maintains the biological, physical and chemical integrity of the system, and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.
- Water flows sufficient to create and sustain riparian aquatic and wetland habitats and to retain patterns of sediment, nutrient, and wood routing.
- Water temperatures that satisfy, or are lower than the state established standards. The criterion established by the Oregon Department of Environmental Quality (DEQ) for salmonid rearing during the summer season is 17.8^0 C.
- The Forest Plan includes Standard and Guideline MA15-14 for Management Area 15 provides parameters for identifying “stable, diverse habitat for salmonids” as:
    1. **Substrate**: A well sorted variety of gravels, cobbles, and boulders, with less than 20% of spawning gravels in fines (<1.0mm), and less than 25% embeddedness of cobbles in riffle areas provide salmonid and invertebrate spawning and rearing habitat. Less than 25% of substrate should be comprised of fine sediment, (<1.0mm), and less than 25% of riffle areas should be embedded by fine sediments.
    2. **Large wood**: Diameter and length of woody pieces may vary according to the stream width and gradient; pieces larger than 25 inches in diameter are generally preferred. Large wood in

the stream would provide a variety of habitat and nutrient characteristics. In low gradient streams, an average of 20 pieces/1000 lineal feet is preferred. The size of wood should provide stable, diverse stream habitats during high flows. LWM should be longer than the stream width, with assorted diameters including pieces larger than 25 inches. A similar quantity and size of wood should be available for recruitment in the future. On steeper stream channels approximately 50% of the channel length should be directly influenced by LWM. This means half the length of any given reach of stream should be in a pool or sediment bar upstream of LWM, or in a plunge pool and associated gravel deposit downstream of a LWM accumulation, as well as the stream area occupied by LWM.

Environmental Consequences

Alternative 1 – No Action- Direct and Indirect Effects

Implementation of Alternative 1 would maintain fish habitat complexity in its current conditions and on its current trajectory.

- **Road System** – implementation of this alternative could result in continued erosion and sediment delivery to streams which could have a negative effect on fisheries resources.
- **Water quality** would be maintained in its current condition. Chronic and episodic inputs of sediment from the existing road system would not be reduced and could result in negative effects to fish.
- **Stream Temperature** – The implementation of this alternative would have little effect on the current trajectory of changes in stream temperature in the short term. Alternately, there would be an effect in the longer run. By taking no action in the Riparian Reserves the riparian trees would grow slower. Taller trees can provide more shade for streams. More shade contributes to the reduction in the potential for solar influences that tend to increase stream temperatures. In the no action alternative a period of time would occur where the riparian trees would not meet their full growth potential because of increased competition. This period would contribute to the delayed recovery of temperature reduction in the project area. If the trees are not thinned, there would be no benefit from reduced competition, and none of the trees would have the opportunity to grow faster and provide for more shade to the streams more quickly.
- **Wood** – The current state of large woody debris (LWD), pool quality and quantity, and general stream condition would remain. Over time LWD recruitment would return to higher levels in the watershed. This point in time would be delayed from the natural progression because these are densely vegetated, formerly managed stands with reduced growth rates. The Silviculture Prescription Parks Smith Planning Area (Elliott, 2007) report explains stand changes in detail. In the interim, fish habitat complexity in the stream areas adjacent to proposed harvest units would continue to have underdeveloped fish habitat. Changes in habitat complexity could occur with natural changes in hydrology, LWD levels, vegetation and other physical changes. These elements could change naturally and artificially through disturbance. If the stagnated growth rate reduces the recruitment rate of LWD to the channel, deficiencies could continue to be present and the result is a decline in habitat complexity for fish. Contributions of small diameter, transient wood could occur as a result of

implementing this alternative. This contribution could provide changes to channel complexity, but as a result of its transient nature would not provide long term habitat condition improvements. Under this alternative there would be no habitat enhancement for fish in the project area, and the continued stagnation of growth in the Riparian Reserves could result in the continued delay of high rates of LWD contributions.

- The implementation of the no action alternative would result in the continuation of the current conditions for fisheries with regard to watershed disturbances, streamflow, Riparian Reserves, turbidity and substrate, and chemical contamination

Alternatives 2 & 3- Direct and Indirect Effects

Implementation of Alternatives 2 or 3 could result in effects to the fishery resource in the project area. It is not likely that any effects would continue to effect fish downstream and outside of the project area. The effects from this project would still be within the natural range of variability for this system and should in the long-term be more positive than negative in nature. During the planning phase of this project any potential concerns relating to the fisheries resource were identified and the interdisciplinary team worked cooperatively to develop a project that would have beneficial effects to multiple resource objectives, including fisheries, in the project area.

As stated above there are current deficiencies in the project area related to fish habitat complexity. One area of deficiency is large woody debris (LWD). Implementation of this alternative should result in enhanced size and consistency in recruitment of LWD into this system. Trees would be harvested in Riparian Reserves outside of the primary shade zone in the action alternatives. There would be a no-entry buffer on all fish-bearing streams where units are directly adjacent to stream channels, and they would not be entered for commercial harvest. Table 54 below shows the unit numbers and the associated no-entry buffers for all units adjacent to fish bearing streams.

Table 54: No-entry buffers on fish-bearing streams

Unit Number	No Harvest buffer	Creek
1	Variable width – with a minimum of 90 ft. and an overall average of 120 feet	Tributary to N. F. Parks Creek
17	125 ft.	Crescent Creek
34	Variable width with a minimum of 89 ft. and an overall average of 185 ft.	Tributary to Ikenick Creek
36	100 ft	Browder Creek

- **Road System**: A net decrease in road-related impacts to fish is expected as a result of improvement to the roads system in the project area. Sediment delivery to streams is expected to increase during the first fall flush which would have indirect effects to fish as described above. Road-related effects to fisheries in the project area are expected to decrease over time and ultimately result in an improved condition for fish.

- **Stream Flow:** It is not anticipated that project activities in Alternative 2 or 3 would result in stream flow outside the natural range of variability for the project area. No direct or indirect effects to fish would occur as a result of implementing the action alternatives.
- **Riparian Reserves**: There is a difference in the effects to Riparian Reserves that would result from the implementation of Alternatives 2 and 3. The implementation of both alternatives would result in some thinning in Riparian Reserves.

Table 55: Acres thinned in Riparian Reserves in Units near Fish-bearing streams

Unit	Alternative 2		Alternative 3	
	Acres of Riparian Reserves thinned to 40% canopy closure *	Acres of Riparian Reserves thinned to 60% canopy closure*	Acres of Riparian Reserves thinned to 40% canopy closure*	Acres of Riparian Reserves thinned to 60% canopy closure*
1	12		12	
17		5	5	
34		5		5
36	30		30	

**minimum canopy closure post thinning in Riparian Reserve areas in units adjacent to fish-bearing streams*

- **Temperature:** This project was designed to protect and retain the primary shade zone and minimize the potential for increases in stream temperature. The project proposes to treat areas adjacent to and outside of primary shade zones along fish-bearing streams. These alternatives propose to retain the complete primary shade zone in harvest areas adjacent to fish bearing streams. Additional risk reduction would result from the 60-foot or greater no entry buffer on all perennial streams. According to the Implementation Strategies document, by retaining the primary shade zone during implementation for projects such as this, the risk of increasing water temperature is reduced to a discountable probability. By implementing the project as designed there should be no effect to water temperature and no effect to the fisheries resource.
- **Turbidity and Substrate:** These effects would be short term in nature, with a longer term positive effect. Effects to turbidity would be primarily caused by road work and timber haul. Temporary increases in turbidity can result in changes in fish behavior and feeding. Prolonged exposure to excessive turbidity levels can have dramatic effects on a fish population's viability and vigor. It is expected that the effects to fish would be mild and temporary. They would be in specific areas related to point source introduction of sediments as a result of road work and hauling operations.
- **Chemical Contamination:** Past projects with riparian thinning elements have demonstrated there is a very low probability of spilling significant amounts of fuel or oil near enough to channels to be transported and present risk to aquatic organisms. Project contract requirements and mitigation measures are effective measures to contain potential fuel and fluid transmission into waterways, reducing the possibility of aquatic habitat contamination to a discountable risk.

- **Wood:** There are expected changes in stand mortality, succession to late-seral stages and in-stream wood recruitment as a result of implementing Alternative 2 or 3. Where thinning is conducted in the Riparian Reserves the stands would experience growth at a greater rate. At some point these larger healthier trees would begin to have mortality as a result of competition. This mortality could result in the delivery of LWD into the stream channels that would have a long term positive effect on the fisheries resource in areas adjacent to the harvest units as well as in areas downstream of those units.
- **Channel Complexity**: Channel complexity would increase as a result of the influx of large woody debris.

Fish Growth and Survival

Existing Condition

Field examinations of fish within the project area show relatively high densities of fish. Populations appear to be healthy and thriving. The numbers and size of fish appear to be of a normal distribution with juvenile, subadult and adults all being observed. Natural production of native and non-native fish is successful at maintaining viable populations.

Low levels of human impacts exist. Human impacts in this area are related to the some fishing pressure for trout in Hackleman and Parks Creeks and recreational harassment at dispersed recreation sites.

Desired Future Condition

Improve habitat conditions to increase fish growth and survival.

Environmental Consequences

Alternative 1 – No Action

This alternative would have no immediate effect on fish growth or survival. Over the long-term, lack of road maintenance may result in large depositions of fine substrate, which would result in the loss of fish habitat, reduced spawning success, reduced fish fitness, and subsequent survival and even increased mortality depending on the size and location of the road failure.

Alternatives 2 & 3

These alternatives may result in a slight negative effect to fish growth rates. Effects of sediment to fish are based on two key components, the concentration of the sediment and the duration of exposure (Macdonald and Newcomb, 1991). The most sensitive life stage for salmonids is the egg and fry stage during the incubation period, juvenile and adult life stages are more resilient to sediment effects (Anderson, 1996). Because sediment generated is predicted to be both of low concentration and short duration of exposure, there would be no mortality experienced to juvenile or adult life stages. These life stages would alter their locations to avoid the stressor and because sediment is predicted not to travel great distances, displacement would be very limited. The incubating process for egg and fry life stages would have a minor short-term impact that could generate a very slight decrease in survival rates. Increased turbidity levels may negatively affect the

ability of fish to feed. Loss of interstitial space and fine sediment deposition may affect egg-fry survival in redds, and juvenile entrapment in channel substrate (Chapman, 1988).

Fish Population Size, Density, Hatchery Influences, Non-Natives, Dams

Existing Condition

Data on the trend in fish numbers or densities is not available for most fish species. Observed densities of cutthroat trout seem to be similar to other watersheds throughout the Sweet Home Ranger District. Parks Creek and Hackleman creek both have robust populations. There are eastern brook trout present in the project area. The origin of those fish is unknown. There is no hatchery stocking program in the project area.

Desired Future Condition

Fish numbers within project area streams would continue to be maintained or improved through time. Species diversity would continue to be kept at natural levels. Non-native fish would be removed from the system to allow native populations to access all potential habitat to maximize populations size and viability.

Environmental Consequences

Alternative 1 – No Action

Fish population sizes would likely continue to be maintained at current levels. This alternative doesn't upgrade existing problem roads, and therefore chronic and/or episodic sediment delivery from unstable road systems would continue to slightly depress the survival rates of fish in habitat near these roads, potentially leading to a slight reduction in the population size over time.

Alternatives 2 & 3

These alternatives would likely result in a very minor reduction in fish population numbers immediately following project implementation, due to the potential for reduced survival associated with increased sediment delivery. Longer term, habitat conditions would improve and population numbers should slowly increase until carrying capacity is reached.

Cumulative Effects - Fisheries - The area that is used to evaluate cumulative effects on fisheries for this project is the 5th field watershed of the Upper McKenzie River. The rationale for selecting that area is that there are several smaller 6th field subwatersheds in the proposed project area. By limiting the evaluation to those subwatersheds it would remove the opportunity to evaluate the interactions of fish between those three subwatersheds and the other 6th field subwatersheds within the Upper McKenzie that some of them are connected to. It is likely that there are interactions between the populations of those subwatersheds that are connected. Additionally, if the analysis was limited to the smaller subwatershed area it would exclude analysis of the nearest Endangered Species Act (ESA)- listed fish and would not analyze the potential impact on that population.

Past, present, and reasonably foreseeable future projects were reviewed and the effects of those projects relative to the fishery resource shows there is overlap in time and space with the potential for direct and indirect effects resulting from this action.

Historic clearcut harvest and subsequent broadcast burning down to the stream banks is still having a residual effect on fish habitat conditions, since this management interrupted the supply of wood to the streams, removed stream cover, and increased sediment delivery to the stream channel. Since these effects persist over time to some degree, and overlap in space with this project, they are still incrementally affecting the condition of the stream channel. There are private commercial timber lands in the project area. These lands are harvested more intensely and riparian thinning occurs into the primary shade zone in some areas. These management practices would have an effect on stream temperatures.

In addition to effects from past logging practices, there remains some indirect effects to the fisheries resource from roads and their management. Past road construction resulted in the presence of roads which have had limited maintenance. Poor maintenance results in the potential for increased sediment delivery to streams in the project area. Fish are indirectly affected by the presence and poor maintenance of roads because the increased sediment from them can contribute to increased turbidity which results in negative impacts for fish.

Brook trout have been introduced to the project area and as an invasive species have a direct effect on the native populations of cutthroat trout. They directly compete for food and habitat.

Recreational fishing is an additional cumulative effect in the project area. The influence of this activity is direct in effects and can over time result in changes in population size and structure.

There would be no other cumulative effects to fisheries from the implementation of this project for any of the alternatives.

Conclusion – Fisheries - In looking at the direct and indirect effects for hydrology, stream channels, water quality and Riparian Reserves, it is not anticipated that any of the effects would be detrimental or create significant downstream effects. The critical elements in the maintenance of hydrology, stream channels, water quality and Riparian Reserves in the planning area are the existing riparian areas. Provided these riparian areas are maintained in a healthy state, the stream systems would be anticipated to obtain their desired future condition. Future management activities are considered in the long term objectives for riparian areas of perennial and intermittent streams. Long-term riparian objectives are considered along with other resource goals and objectives agreed to by the interdisciplinary team. Stream-side management prescriptions are designed to maintain Aquatic Conservation Strategy Objectives (ACSO), as defined in Willamette's LRMP to meet these long term objectives.

No Jurisdictional Floodplains occur along streams within the planning area. Wet areas would be dealt with on an individual basis under the stand specific recommendations and wetland areas less than ¼ acre would be treated as special habitat areas (FW-211).

The action alternatives proposed in the Park Smith Thin project meet Federal and State water quality objectives. These objectives are met through the implementation of Best Management Practices (BMP's). Riparian Reserves have been established 150 feet on either side of the intermittent and perennial non fish

bearing streams, and 300 feet on either side of the fish bearing or domestic water supply streams as per the direction in the Northwest Forest Plan. No harvest buffers are found within these Riparian Reserves which help protect the waters of the State of Oregon. These reserves are adequate to maintain and restore water quality necessary to support healthy riparian, aquatic and wetland ecosystems and meet the Aquatic Conservation Strategy (ACS) Objectives at the site and 5th field watershed level and are consistent with the NWFP Temperature TMDL Implementation Strategies as conditionally approved by the Oregon Department of Environmental Quality.

To protect stream temperature, this project would not thin trees within the primary shade zone. This project would maintain a average 50% canopy closure in the secondary shade zone. This is consistent with the recommendations of the Implementation Strategies.

Implementation of this project would result in a net benefit to aquatics because roads that are currently contributing to soil erosion, sedimentation and turbidity would be hydrologically stabilized. There would be approximately 14.4 miles of stromproofing high aquatic risk roads that are currently not drivable or are closed. This would reduce road density and restore hydrologic function to the improved areas.

This project has been designed to achieve the ACS objectives and through this would benefit the fisheries resources in the project area. There are no issues in this project that were developed specifically for fisheries. This specialist report elaborates on the analysis that was conducted during the planning phase. The implementation of Alternative 1 would leave the stands and Riparian Reserves adjacent to fish bearing streams in their current condition and on the same trajectory. Through the IDT process Alternatives 2 and 3 of this project were designed with criteria to protect the fisheries resource and prevent potential adverse impacts to it. By maintaining no entry buffers, identifying potential habitat enhancement opportunities, utilizing protective contract language, and utilizing Best Management Practices during implementation it is highly unlikely that the implementations of Alternatives 2 or 3 would have a long term negative impact on the fish populations in the project area. On the contrary, the implementation of alternatives 2 or 3 would likely have a long term positive impact for this resource. If alternative 1 is selected it could result in the continued interruption of delivery and recruitment of LWD into this watershed, and the delay of growth of trees in the riparian zone that are important for the needed development of complex fish habitat in this area.

Streams in the analysis area have been impacted by past management practices. Early timber harvest actions removed trees directly adjacent to fish bearing streams in the project area. This has disrupted the recruitment and retention of woody material in this watershed. The result of the disruption in the physical process of woody debris recruitment and retention has contributed to habitat conditions for fish that are below the desired level for abundant and high quality fish habitat complexity. The LRMP protection measures are allowing these streams and their associated riparian areas to slowly recover over time towards the DFC. This project is designed to accelerate that recovery.

This project would accelerate the growth and improve the health of the treated stands of trees. Implementation of this project would result in the risk of some short-term negative effects to stream conditions, primarily through short term slight increases in the sediment delivery rates to streams, and subsequent short term increases in turbidity levels. There is a low risk that may result in the downstream effect to fish bearing stream reaches and MIS resident fish may be temporarily affected. It is unlikely that the

effects would be measurable. The effects of increased turbidity should not extend into higher order streams from the site specific actions occurring during this project. This means that any turbidity increases should be short term and any mobilized sediment should fall out prior to having the opportunity to impact fish. Given the very distant proximity to the project activity, MIS anadromous fish would not be negatively affected. There are no streams within the project area that provide habitat for any MIS Anadromous fish species. All alternatives would be no affect to MIS Anadromous fish species. This project would result in no effect to Critical Habitat and no effect for Essential Fish Habitat.

Table 56: Potential Impacts to ESA-listed fish or Management Indicator Species (MIS) fish

Measurement Criteria for Fish		Alt. 1	Alt. 2	Alt. 3
Probability of measurable negative effects realized to occupied fish habitat	ESA Listed Fish	zero	zero	zero
	MIS-Anadromous	zero	zero	zero
	MIS-Resident	very low	very low	very low
Magnitude of negative effects to fish habitat	ESA Listed Fish	zero	zero	zero
	MIS-Anadromous	zero	zero	zero
	MIS-Resident	very low	very low	very low

Economics

The viability of a timber sale proposal is predicated on having an economically efficient proposal that contractors would want to purchase. Sale design and thinning prescription implementation requirements all must be taken into consideration in determining the economic viability of a project. A below cost (deficit) sale or a package which generates no bidder interest is not desirable because it does not accomplish the desired silvicultural treatments to achieve habitat objectives and provides no wood or work for the community.

Methodolgy

This analysis was done using an economic analysis spreadsheet developed by Steve Rheinberger (Forest Resource Enterprises, USFS) designed to estimate the economic viability of planned Federal timber sales using the residual value appraisal method. User inputs data necessary to make the determination in various tables. The summary table (table 53) displays items such as the advertised rate, base rate, timber value, whether or not the unit and/or sale is estimated to be deficit or not, and the estimated value the sale is above (or below) base rates.

Environmental Consequences

Alternative 1 (No Action)

This alternative would produce no returns to the treasury and no costs would be incurred for stand treatments. By not harvesting in this area, no timber volume would be offered for sale which could affect employment of local workers in the wood products industries.

Alternatives 2 and 3

All proposed action alternatives for Park Smith Thin show a positive return to the treasury (see table 57 below and economic worksheets in Appendix C). 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. Both action alternatives provide a positive return on investment. If the sales are not harvested because the sales are not sold, then project objectives are not realized.

Table 57 - Economic Summary

Evaluation Criteria	Alternative 2	Alternative 3
Estimated total timber value (advertised rate)	$447,323	$502,035
Estimated total timber value (base rate)	$173,019	$180,438
Sale Viability	Viable	Viable
Value above base rates	$274,304	$321,597

Recreation

Methodology and Scale of Analysis

Analysis began with a review of the scale and location of this proposed action in relation to scenic viewshed allocations on the landscape. A mapping analysis was completed to verify that total harvest acres under the proposed action were within Forest Plan standards and guidelines for maximum disturbed acres by scenic land allocation.

Next, field reconnaissance defined the viewpoint(s) along scenic travel routes (Highways 20, 22 and 126) where the effects of the proposed action could be visually experienced by forest visitors. For viewpoints where project effects can be seen, an assessment of spatial and temporal scale of these effects was completed and compared to Forest Plan standards and guidelines.

Wherever the proposed action occurs close to existing (or planned) recreation facilities and dispersed recreation sites was also determined in order to assess the project's potential disturbance effects on forest visitors. Understanding what transportation systems would be used (or developed) to implement the proposed action, and what seasons the project activities would occur was also considered to assess project effects on recreation sites and popular recreation travel patterns.

Resource information reviewed to evaluate project effects on recreation resource includes: maps of designated winter recreation trails, map of existing road systems (including closures); a database of road maintenance levels, and a database of deferred maintenance needs for recreation sites.

Mapped data used for this analysis includes GIS layers of land management allocations, road and trail systems, dispersed recreation sites, and proposed harvest units with new roads. Larger scale maps of individual thinning units with an aerial photo base were also used to understand how logging operations could affect adjacent recreation sites or trails.

The following criteria are used to assess project effects to recreation and scenic resources:

- Treated acres by management allocation that can be seen from highway viewpoints;
- Miles of temporary roads created and miles of roads closed
- Number of trailheads and their access roads seasonally closed by operations
- Number of dispersed camp sites impacted and/or closed during harvest operations
- Scenic Management Allocations - The planning area contains three different scenic management allocations. For this project, these scenic management areas are connected to viewsheds for Highways 20, 22 and 126. The sensitivity of these scenic viewsheds is notable because all highway sections through the planning area are State Scenic Byways, and Highway 22 and 126 are also National Scenic Byways.

Travelers along all three highways have little opportunity to see beyond foreground views due to dense vegetation or terrain features along the highways. Highway viewpoints that do offer distant glimpses of the forest landscape in the planning area occur at natural openings, such as lava flows, lakes, or by looking down extended straight stretches of highway. Fish Lake day use site and Fish Lake Remount Station are sensitive viewpoints with good opportunities for expansive middleground views to the west.

The Forest Plan regulates project effects to scenery resources by restricting the number of acres that can occur in an unrecovered state within each scenic allocation in any given decade. An unrecovered vegetative

state is generally created through regeneration harvest methods, harvest landings, road construction or wildfire. For the plan's second decade (2000-2010), few scenic management acres within the planning area were converted to, and remain in, an unrecovered state. Timber sales that have influenced the planning area over the last ten years include Parks Overstory Removal and Smith Prairie. These two sales implemented overstory removals on old shelterwood units whose understory layer had since recovered to meet Forest Plan standards and guidelines.

The map below shows where thinning units occur within scenic allocations for Highways 20, 22 and 126. Field reconnaissance has found that few thinning units can be seen from viewpoints along these highways due to dense forest cover or topographic breaks along the highway. Units that might be seen by visitors from highway viewpoints include portions of units 19, 26, 27, 28, 32 and 33. The two Fish Lake developed sites offer extended views of units 26, 27, 32, and 33. Other viewpoints that offer travelers only brief glances of these four middleground units are located at natural lava flow openings along Highway 126 north of Fish Lake day use site. Highway 20 travelers heading east may also catch a glimpse of unit 19. Unit 3 is the only unit within the viewshed of Highway 22, but is separated by a low ridgeline.

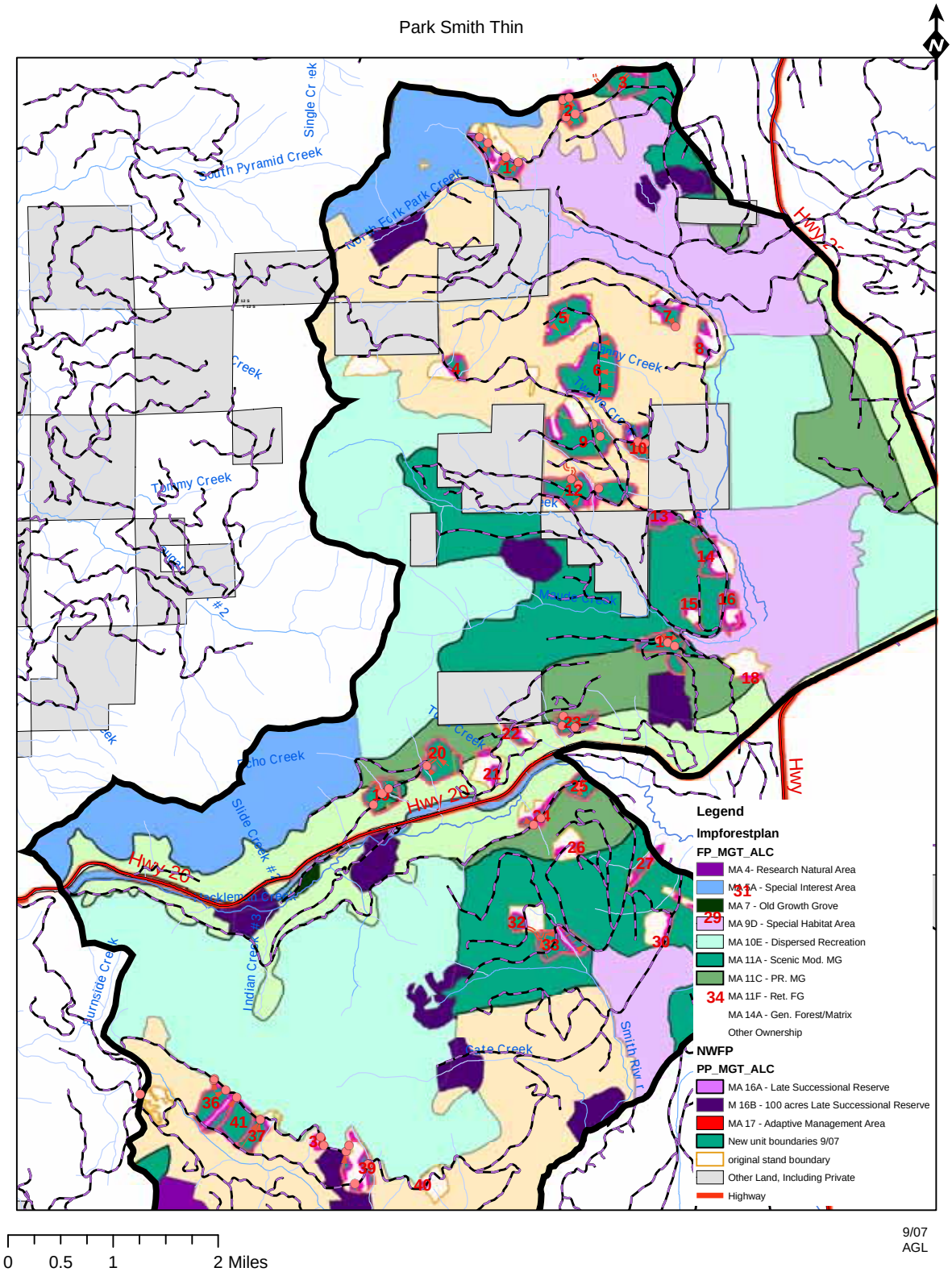


Figure 16: Proposed Thinning within Scenic Management Areas

Existing Condition

Recreation Facilities - The planning area contains eight developed recreation sites: one campground, two snoparks, and five trailheads. Lost Prairie campground is located on the south side of Highway 20 and closest to thinning units 19, 20 and 21. Lava Lake snopark is at the junction of highway 20 and forest road 2067 and closest to unit 17. Big Springs snopark is at the junction of Highway 22 and forest road 2200-090, but not close to any thinning units. Both snoparks receive public use year-round. The Echo Basin trailhead is on forest road 2000-055 and about one mile west of unit 20. Crescent Mtn trailhead is on forest road 2067-805 and just outside unit 17. Pyramids trailhead is on forest road 2067-560 and just outside unit 1. Gate Creek trailhead is on forest road 1598 but not close to any thinning units. Finally, Browder Ridge trailhead is on forest road 1500-080 and about one mile west of unit 36.

Proposed thinning has the potential to affect trailheads directly during logging operations by using trailheads as temporary landings or by temporarily closing them and their system roads to public access. Thinning operations in units 1 and 17 have the highest potential to affect public use of adjacent trailheads due to their close proximity.

Recreation facilities located further away from thinning units have less potential to be physically affected by operations, but may still be closed to public access during harvest operations. Proposed thinning operations are not expected to have any adverse effects to Lost Prairie campground or the two snoparks mentioned above.

Dispersed Recreation Sites - The planning area contains slightly more than 50 dispersed recreation sites scattered along the existing road system. Dispersed sites are comprised of a barren core area of compacted soil with no vegetation, a fire ring made with rocks, and an access route off the system road. Many of these sites are seasonally used only during big-game hunting seasons, though a handful of the larger sites receive use during summer months as well. Sites that receive both summer and fall use are typically situated next to year-round streams like Parks Creek.

Over the past five years, a few of the larger dispersed recreation sites located away from stream courses have been used in summer months by all-terrain vehicle riders. Sites that have attracted this type of use are generally large enough for vehicles with trailers to maneuver about.

The proposed thinning operations have the potential to damage or temporarily interfere with the use of dispersed recreation sites in the planning area. Damage to sites can be expected for sites occurring in or very near proposed thinning units. Short term interference with the public’s use of sites is expected when local access roads are closed to public traffic during thinning operations. Visitors at some dispersed sites may also experience excessive dust and truck noise from log trucks traveling along access roads where sites are located within 100 feet of these roads.

Desired Future Condition

The 1990 Forest Plan describes desired future conditions for scenery and recreation resources for each management area on the forest. This project has the potential to influence resource conditions in four management areas:

MA 11A – Scenic, Modification Middleground

MA 11C – Scenic, Partial Retention Middleground

MA 11F - Scenic, Retention Foreground

MA 14a - General Forest

One purpose of the proposed action is to enhance the future health of selected plantations by reducing stand densities through commercial thinning. Healthier stand conditions through reduced densities are expected to move the vegetative landscape in the planning area towards desired future conditions for above scenery resources within above management areas by increasing vegetative complexity within treated stands.

Over time, thinned plantations should mimic the textural and color features of the characteristic natural forest landscape more effectively than current stand conditions. The thinning of 30-40 year old plantations can attain these stand conditions by accelerating the development of large diameter trees and a complex understory.

For this proposed action, stand thinning would be designed to meet visual quality objectives (VQO) for the four management areas, and eventually offer more attractive forest settings for forest visitors compared to current stand conditions left to develop naturally.

Environmental Consequences – Recreation

Alternative 1 – No Action – Direct and Indirect Effects

Direct and Indirect Effects (Alternative 1) – Alternative 1 would thin 0.0 acres within scenic management allocations in this planning area. Vegetative densities or characteristics would not be modified under Alternative 1.

Cumulative Effects (Alternative 1) - Alternative 1 would create no added effects to the cumulative effects created by past actions within the planning area.

Alternative 2 – Proposed Action – Direct and Indirect Effects

Alternative 2 would commercially thin 500 acres of managed plantations in various scenic allocations along Highways 20, 126 and 22. Table 58 below shows which proposed harvest units fall within which scenic allocations.

Table 58: Proposed harvest units by scenic allocation

Scenic Management Area	Harvest Units	Unit Acres	Approx. Harvest Acres
Highway 20 Viewshed			
Modification Middleground (11%)*	All of 13, 14, 15, 16, part of 17	29, 35, 14, 17, 13	106
Partial Retention Middleground (7%)	part of 17 & 19; part of 20; part of 22, 23 24, 25; All of 26	43, 15,21 10, 10, 3, 26, 8	130
Retention Foreground (5%)	part of 19 & 20; All of 21; part of 22, 23, 24, 25	37, 6, 10 7, 25, 8, 6	105
Highway 126 Viewshed			
Modification Middleground (11%)*	All of 27, 32, 33, 34	12, 16, 52, 31	111
Highway 22 Viewshed			
Modification Middleground (11%)*	All of 3	48	48

* - Numbers in parentheses are approx. decadal harvest limits using regeneration methods.

The majority of thinned acres would retain 40 to 60% canopy closures which are sufficient densities to remain in a vegetatively-recovered condition. Proposed thinning operations would clear small openings through the construction/reconstruction of roads and landings. Alternative 2 would reconstruct 65 existing landings to facilitate the thinning of units listed in table 54 above. Only 3 or 4 new landings would be needed to facilitate thinning operations in Unit 3. New landings are associated only with the reconstruction of two temporary roads totaling 0.6 miles in length. Road reconstruction would create 30-foot wide corridors and clear approximately 2 acres. Existing landings are be located on existing roadways and should not exceed 1600 square feet in size. Because of harvest methods used in this thinning project, Alternative 2 is not expected to create any sizeable openings through road or landing construction/reconstruction. Created openings would remain subordinate to the characteristic natural landscape, and escape the notice of highway travelers.

Unit 3 lies in the Modification Middleground scenic allocation for Highway 22 and cannot be seen from any viewpoint off Highway 22. After operations, these temporary roads would be decommissioned and subsoiled to mitigate localized soil compaction and seeded with a native species mix.

Cumulative Effects – The numbers in parentheses in the first column of table 54 above represent the percent of acres allowed by the Forest Plan to be in an unrecovered state (due to regeneration harvest methods) per decade. This harvest limit is applied by individual viewsheds and is intended to keep harvest effects from dominating the characteristic natural landscape.

For the decade 2000-2010, Parks Overstory Removal and Prairie Gate timber sales have been the only regeneration-type harvest operations affecting scenic management allocations within the Highway 20 and 126 viewsheds. Units within these two sales had fully recovered understory layers prior to removal of their shelterwood/seed tree overstories. Most of the acres harvested during these two sales remained vegetatively recovered after the overstories were removed.

Alternative 2 proposes to thin units and retain 40 and 60 percent average canopy closure in treated stands. Within scenic allocations, Alternative 2 would only add approximately 2 acres of new openings to the modification middleground of the Highway 22 viewshed. Cumulatively, this increase in unrecovered acres is within Forest Plan standards and guidelines for this scenic allocation.

Alternative 3 proposes to thin the same 500 acres of managed stands as Alternative 2, but would thin more aggressively in units located within the Critical Habitat Unit. Heavier thins would favor individual tree growth over total stand growth and likely be more noticeable to the highway traveler. The number of harvest landings and temporary roads would remain the same as under Alternative 2.

Alternative 3 - Direct and Indirect Effects - Same as Alternative 2. Stands thinned to 40 percent canopy closure may be more textually notable than stands thinned to 60 percent. However, all thinning acres would remain vegetatively recovered after operations are complete. Thinned stands would remain visually subordinate to the characteristic natural landscape, and more quickly mimic the natural landscape over time than current conditions.

Alternative 3 would convert the same 18-19 acres of managed stands into scattered openings due to the reconstruction of 0.6 miles of spur roads and creation of 65 landings. These openings may appear larger wherever the surrounding stand density is reduced to an average 40% canopy closure. Thinning units would remain visually subordinate to the characteristic natural landscape.

Cumulative Effects – Same effects as described under Alternative 2.

Conclusions - Scenic Resources - This thinning project would have little negative influence on scenic qualities seen from viewpoints along Highways 20, 22 and 126. Textural and color changes created by thinning relatively homogeneous stands would remain subordinate to characteristic features of the natural landscape and should not present dominant features that catch the eye of travelers along these highway corridors. Overtime thinning should promote stand development and complexity that blends well with surrounding natural stands.

Openings created by new landings would be relatively small and unobtrusive when seen in middleground views. Similar openings in foreground scenic management areas would not be seen from highway viewpoints due to screening vegetation or topographic breaks along these travelways.

Environmental Consequences – Recreation Facilities

Alternative 1 – No Action – Direct and Indirect Effects

Alternative 1 would create no direct or indirect effects on recreation facilities in the planning area.

Cumulative Effects - None

Alternatives 2 and 3 – Direct and Indirect Effects

Alternative 2 proposes to thin units 1, 17, 19 and 20 which are situated on secondary forest roads accessing three summer trailheads. Operations would require the temporary closure of these spur roads and their associated trailheads to public access. Given operational restrictions typically imposed for protected wildlife species, thinning operations are likely to occur during the summer and fall recreation seasons when trailhead use is high. Loss of public access to these three trailheads would be temporary and should affect only year of access.

Thinning operations in units 1 and 17 also have the potential to physically damage adjacent trailheads due to their close proximity. Heavy equipment operated on these two trailheads would create ruts in trailheads and damage to surrounding understory vegetation. Equipment use would also cause localized loss of gravel surfacing and scatter logging debris on the trailheads. Potential damage to the trailheads would be mitigated through implementation of timber sale contract clauses to protect these improvements.

The Pyramids trailhead next to unit 1 may experience substantially more operational impacts if the purchaser is allowed to haul timber through the trailhead rather than east down road 2067-560. Permitting log haul through this trailhead would also lengthen any closure period to public access. Timber haul through this trailhead would also require the reconstruction of a constructed berm on the east side of the trailhead. Potential damage to the trailheads would be mitigated through implementation of timber sale contract clauses to protect these improvements.

Cumulative Effects- Same as direct and indirect effects.

Conclusions and rationale for conclusions (Recreation Facilities) - Thinning operations next to trailheads under Alternatives 2 and 3 would create physical changes to the trailhead surface and surrounding vegetation, and require three trailheads to be closed to public access during the summer or fall seasons. The Pyramids Trailhead is most at risk from thinning operations. These impacts would be restricted to one year and physical impacts could be repaired. Project effects on recreation facilities would not have a lasting affect on recreation use patterns.

Environmental Consequences – Dispersed Recreation Sites

Alternative 1 – No Action – Direct and Indirect Effects

Alternative 1 would have no effect on existing dispersed recreation sites.

Cumulative Effects - None

Alternatives 2 and 3 – Direct and Indirect Effects

Thinning operations proposed by Alternative 2 would physically affect few dispersed campsites. Existing dispersed sites generally are not located within the proposed thinning units. Operations would temporarily interfere with the use of some existing sites through the temporary closure of local spur roads that access these sites. Public use of existing sites would also be affected by nearby operational noise disturbance (within ¼ mile) and road dust generated by log trucks passing these sites. Sites most susceptible to noise and dust impacts are those located within 100 feet of designated gravel haul routes.

Forest visitors enjoying dispersed recreation activities within the planning area would also be temporarily affected by log trucks while traveling open haul routes. Forest roads are relatively narrow and not easy for many visitors to navigate against a flow of commercial traffic. Fall season hunters would likely feel most impacted by log truck traffic given the tendency of many hunters to search for signs of game trails crossing roadways.

Cumulative Effects – No other public timber sales are scheduled for operation in the planning area over the next five years. Timber sales on private lands may occur but are unknown at this time. Given known schedules of future timber sales, cumulative effects on the use of dispersed sites in the planning area is the same as described under direct and indirect effects.

Over the last twenty years, the number of dispersed camping sites in the planning area has decreased due to road closures and vegetative recovery on non-graveled roadways. Most of the lost sites are simply seasonal hunting camps that receive use for only a couple of weeks each year. Proposed thinning in this project area is not expected to further reduce the population of dispersed sites.

Conclusions - Dispersed Recreation Sites - Thinning operations can be expected to create disturbance and stir up dust along haul routes. These effects could displace some dispersed site visitors while operations are ongoing, particularly when sites are within 100 feet from haul routes. The movement of log trucks along haul routes is also likely to create conflicts with forest visitors traveling these roads. All of these effects are expected to be short-term in duration and not create any changes to long-term recreation use patterns within the project area.

Heritage

Analysis Methods

The district archaeologist designed a modified unit-based heritage resource inventory based on information gleaned from the District heritage resource files (inventory reports, site reports, historic maps, GLO maps and ethnographic information), topographic maps, and Geographic Information Systems (GIS).

Two objectives were considered in creating the survey. First it must cover the possible discovery of the various site types know to occur within the project area; and second it must cover heritage properties known or believed to exit within the project area for purposed of monitoring their conditions or verifying their location.

Along with the above objectives three requirements were incorporated into the overall survey design.

100% of high probability ground and 20% of low probability must be surveyed unless it has been covered by a recent inventory survey, which meets current standards, given that no change in surface visibility has occurred since the time of the survey. Low probability ground over 65 percent slope should be considered but does not need to be surveyed.

The effect on heritage resources, both discovered and undiscovered, expected to occur during the course of the proposed Park Smith Thin project area harvest shall be determined.

All heritage resources would be avoided when they are found to be in conflict with the proposed timber harvest units and associated roads and landings. Determination of property avoidance would be made after all the fieldwork is completed.

Surveys

The proposed project area units consist entirely of existing plantation units that were harvested from 40 to 50 years ago. None of the units surveyed for heritage resources at that time. All of the units were clearcut harvests. Harvest methods varied from tractor logging to cable harvest. In many instances high probability ground was highly disturbed from ground-based heavy equipment activities during this initial harvest no post harvest monitoring occurred. Subsequent salvage sale projects within the surrounding area required cultural resource surveys, however none are current within the last ten years.

The survey of the Parks Smith Thin project area was planned and conducted under the direction of District Archaeologist Tony Farque. The survey was conducted during the 2006 and 2007 summer months by District Archaeologist Tony Farque, Cultural Resource Technicians (CRTs) Ken Loree, Doug Shank, Nancy Curtis and Jason McGovern. All of the high probability areas were covered during the survey. Low probability ground was covered both by design and opportunistically between high probability areas. Some of these areas were too small to depict on the survey design and results map.

Ground surveys for the proposed Park Smith Thin project area occurred during 7 days in 2006 (October – November) and 28 days in 2007 (June – October), mainly on sunny to partly cloudy days. Surveys were conducted at parallel, compass-oriented transects spaced from 150 to 20 meters apart, in accordance with current survey standards. When possible, surveyors would zigzag within their respective swaths in order to inspect areas of either high visibility such as exposed mineral soil or areas of high probability such as obvious trails or landmarks. Every thirty meters within the high probability ground each surveyor exposed to mineral soil a surface area of 1x1 meter square. This was done with greater frequency in locations especially likely to contain heritage resources. The old plantation unit boundaries were generally easily determined by variation in vegetation (cutting boundaries and fireline post residual flora). This helped ensure that survey areas were covered in the field as designed.

A total of 709 acres of high probability ground were surveyed for the Park Smith Thin project area. As a result of this inventory, one new archaeological site was discovered. Prior to this inventory, during past salvage sale preparation, nine heritage properties had been recorded within or near to the selected timber stand planning units and their associated access routes. These nine sites were monitored during the project survey and included in the consideration of project effects on heritage resources.

Existing Condition

Ethnographic evidence suggests that highly mobile groups indigenous to the western Cascade Mountains lived during the winter along low elevation streams, accessing the uplands during the summer and fall to hunt game and gather berries and other important plant resources. Extensive trail networks were important for traversing the Cascade Mountains, linking the Molala Indian bands with each other, surrounding tribes and important resource procurement and trade centers. A common activity at many of the sites is the manufacture and maintenance of lithic tools and biface reduction. The site distribution patter with the Park Smith Thin project area suggest that past Indian groups were traveling along the ridgelines and along riverine terraces to access high elevation meadows, huckleberry fields, obsidian sources, trading locales, and big game.

The 1931 Santiam National Forest map and the 1947 Willamette National Forest map reveal the Smith River and Big Meadows Trails traversing north/south along the eastern edge of the project area, and the Parks Trail crossing the northern third project area in an east/west orientation. These trails serves to allow indigenous travel through and within the project area. The Smith River Trail provided travel from the McKenzie area resources, including obsidian, to the North Santiam ridge system when tended northwest to the trading centers at Willamette Falls on the Willamette river near present day Oregon City. The Parks Trail connects two areas of archaeological site concentration indicating frequent, long-term indigenous use; the Parks creek site area on private land known historically as “The Park,” and the headwaters of the North Fork Park Creek (saddle providing hunting and travel into the Middle Santiam drainage. These historic way trails are not recorded within any of the proposed Park Smith Thin units.

The field survey for the Park Smith Thin project area located one new archaeological site. In addition, previous surveys in the project area associated with salvage sale preparation located nine lithic scatter sites within the proposed project area boundary. These ten sites are considered potentially eligible to the National Register of Historic Places (NRPO and must be protected from project activities or evaluated to determine their eligibility to the NRHP.

Environmental Consequences

Alternative 1 – No Action

Implementation of the No Action Alternative would not directly or indirectly affect heritage resources since there would be no change to the integrity of heritage resource sites.

Direct and Indirect Effects–Alternatives 2 and 3

Implementation of Alternatives 2 and 3 would result in ground disturbance through the following activities: opening of about 3.8 miles of existing spur roads; constructing about 1.1 miles of new temporary roads, 45 miles of road maintenance, 5.5 miles of drivable stormproofing on roads, 14.4 miles of road storing/decommissioning/stormproofing; 612 acres of ground-based yarding, 242 acres of grapple piling within ground-based yarding units and 35 acres of roadside grapple piling, 36 new landings and 107 landings on existing roads. All potentially eligible heritage sites have been protected by redesigning timber sale unit boundaries, and/or restricting ancillary activities to protect sites from timber harvest and associated project activities.

Since appropriate and approved surveys and cultural site protection measures are already in place for this project, the potential direct effects would be in the form of inadvertent damage to the integrity of cultural resources which were not discovered during initial survey. Any sites uncovered during implementation of the project would require the application of Design Measures described in table 10 “Design Criteria.”

Cumulative Effects - It is not anticipated that there would be cumulative effects to the potentially eligible cultural resource sites in the French Bug Thin Timber Sale Project Area from any of the proposed actions.

Irreversible/Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments that would affect heritage resources by implementing any of the proposed alternatives.

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. Road or landing aggregate, either crushed or pit run, that might be required for this sale could come from various rock sources such as North Parks, Little Nash, Latiwi or Boundary Rock Sources. Minor clearing of less than one acre for any individual pit could be associated with the development of any of these rock sources. Clearing could include managed stand trees in plantations or brush.

Compliance with Other Laws, Regulations, and Policies_____

This section describes how the action alternatives comply with applicable State and Federal laws, regulations and policies. It first lists the major applicable laws, gives a summary of the law and then tells how the project complies with the law.

National Forest Management Act (NFMA), 1976 (90 Stat. 2949; 16 U.S.C. 1609)

The National Forest Management Act reorganized, expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The National Forest Management Act requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System. It is the primary statute governing the administration of national forests.

There are several important sections within the act, including Section 1 (purpose and principles), Section 19 (fish and wildlife resources), Section 23 (water and soil resources), and Section 27 (management requirements that relate to perspective project planning).

All alternatives were developed to be in full compliance with NFMA via compliance with the Willamette National Forest Land and Resource Management Plan 1990, as amended. Throughout the environmental analysis and various specialist reports in the Appendices, there are references to Forest Plan standards and guidelines and how those standards and guidelines were met in the various aspects of the alternative design.

National Environmental Policy Act of 1969 (NEPA), (42 U.S.C. §§ 4321-4347, January 1, 1970, as amended 1975 and 1994).

NEPA declares it a national policy to encourage productive and enjoyable harmony between man and the environment and promote efforts to better understand and prevent damage to ecological systems and natural resources important to the nation. Agencies are required to prepare a detailed environmental impact statement for any major federal action significantly affecting the environment. The Act also establishes the Council on Environmental Quality to review government policies and programs for conformity with NEPA.

This law essentially pertains to public participation, environmental analysis, documentation and appeals. NEPA establishes the format and content requirements of environmental analysis and documentation such as the Park Smith Thin analysis. The entire process of preparing an environmental assessment was undertaken to comply with NEPA requirements, as codified by 40 CFR 1501 and the Forest Service Handbook 1909.15, Chapter 40.

Endangered Species Act of 1973, (16 U.S.C. §§ 1531-1544, December 28, 1973, as amended 1976-1982, 1984 and 1988).

The Endangered Species Act provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered in the U.S. or elsewhere. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The Act outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species, and contains exceptions and exemptions.

Field surveys and Biological Evaluations for all listed endangered, threatened, or sensitive species have been prepared to determine possible effects of any proposed activities in the Park Smith Thin project area. Consultation occurred with the US Fish and Wildlife Service regarding this project (see the Wildlife and Plant Biological Evaluations, and Fish Biological Assessment and the Biological Opinion from the US Fish and Wildlife Service in the Analysis File).

Clean Air Act (42 U.S.C. §§ 7401-7671q, July 14, 1955, as amended 1963, 1965-1967, 1969-1971, 1973, 1974, 1977, 1978, 1980-1983, 1988, 1990, 1991 and 1994-1996).

The primary objective of the Clean Air Act is to establish federal standards for air pollutants from stationary and mobile sources and to work with the states to regulate polluting emissions. The Act is designed to improve air quality in areas of the country which do not meet federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.

This law authorizes the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment.

The Oregon Smoke Management Plan has delegated authority for implementing all regulations related to smoke emissions, including Clean Air Act and its amendments. The Northwest Oregon Fire Management Plan has established guidelines for implementing fire suppression, prescribed fire and fuels treatment operations. Fuel treatments proposed in this project are in compliance with the Willamette Forest Plan, the

Oregon Smoke Management Plan and the Northwest Oregon Fire Management Plan helping to ensure compliance with the Clean Art Act.

Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. §§ 1251-1387, October 18, 1972, as amended 1973-1983, 1987, 1988, 1990-1992, 1994, 1995 and 1996).

The Federal Water Pollution Control Act, popularly known as the Clean Water Act, is a comprehensive statute aimed at restoring and maintaining the chemical, physical and biological integrity of the nation's waters.

Under Section 303(d) of the Clean Water Act, the State has identified the McKenzie River as a water quality-limited water body due to elevated temperatures.

All action alternatives including various project design elements, associated mitigation, and Best Management Practices (BMPs) are consistent with current management direction for protecting water quality including Willamette Forest Plan Standards and Guidelines, Aquatic Conservation Strategy (ACS) Objectives (at the watershed analysis area) and the Federal Clean Water Act.

Implementation of required BMPs would ensure protection of water quality and beneficial uses under all alternatives. Retention of no-harvest buffers within the effective shade zone of tributaries to the McKenzie River would result in a negligible affect on stream temperatures in the 303 (d) listed McKenzie River in the short-term.

Federal Mine Safety and Health Act of 1977, Public Law 91-173, as amended by Public Law 95-164.

Development of rock pits would conform to the requirements of this act, which sets forth mandatory safety and health standards for each surface metal or non-metal mine. The purpose of the standards are to protect lives by preventing accidents and promoting health and safety.

Rock pit development would occur in full compliance with this act.

Magnuson-Stevens Fishery Conservation and Management Act, 1976 (MSA):

This act directs that "Each Federal agency shall consult with the Secretary with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this Act."

Implementing regulations for this act (50CFR part 600), specifically §600.920(a) state that "Federal agencies must consult with National Marine Fisheries Service regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect Essential Fish Habitat (EFH).

Chinook salmon are the only MSA fish species on the Willamette National Forest. Essential fish habitat has been delineated in the Willamette River Basin based on the process described in MSA §303(a) (7). Federal agencies are to minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat (MSA §303(a) (7)). All alternatives in the Park Smith Thin project are in compliance with this act. No Chinook salmon or any identified essential fish habitat would be impacted by this project.

Wild and Scenic Rivers Act (16 U.S.C. §§ 1271-1287, October 2, 1968, as amended 1972, 1974-1976, 1978-1980, 1984, 1986-1994 and 1996)

This Act establishes a National Wild and Scenic Rivers System for the protection of rivers with important scenic, recreational, fish and wildlife, and other values. Rivers are classified as wild, scenic or recreational. The Act designates specific rivers for inclusion in the System and prescribes the methods and standards by which additional rivers may be added. The Act contains procedures and limitations for control of lands in federally administered components of the System and for disposition of lands and minerals under federal ownership. Hunting and fishing are permitted in components of the System under applicable federal and state laws.

No project activities are proposed near any rivers deemed eligible for inclusion into the Wild and Scenic River program.

Wilderness Act (16 U.S.C. §§ 1131-1136, September 3, 1964, as amended 1978)

The Wilderness Act established the National Wilderness Preservation System. The Secretary of the Interior was directed to review every roadless area of 5,000 acres or more and every roadless island within the national wildlife refuge and national park systems for possible inclusion in the System. The Act also included some national forest lands in the System and directed the Secretary of Agriculture to recommend others. Over 100 million acres have been included in the National Wilderness Preservation System so far.

No project activities are proposed in either Wilderness or Inventoried Roadless Areas.

Executive Order 13186: Neotropical Migratory Birds

This E.O. requires the "environmental analysis of Federal actions, required by NEPA or other established environmental review processes, evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern."

There are 85 bird species recognized as neotropical migrants on the Willamette National Forest. Thirty-five of these species found on the Willamette have been identified as species of concern (Sharp 1992). A Memorandum of Understanding was signed between the USFS and USFWS to complement the January 2001 Executive Order.

The Park Smith Thin Project Area contains populations of migratory land birds typical of the western Cascades. Current science applied to Forest Plan standards and guidelines governing management of this project area provide direction that ensures the long term maintenance of amount and distribution of suitable habitat for native residents and migratory land bird species.

National Historic Preservation Act of 1966, as amended

This Act requires Federal agencies to consult with American Indian Tribes, and various State and local groups before nonrenewable cultural resources, such as archaeological and historic structures, are damaged or destroyed. Section 106 of this Act requires Federal agencies to review the effects project proposals may have on the cultural resources in the Analysis Area.

The areas proposed for ground-disturbing activities have been surveyed and evaluated for the presence of inventoried cultural resources. Several areas containing these resources have been identified. The alternatives were either designed to avoid or exclude these areas from any management activities. (See Design Elements section (Table 10) and the Project Record for Heritage Resources available at Sweet Home Ranger District).

Executive Orders 11988 and 11990: Floodplains and Wetlands

Executive Order 11988 requires government agencies to take actions that reduce the risk of loss due to floods, to minimize the impact of floods on human health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

Executive Order 11990 requires government agencies to take actions that minimize the destruction, loss, or degradation of wetlands.

Floodplains occur within the planning area but no activities occur within flood plains due to no-harvest stream buffers on all perennial streams. Wet areas are protected on an individual basis under the stand-specific recommendations and wetland areas less than ¼ acre are treated as special habitat areas (FW-211) and protected with appropriate buffers.

Executive Order 12898 - Environmental Justice in Minority Populations and Low Income Populations

Agencies are directed to address effects accruing in a disproportionate way to minority and low-income populations; the closest population or habitation to the project area is the City of Sweet Home, (population 8200) some thirty miles west of the project area. Sweet Home is within Linn County considered a non-metropolitan county located by its western boundary along Interstate 5 and ranging east along the Western Cascades. Linn County's per capita income ranked 25th out of 36 counties in the state in 1993. In 1999 percent of persons below poverty is 11.4% from the U.S. Census Bureau 1990 and 2000 data. The State of Oregon Employment Department for Sweet Home has an unemployment rate of 11.6 percent in 2002. Minority populations in Linn County are 6.8 percent which include Native Americans, Asians, African Americans, and Hispanic.

From Federal and State data this community contains low-income people and minority persons. Implementation of an alternative that provides the opportunity for employment may positively affect low-income families who are either unemployed or underemployed. No disproportionate impacts to the citizens of Sweet Home are anticipated upon the implementation of an alternative. All contracts offered by the Forest Service contain Equal Employment Opportunity requirements. Subsistence and cultural use levels are difficult to quantify and differential patterns of subsistence consumption are unknown at this time. However, the Forest provides access to firewood, Christmas trees, mushrooms and other consumables through a personal-use permit system. The proposed thinning has the potential to contribute to the supply of special forest products (SFP) available within the area.

Executive Order 13112 (Invasive Species)

This 1999 order requires Federal agencies whose actions may affect the status of invasive species to identify those actions and within budgetary limits, "(i) prevent the introduction of invasive species; (ii) detect

and respond rapidly to and control populations of such species… (iii) monitor invasive species populations… (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded;…(vi) promote public education on invasive species… and (3) not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species… unless, pursuant to guidelines that it has prescribed, the agency had determined and made public… that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm would be taken in conjunction with the actions."

The action alternatives implement the direction from the Willamette Forest Plan and the Integrated Weeds Management EA. The action alternatives include design criteria which would limit the spread of invasive weeds. These include the cleaning of off road equipment between infested work sites, pre-treating roads before road maintenance and reconstruction, re-vegetating all disturbed areas with native seed, and monitoring weed infestations following treatments.

Energy Requirement and Conservation Potential

There are no unusual energy requirements for implementing any of the alternatives. Alternatives which involve tree removal would create supplies of firewood as a by-product of the timber harvest. This product would contribute to the local supply of energy for home space heating.

Prime Lands

The Secretary of Agriculture issued memorandum 1827 which is intended to protect prime farm lands and rangelands. The project area does not contain any prime farmlands or rangelands. Prime forestland is not applicable to lands within the National Forest System. National Forest System lands would be managed with consideration of the impacts on adjacent private lands. Prime forestlands on adjacent private lands would benefit indirectly from a decreased risk of impacts from wildfire. There would be no direct, indirect, or cumulative adverse effects to these resources and thus are in compliance with the Farmland Protection Act and Departmental Regulation 9500-3,"Land Use Policy".

Forest Plan Consistency

Actions analyzed in the Park Smith Thin environmental assessment are consistent with the Forest Plan standards and guidelines that have been discussed and disclosed throughout this document. This project is consistent with the goals and management direction analyzed in the Willamette National Forest Land and resource Management Plan FEIS and Record of Decision as amended.

State Laws/Regulations

Oregon State **Best Management Practices** (BMPs) are employed to maintain water quality and are certified by the Environmental Protection Agency for meeting the Clean Water Act.

The **Oregon Smoke Management Plan** - Oregon Department of Environmental Quality and the Oregon Department of Forestry are responsible for regulating all prescribed burning operations. The USDA Forest Service Region 6 has a Memorandum of Understanding with Oregon Department of Environmental Quality,

Oregon Department of Forestry and the USDI Bureau of Land Management regarding limits on emissions, as well as reporting procedures. All burning would comply with the State of Oregon's Smoke Management Implementation Plan.

The Oregon State Implementation Plan and the Oregon State Smoke Management Plan would be followed to maintain air quality. See Fire and Fuel prescription in the project record available at the Sweet Home Ranger District.

Consultation with the Oregon **State Historic Preservation Officer (SHPO)** would be completed concerning proposed activities prior to a decision being made on this project. SHPO has concurred with the finding that there are historic properties but the undertaking would have no effect on them as defined by 36 CFR 800.16(i). The Advisory Council on Historic Preservation (ACHP) has also been consulted about measures to protect significant archeological sites from adverse effects (see Appendix G).

Northwest Forest Plan Temperature TMDL Implementation Strategies (Sept. 2005)

Proposed harvest treatments within riparian areas have been designed to comply with the *Northwest Forest Plan Temperature TMDL Implementation Strategies* for stream temperature – Evaluation of the adequacy of the Northwest Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards" (USDA and USDI, 2005). This document was prepared in collaboration with Oregon Department of Environmental Quality and United States Environmental Protection Agency to provide documentation of Northwest Forest Plan compliance with the Clean Water Act with regard to state water quality standards for stream temperatures. As such, it redeems several of the Forest Service responsibilities identified in "Memorandum of Understanding between USDA Forest Service and Oregon Department of Environmental Quality to Meet State and Federal Water Quality Rules and Regulations" (USDA Forest Service and Oregon DEQ, May 2002). The Implementation Strategies provide current scientific guidance for management of riparian vegetation to provide effective stream shade, including appropriate methods of managing young stands for riparian objectives other than shade, such as production of large wood for future recruitment.

Treatments must comply with the Implementation Strategies since the project is tributary to the McKenzie River which is on the 303 (d) list for stream temperatures that exceed salmonid rearing requirements during part of the summer. All perennial and intermittent streams slowing in the summer were protected with a no-harvest buffer of at least 60 feet to ensure that these streams do not contribute to higher summer stream temperatures in the McKenzie River. Riparian restoration occurring as part of this project would be reported to the Oregon Department of Environmental Quality yearly as part of requirements under the Willamette TMDL (2006) and subsequent Willamette Basin Water Quality Restoration Plan (2008).

Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

ID Team Members

Table 59 identifies members of the interdisciplinary team responsible for coordination, conducting and contributing to the environmental analysis for Park Smith Thin.

Table 59 – Interdisciplinary Team Members

IDT Member	Position	Education
Melany Glossa	District Ranger	
Nikki Swanson	Acting District Ranger	
K.C. Briggs	Fisheries Biologist	B.S. Fisheries Management
Nanci Curtis	Fire/Fuels Planner	A.S. Forest Science
Leslie Elliott	Silviculturist	
Tony Farque	Archaeologist	B.S. Anthropology A.A. Forestry
Lance Gatchell	Hydrologist	
Dave Halemeier	Hydrologist	B.S. Resource Planning and Interpretation M.S. Natural Resources Watershed Management
Josh Latham	Engineer	
Anita Leach	Planner	B.S. Forest Management
Ken Loree	Logging Systems/Pre-sale	Logging Systems Program, OSU Forest Engineering Institute
Jared McCormick	Logging Systems	
Brian McGinley	Recreation Planner	B.S. Forestry M.F. Forest Management
Doug Shank	Geologist	B.S. Geology M.S. Geology
Alice Smith	Botanist	B.S. Botany/Plant Pathology M.S. Botany/Plant Pathology
Tiffany Young	Wildlife Biologist	B.S. Wildlife Biology and Fisheries Biology

Federal, State and Local Agencies

Formal consultation with the U.S. Fish and Wildlife Service was completed and a Biological Opinion was received on April 4, 2008. A Not Likely to Adversely Affect (NLAA) determination was made (USDI, 2008).

Consultation with U.S. Fish and Wildlife Service for fisheries was not required since no bull trout habitat exists in the planning area. In addition, consultation with NOAA Fisheries was not required because this undertaking would have no effect on ESA-listed anadromous fish species.

Under the Programmatic Agreement among the USDA, Forest Service Pacific Northwest (Region 6), The Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service (2004) the Forest Heritage Specialist has project review authority, and certifies that the project complies with Section 106 of the National Historic Preservation Act. That certification of this project as "No Historic Properties Affected" was completed in June 2008.

Tribes

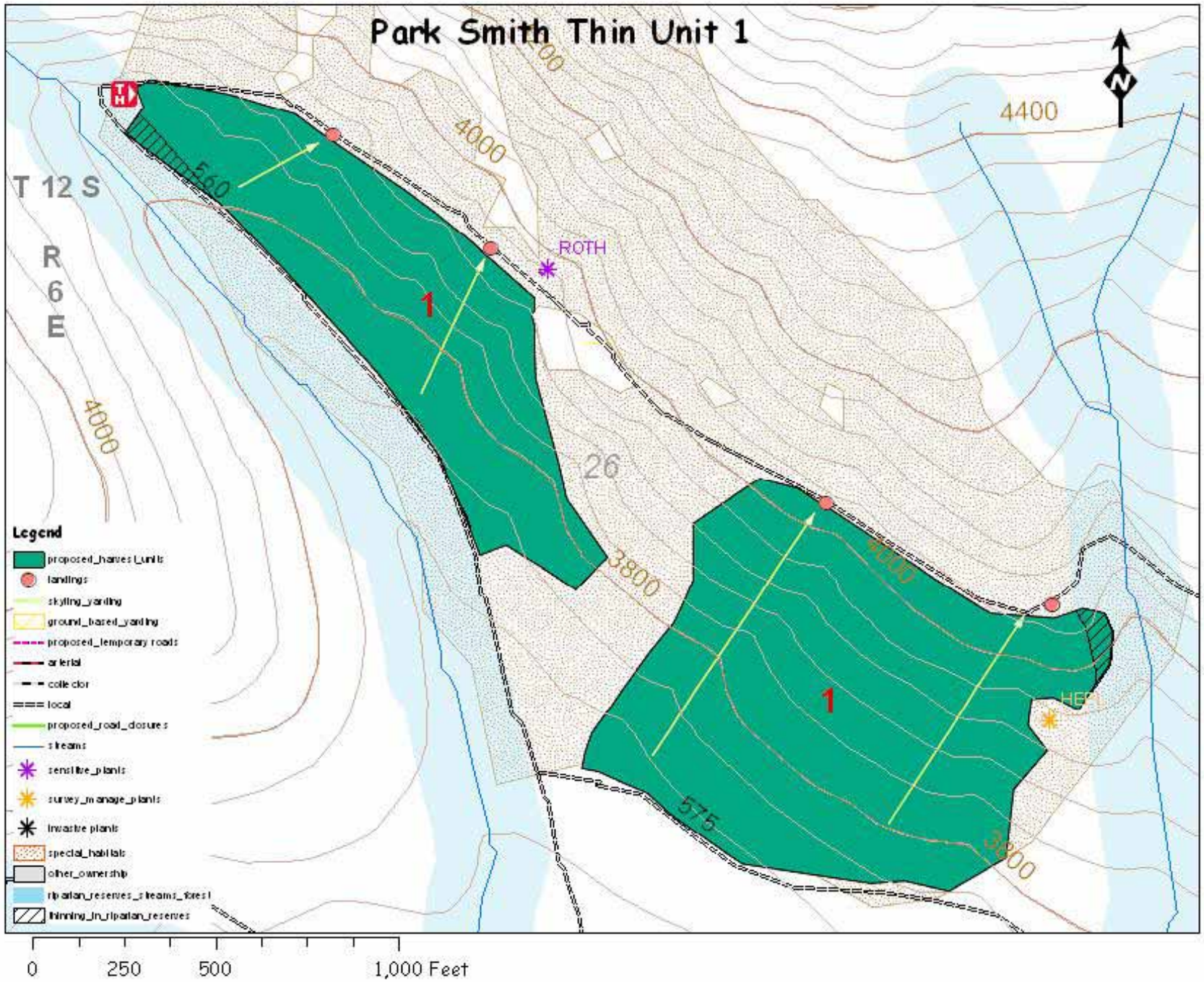
The Park Smith Thin Project was included in the Annual Program of Work Review with the Confederated Tribes of the Grand Ronde on February 20, 2008 and the Confederated Tribes of Siletz Indians on April 10, 2008. No comments have been received specific to the this project as a result of these meetings.

Government-to-government consultation regarding this project was conducted during the winter of 2008. A letter describing the Park Smith Thin Timber Sale was mailed to tribal contacts at Confederated Tribes of the Grand Ronde. No comments were received from the tribes.

A number of prehistoric sites were identified near the proposed harvest units. Located sites have been protected from ground-disturbing activities by removing them from harvest units or buffering them from mechanical disturbance. No impacts, as outlined in the American Indian Religious Freedom Act, are anticipated with any of the proposed activities.

Literature Cited

See Appendix H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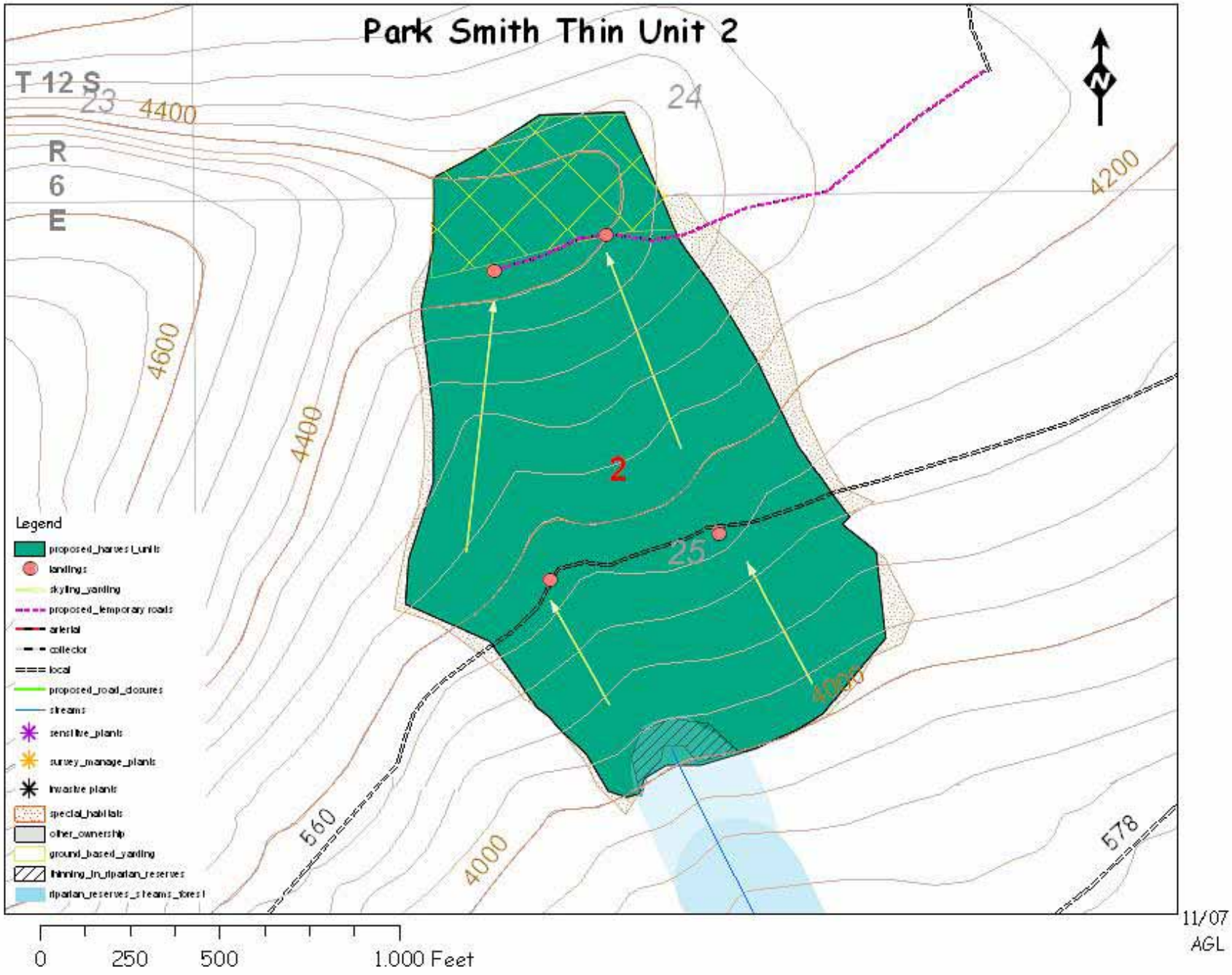
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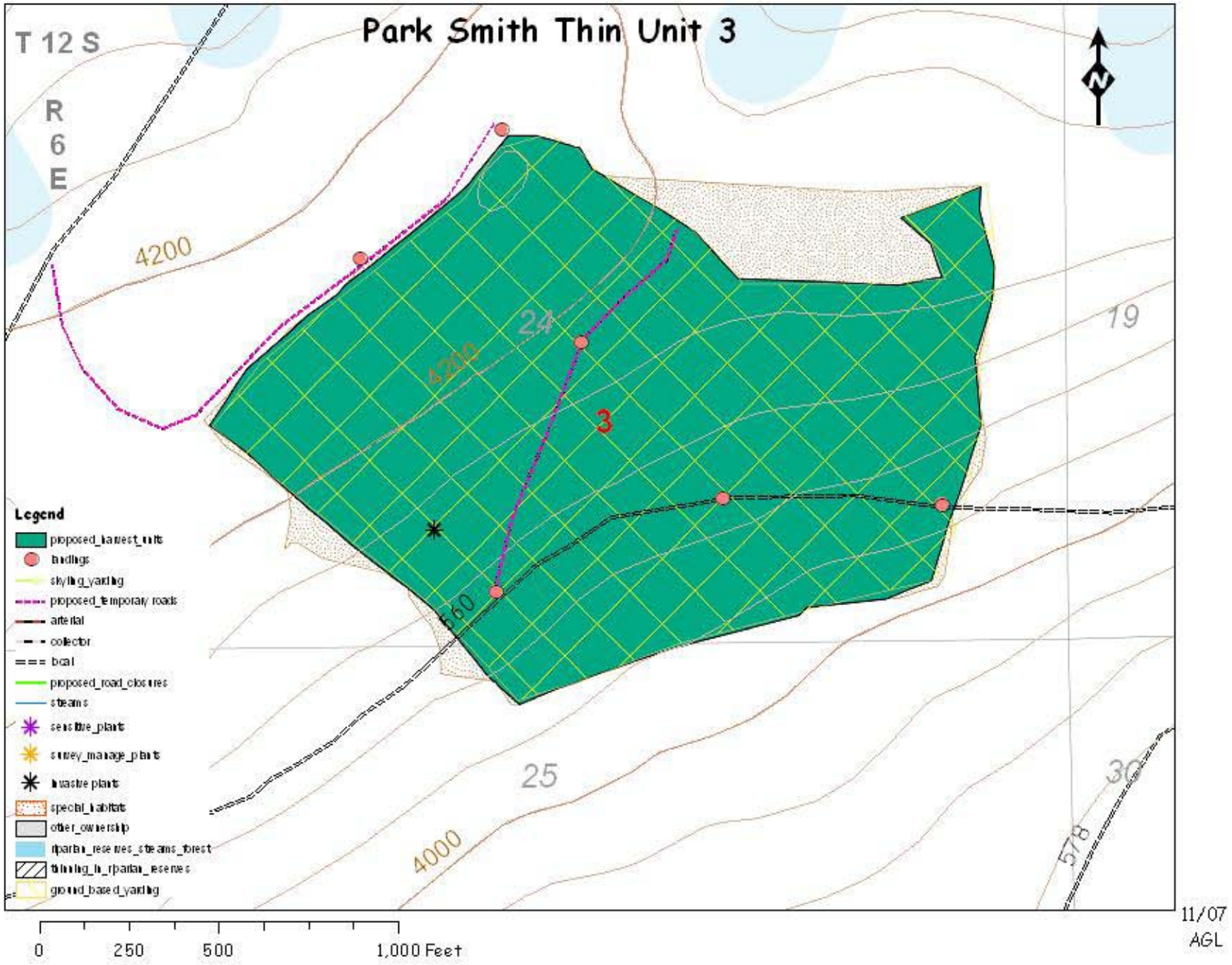
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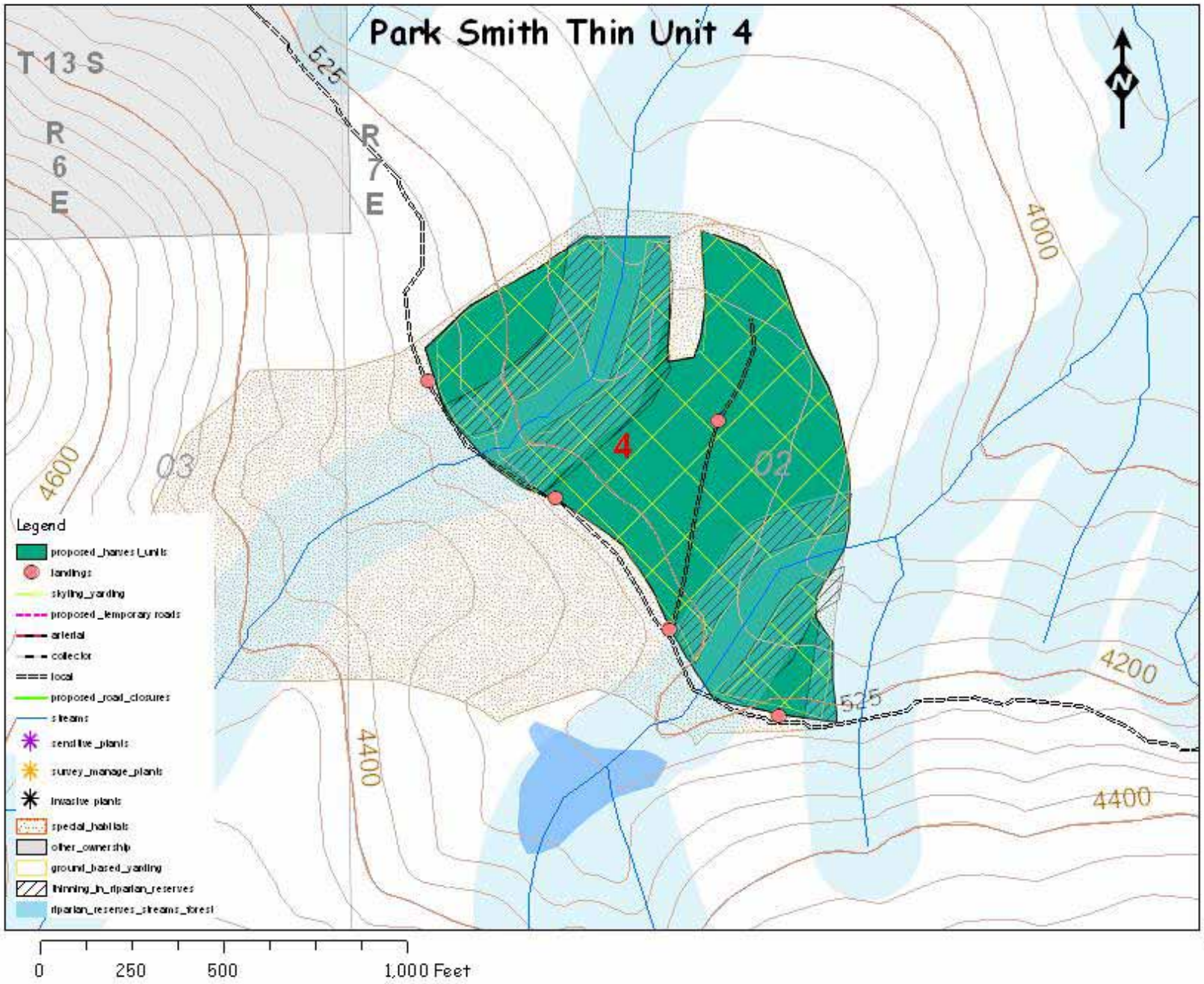
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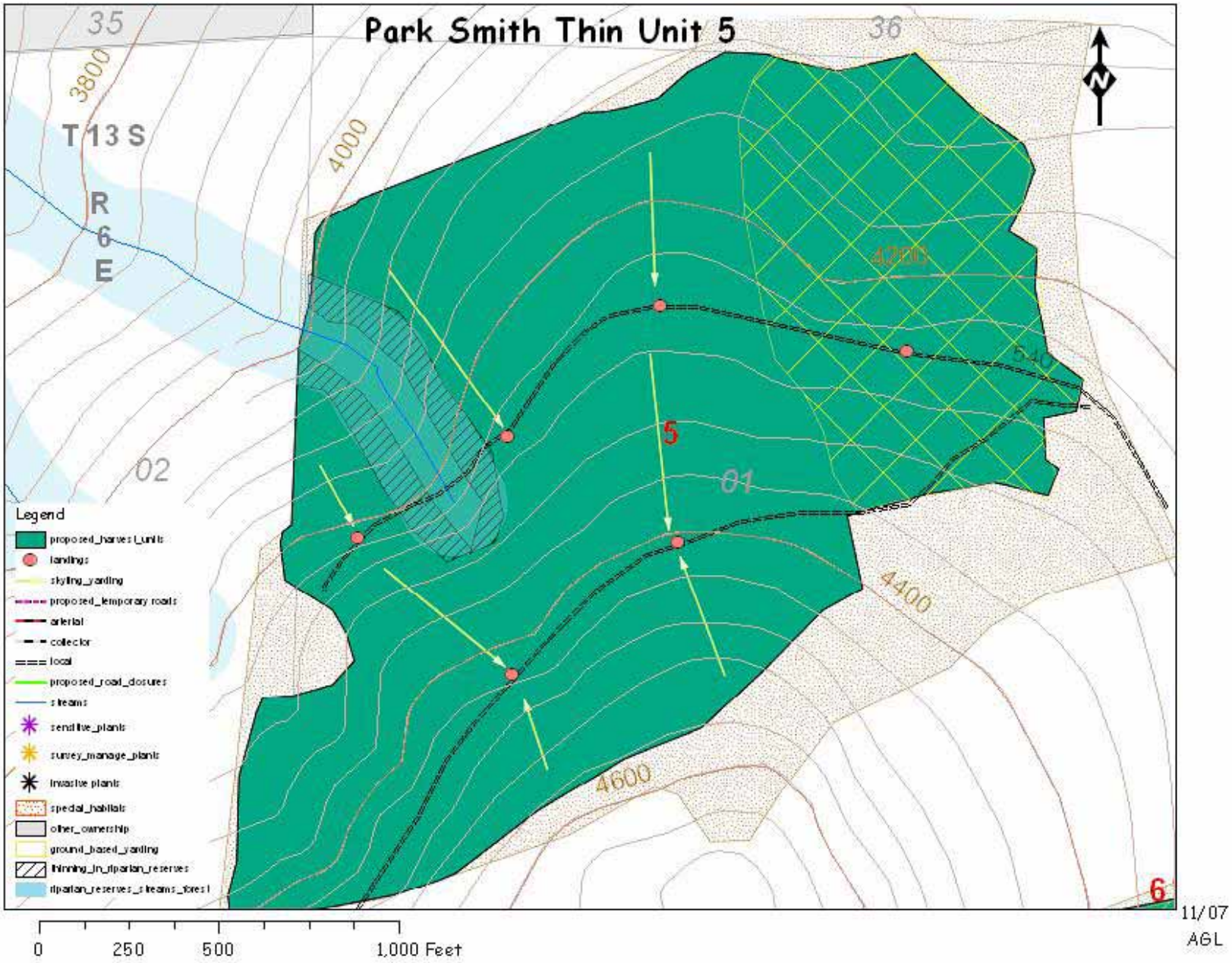
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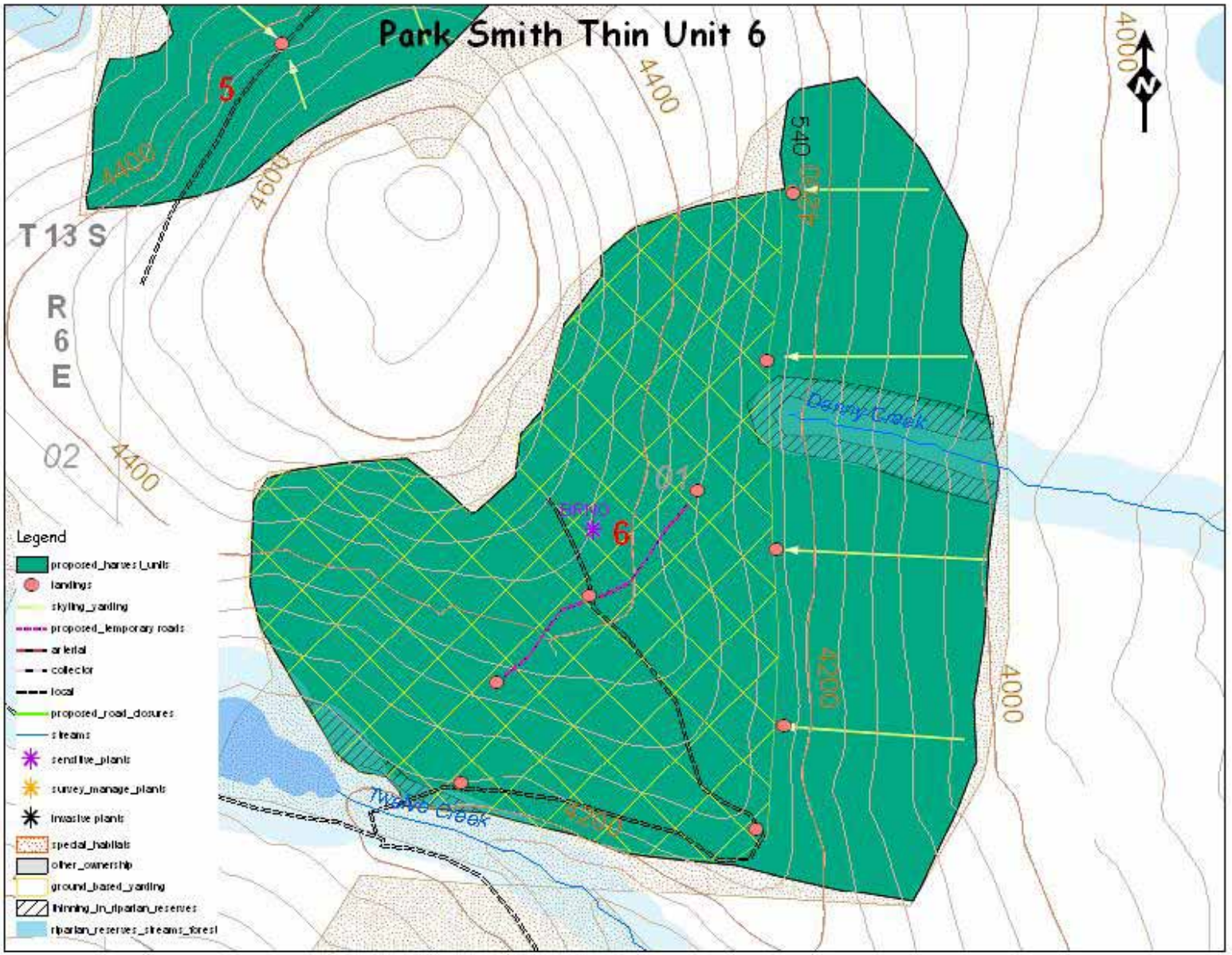
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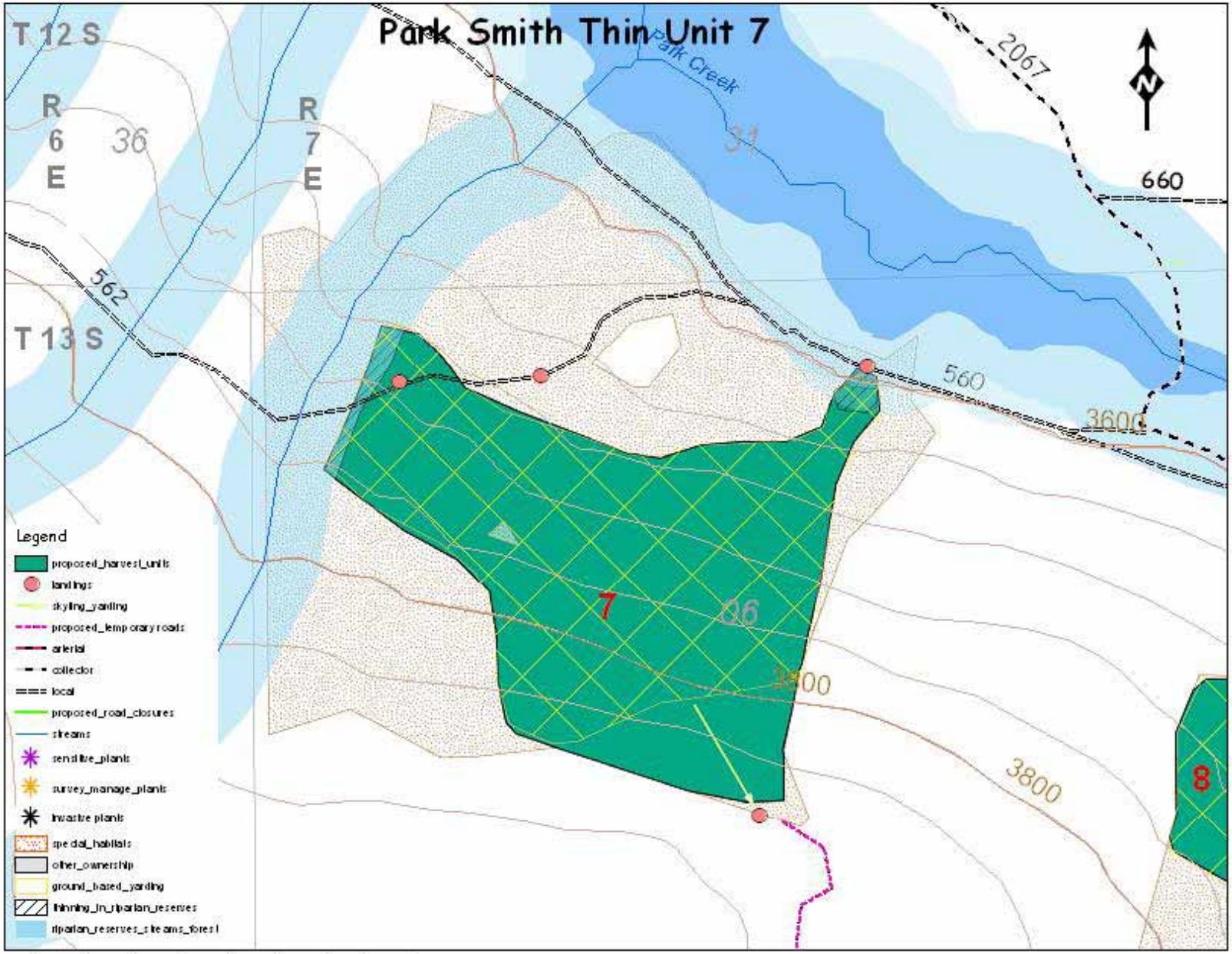
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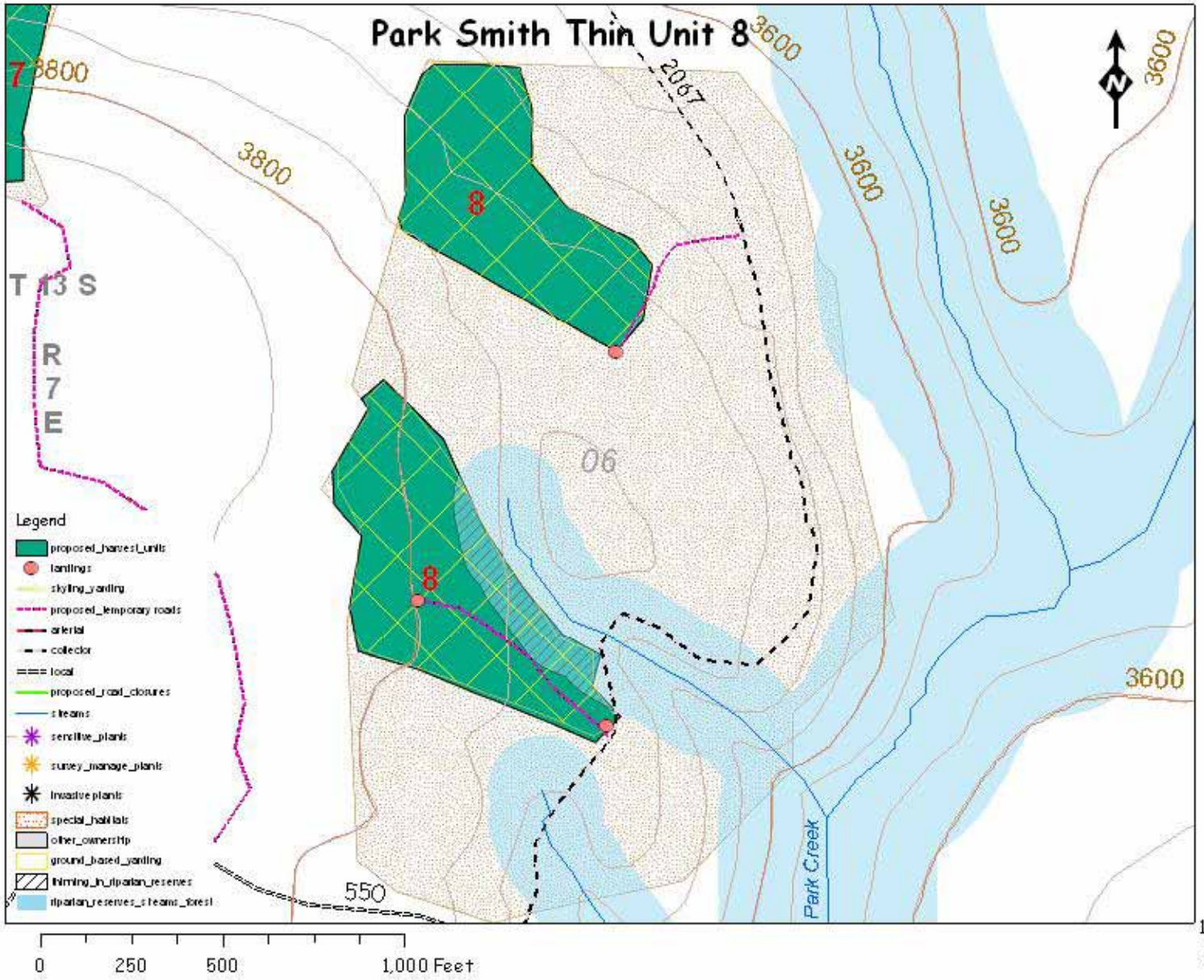
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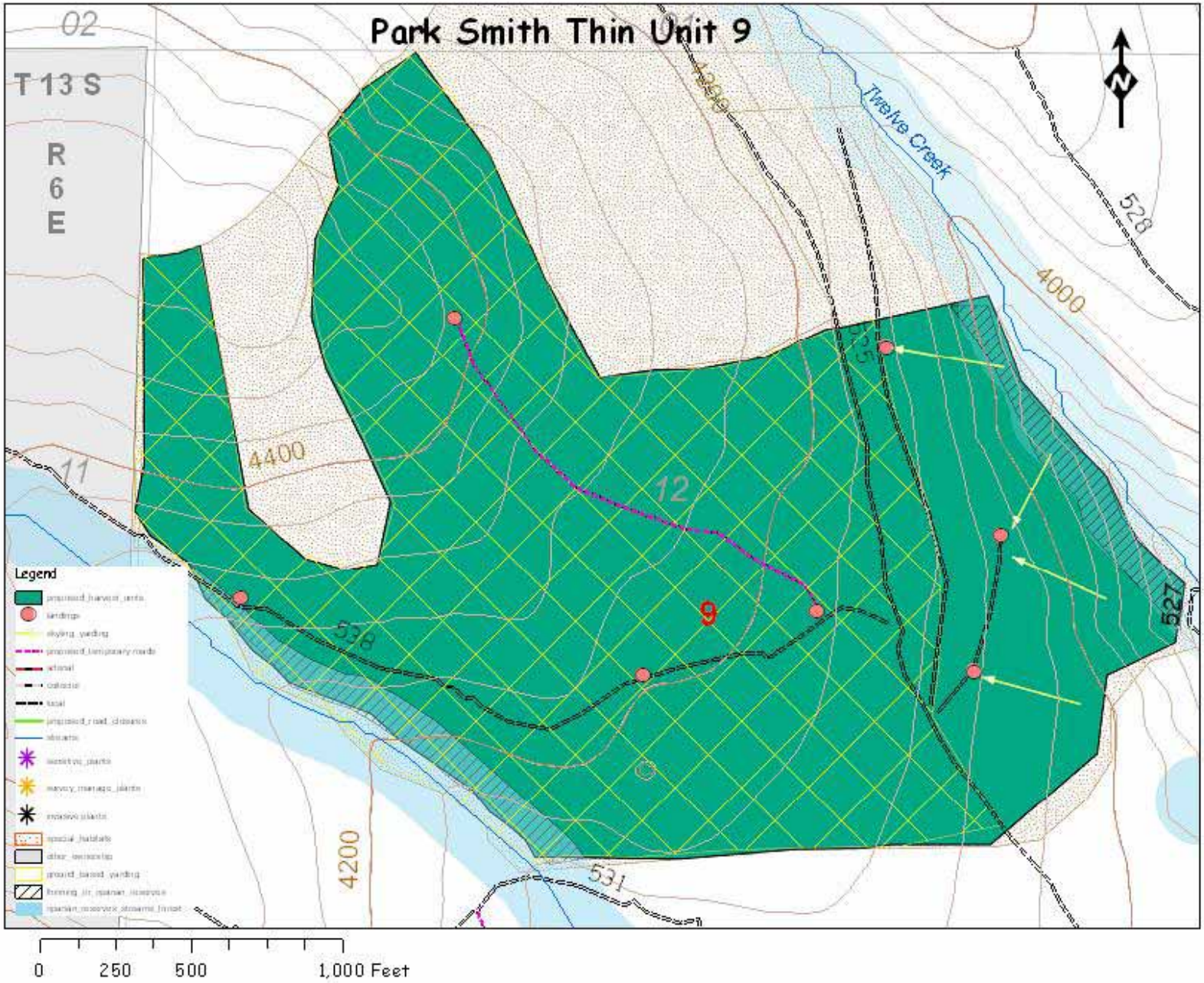
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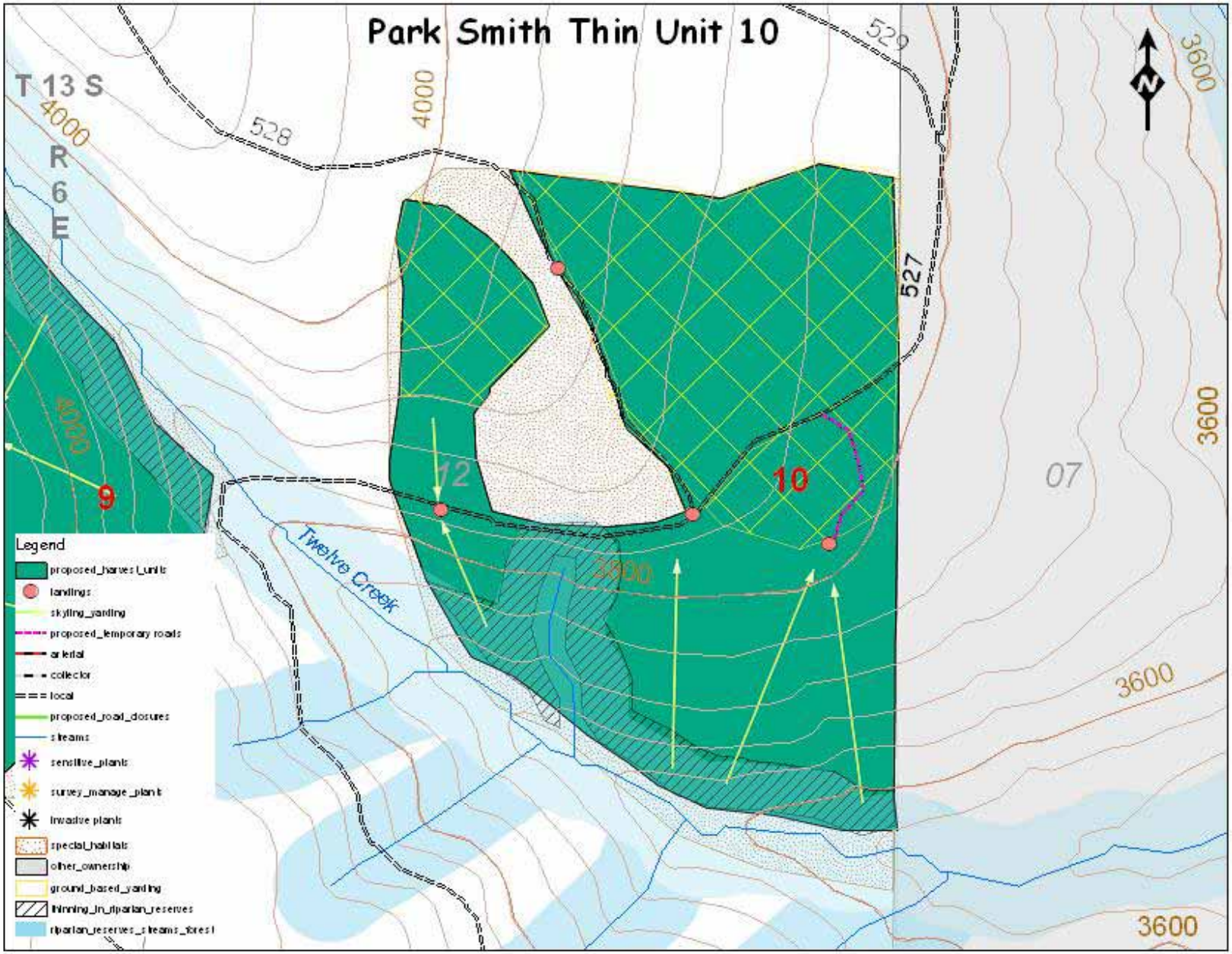
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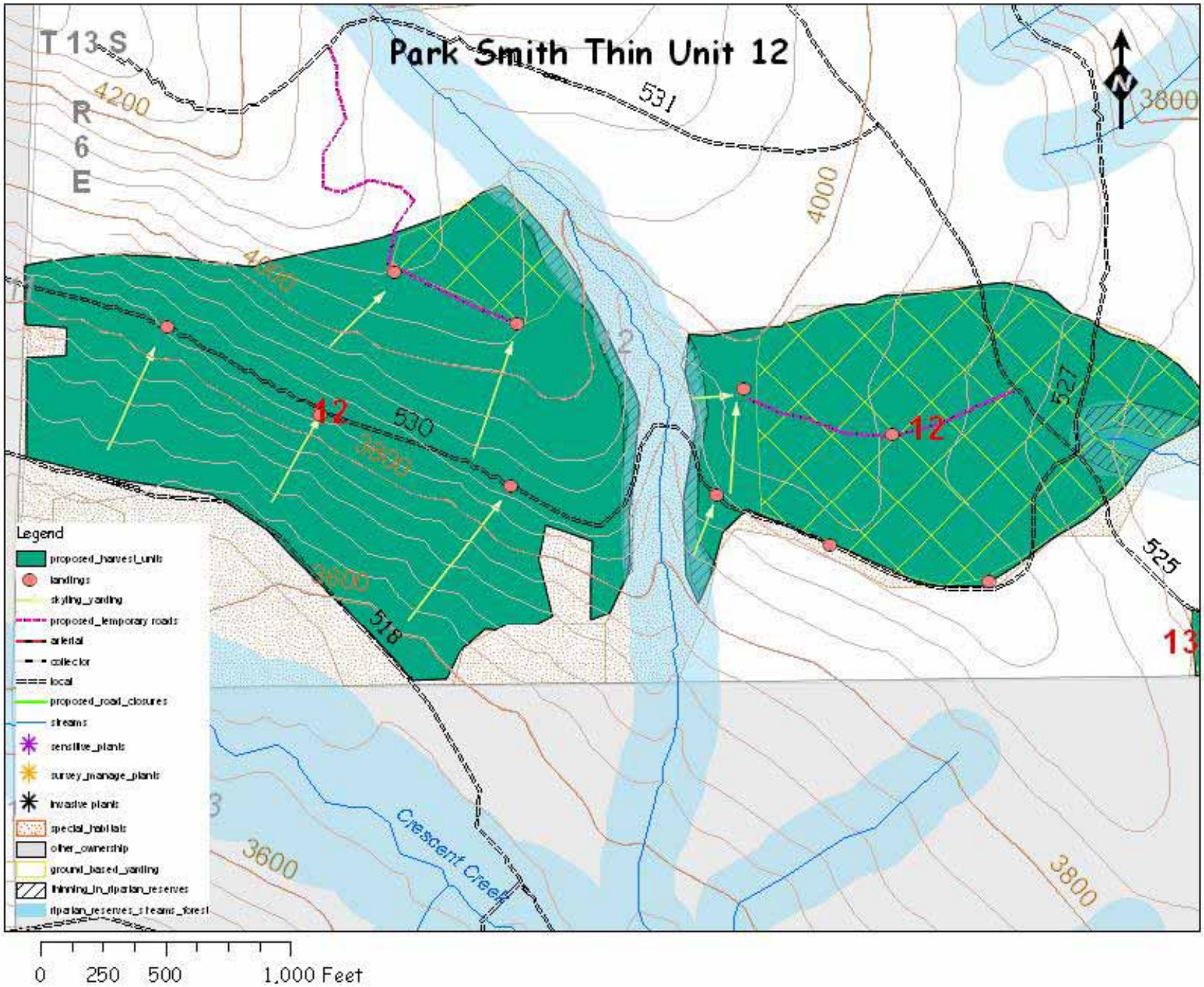
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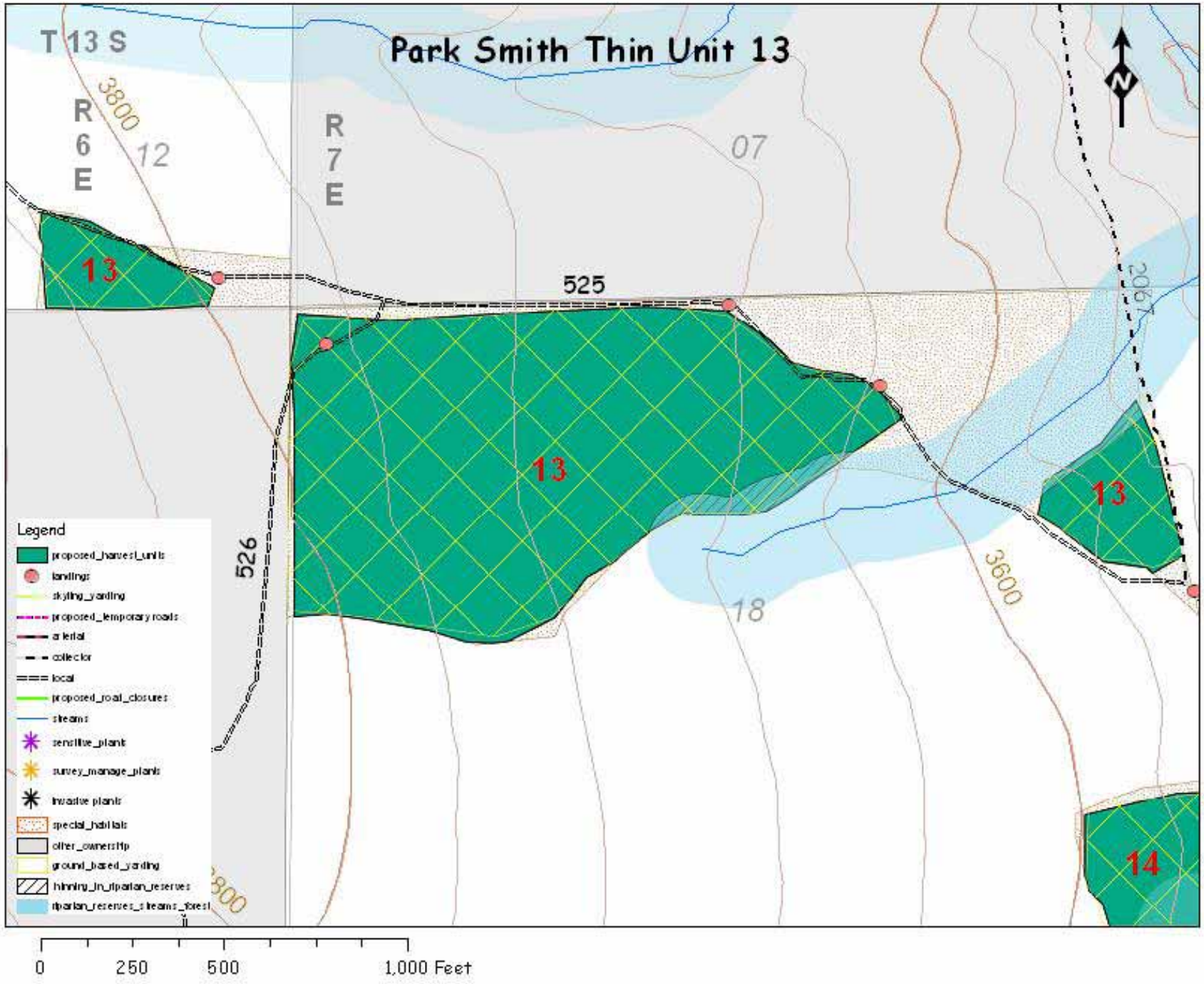
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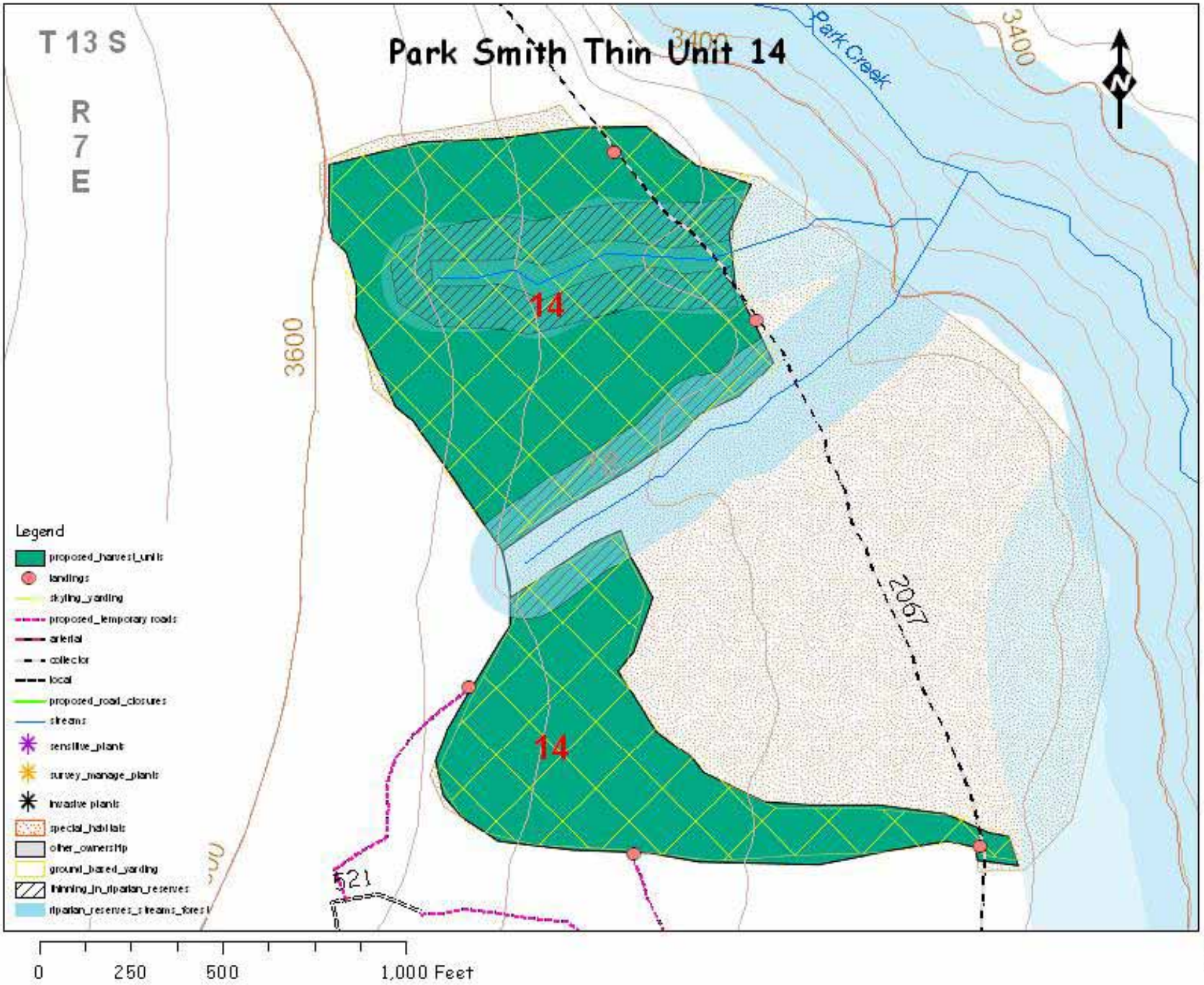
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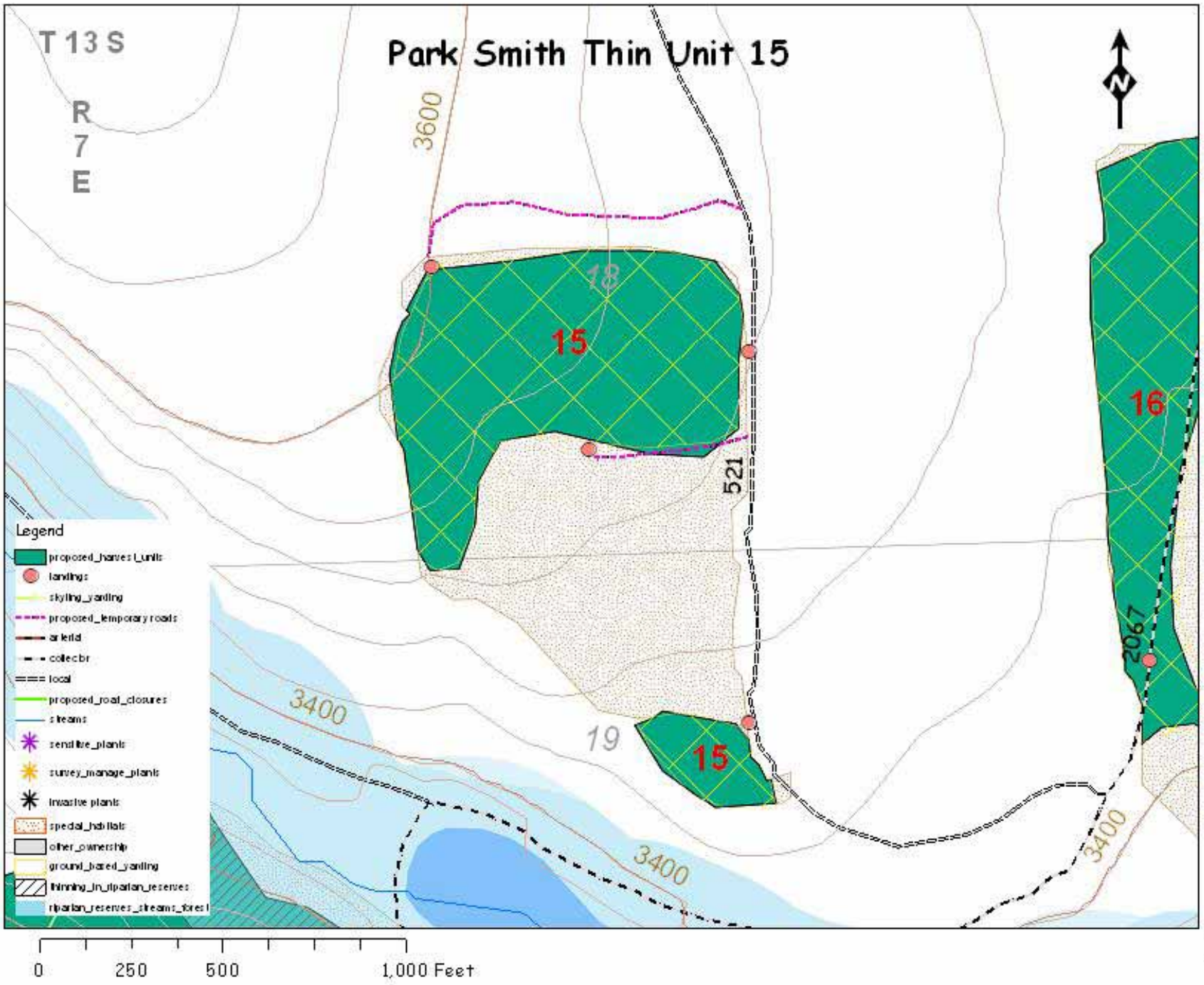
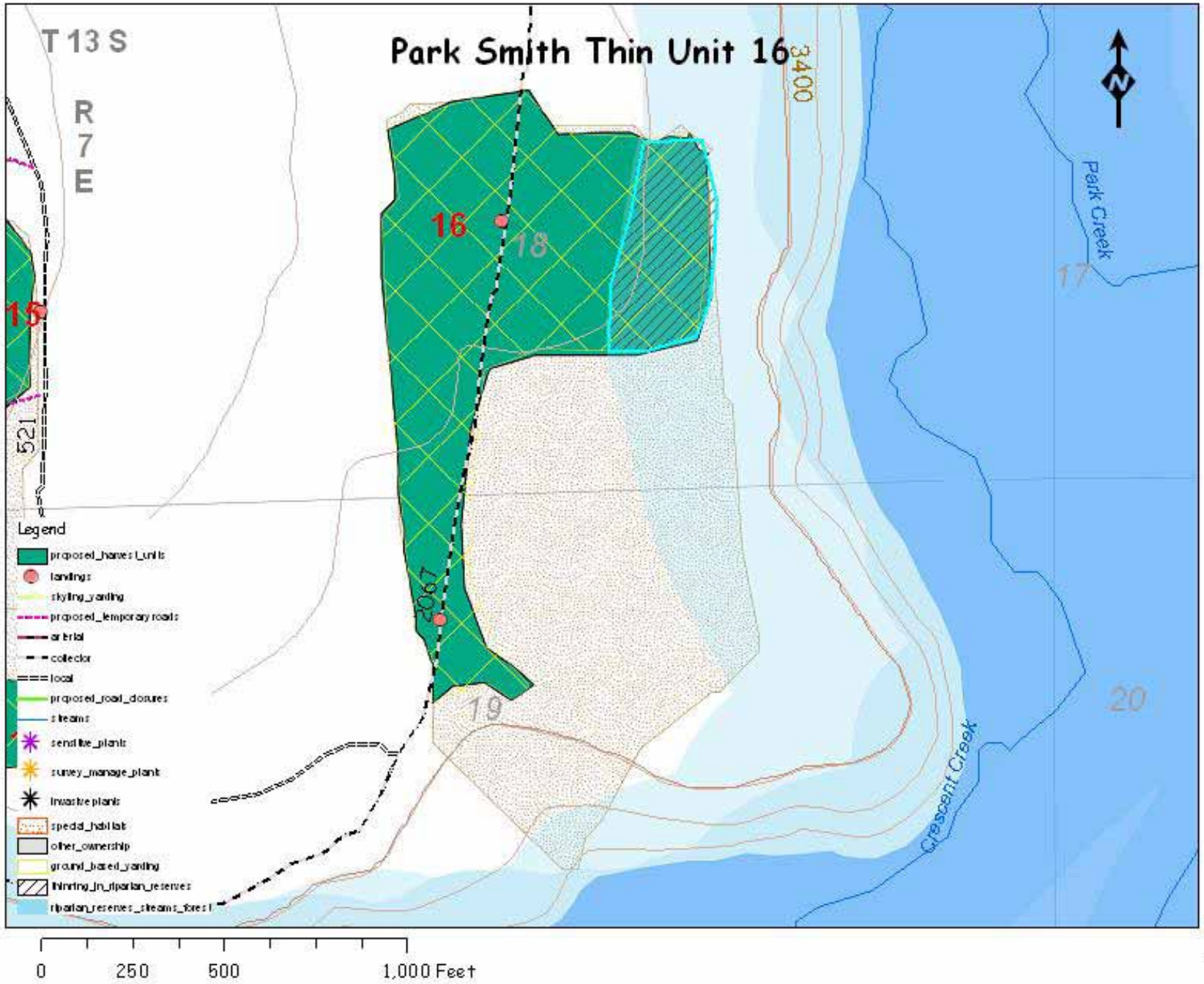
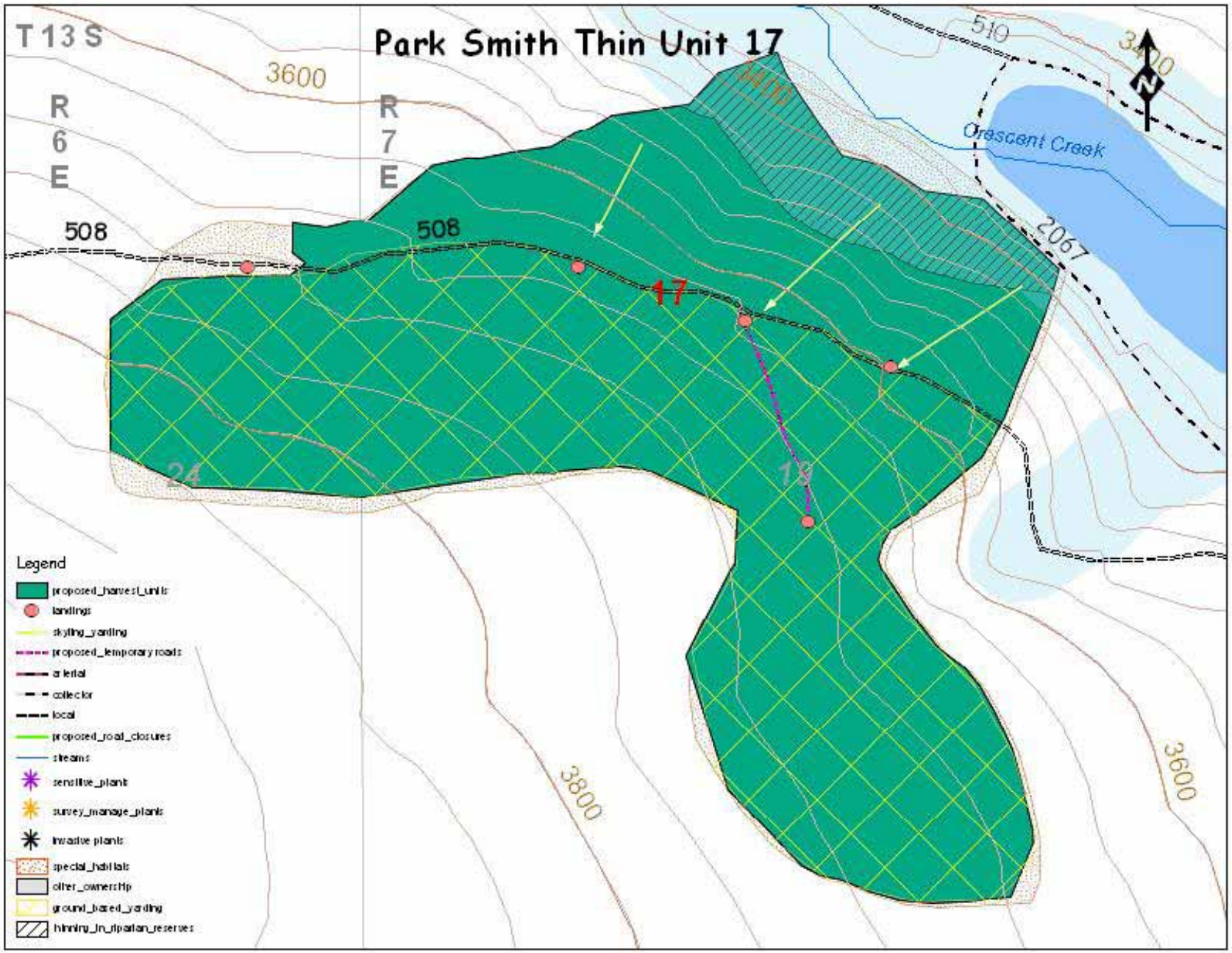
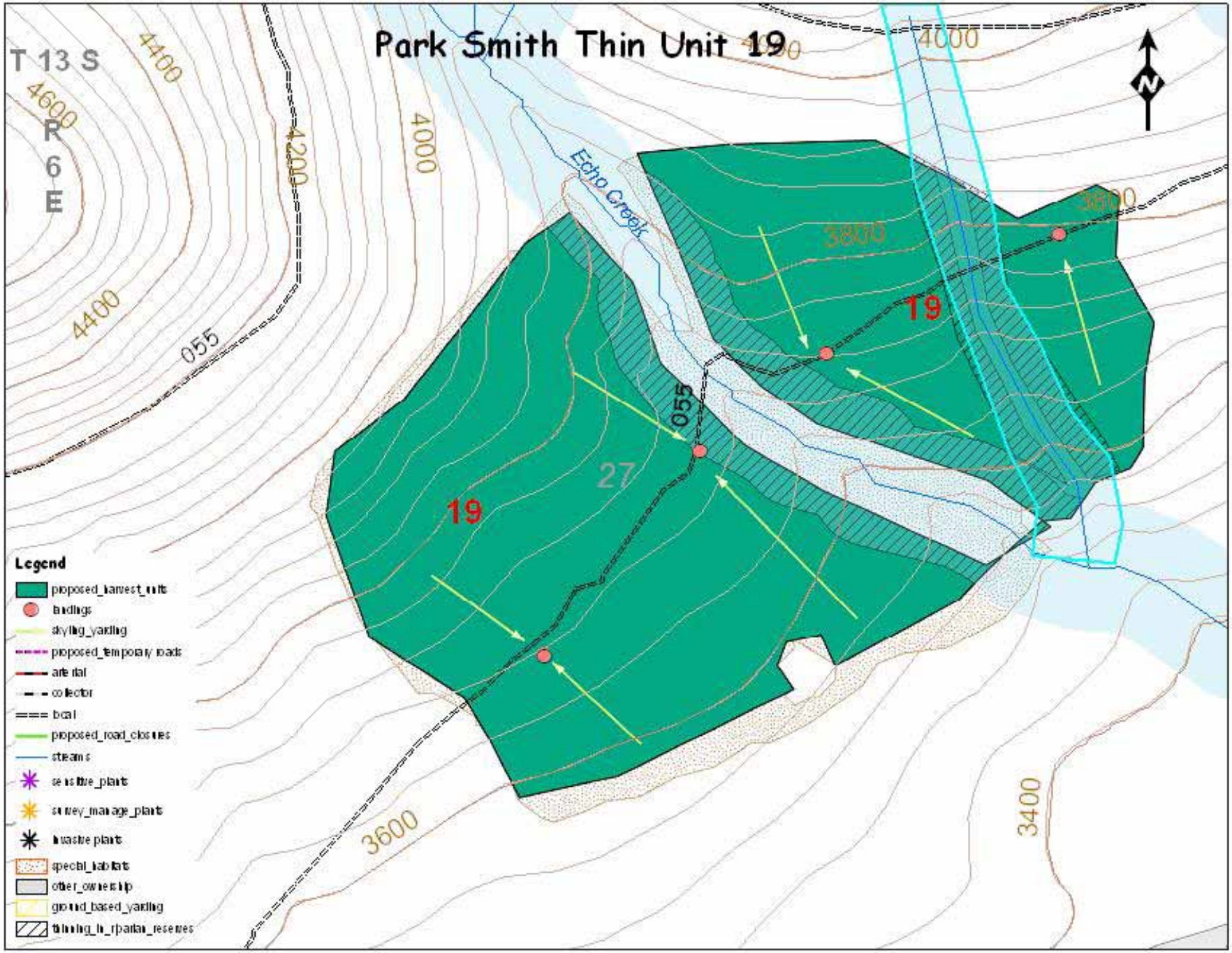

T 13 S
R 7 E
Park Smith Thin Unit 15
N
3600
18
15
16
521
2067
19
15
3400
3400
3400
Legend
proposed_harvest_units
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
riparian_reserves_streams_forest
0
250
500
1,000 Feet

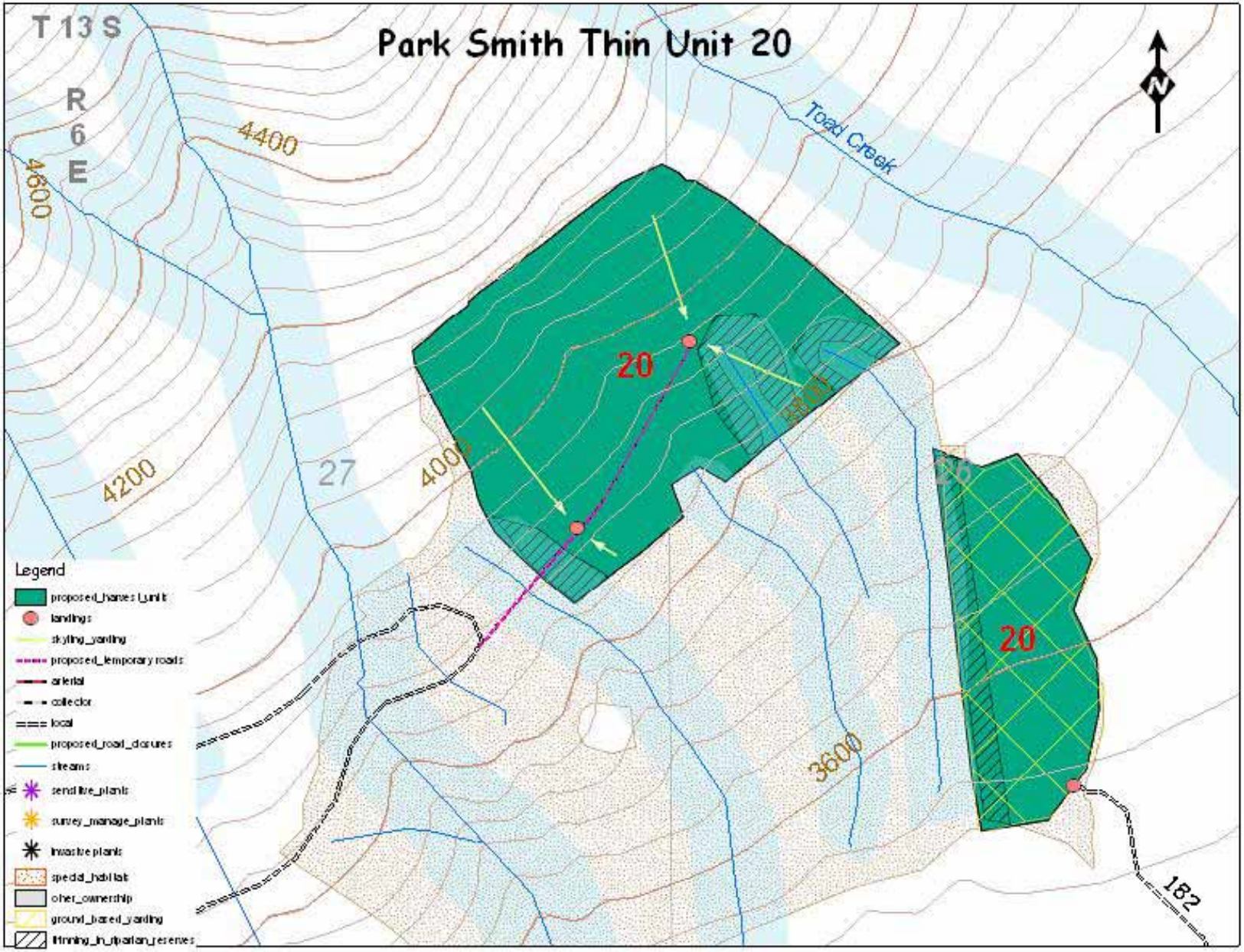
11/07
AGL

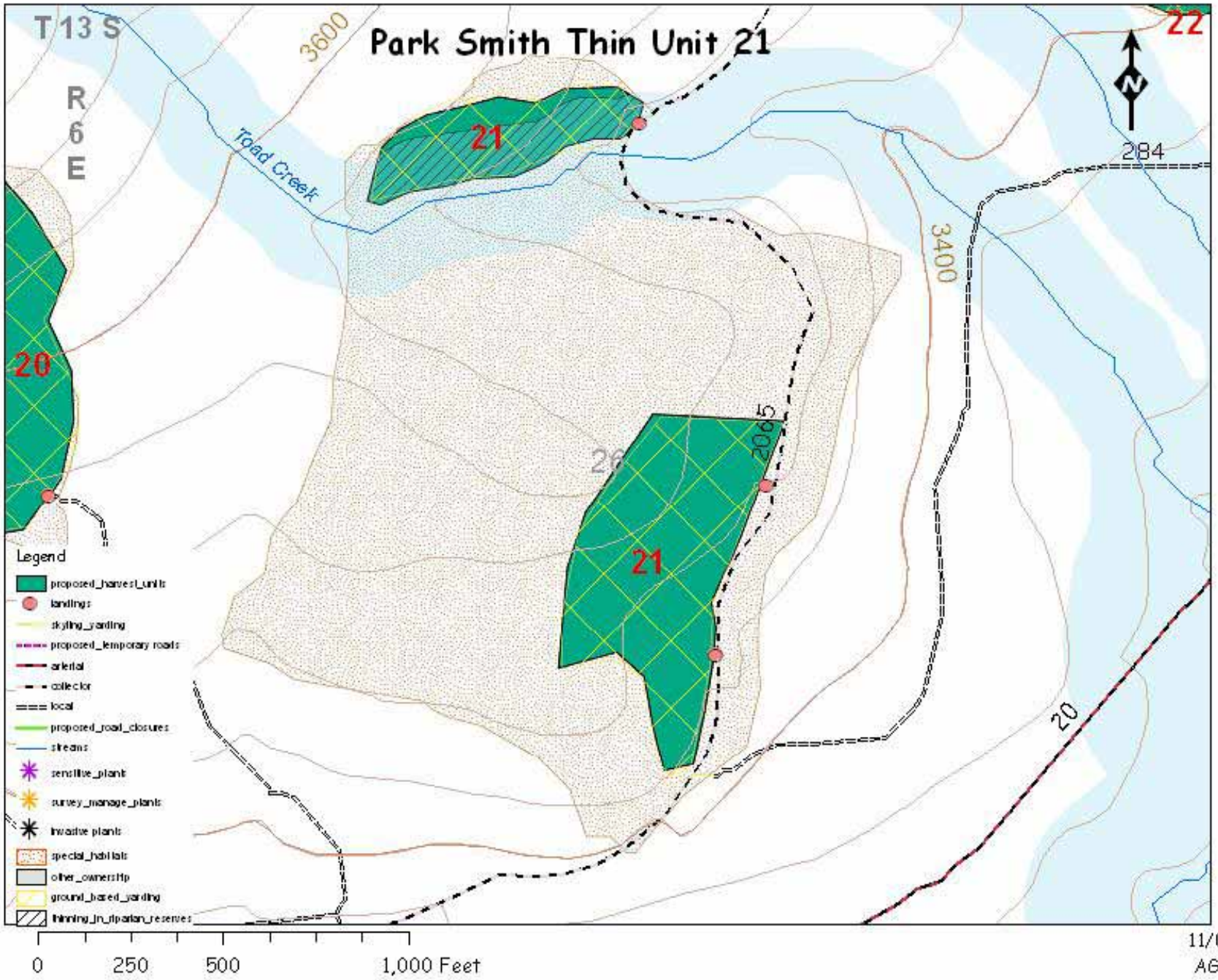

T 13 S
R 7 E
Park Smith Thin Unit 16
3400
Park Creek
Crescent Creek
16
18
15
17
19
20
521
2067
Legend
proposed_harvest_units
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitat
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
riparian_reserves_streams_forest
0
250
500
1,000 Feet
11/07
AGL

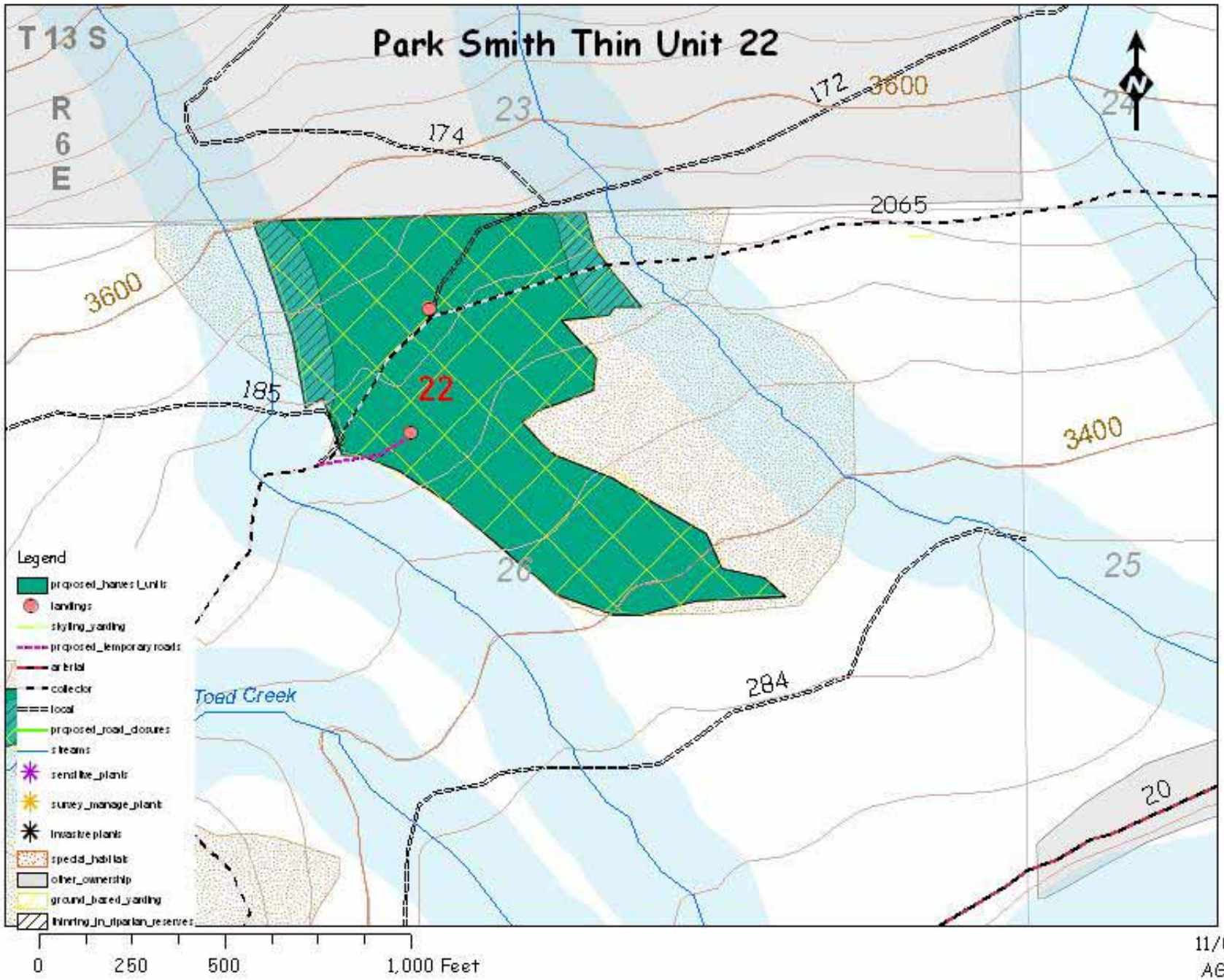

T 13 S
R 6 E
R 7 E
Park Smith Thin Unit 17
3600
3400
510
Crescent Creek
2067
508
508
17
24
19
3800
3600
N
Legend
proposed_harvest_units
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plant
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet

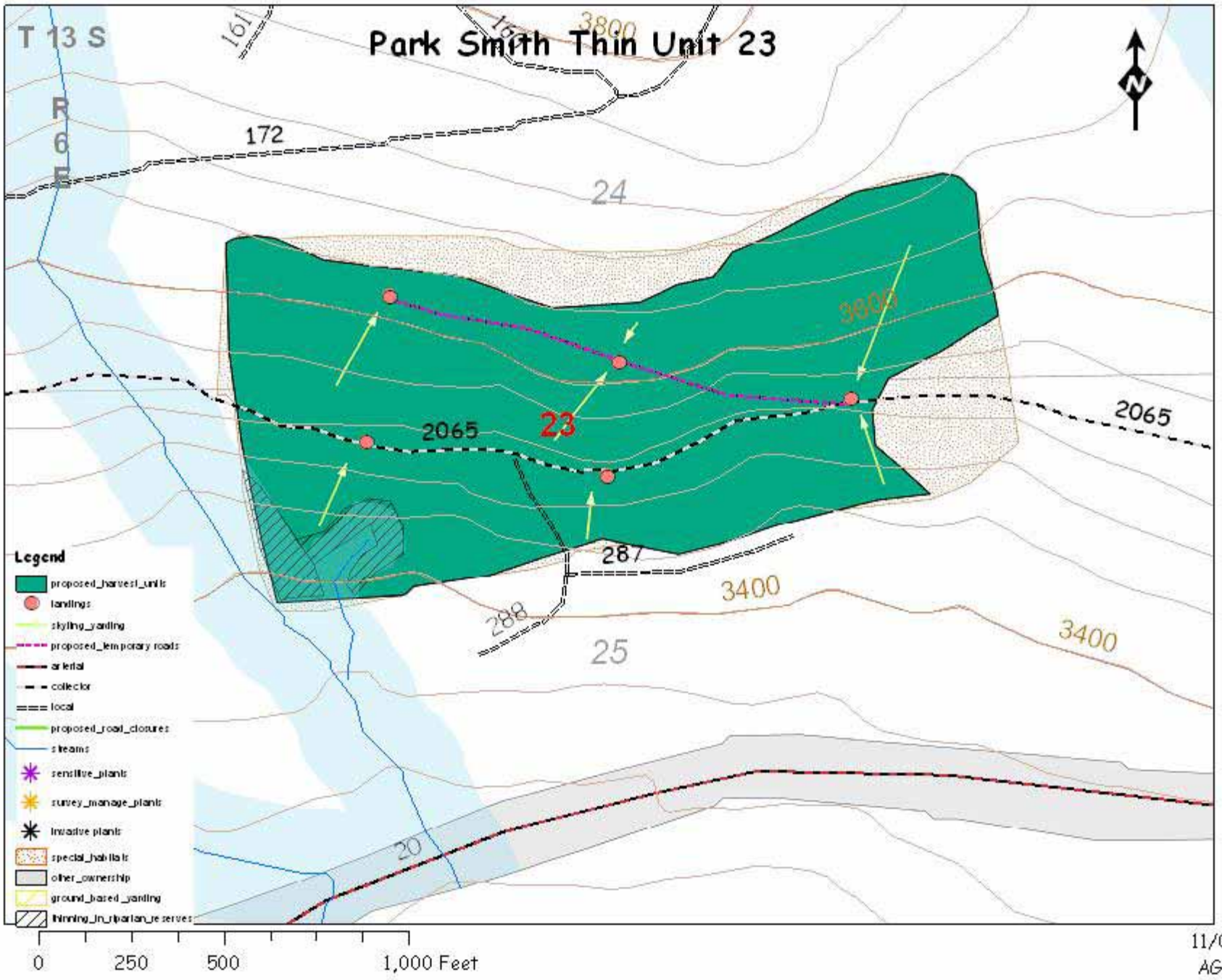
11/07
AGL

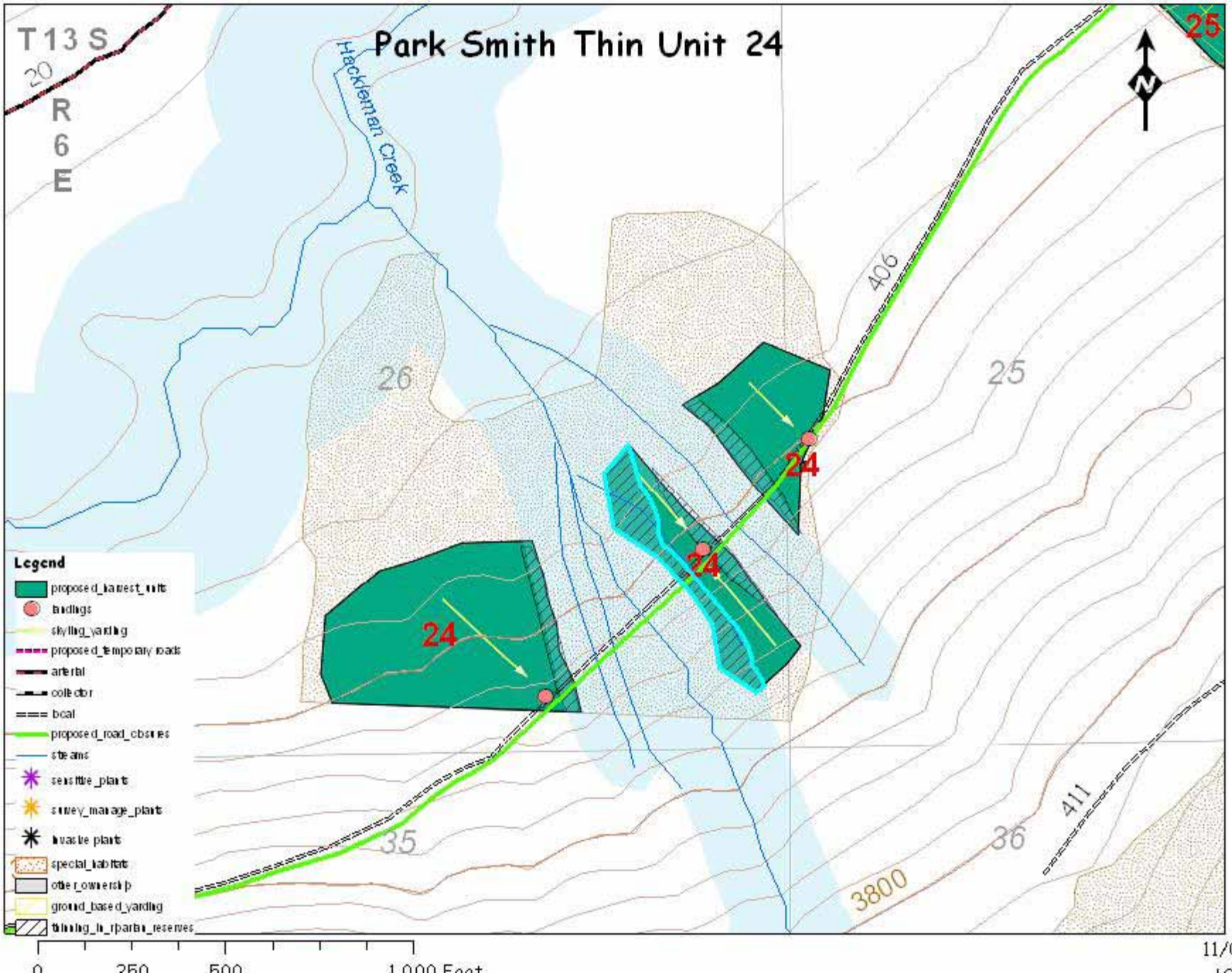

Park Smith Thin Unit 19
T 13 S
R 6 E
4400
4600
4200
4000
3800
3600
3400
055
Echo Creek
19
27
N
Legend
proposed_harvest_units
landings
skyline_yarding
proposed_temporary_roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL

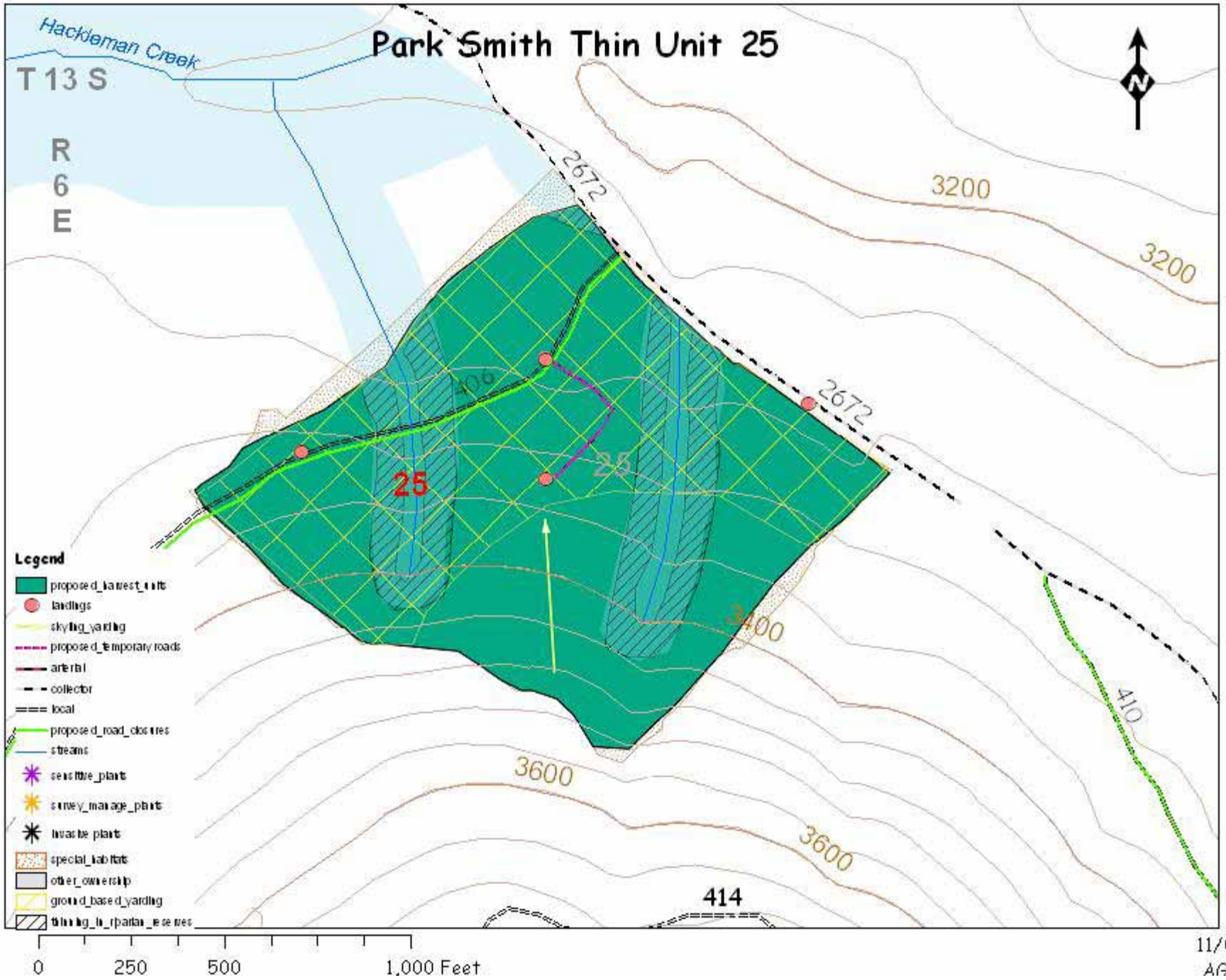

T 13 S
R 6 E
Park Smith Thin Unit 20
Toad Creek
4400
4600
4200
4000
3800
3600
27
26
20
20
182
Legend
proposed_harvest_unit
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitat
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL

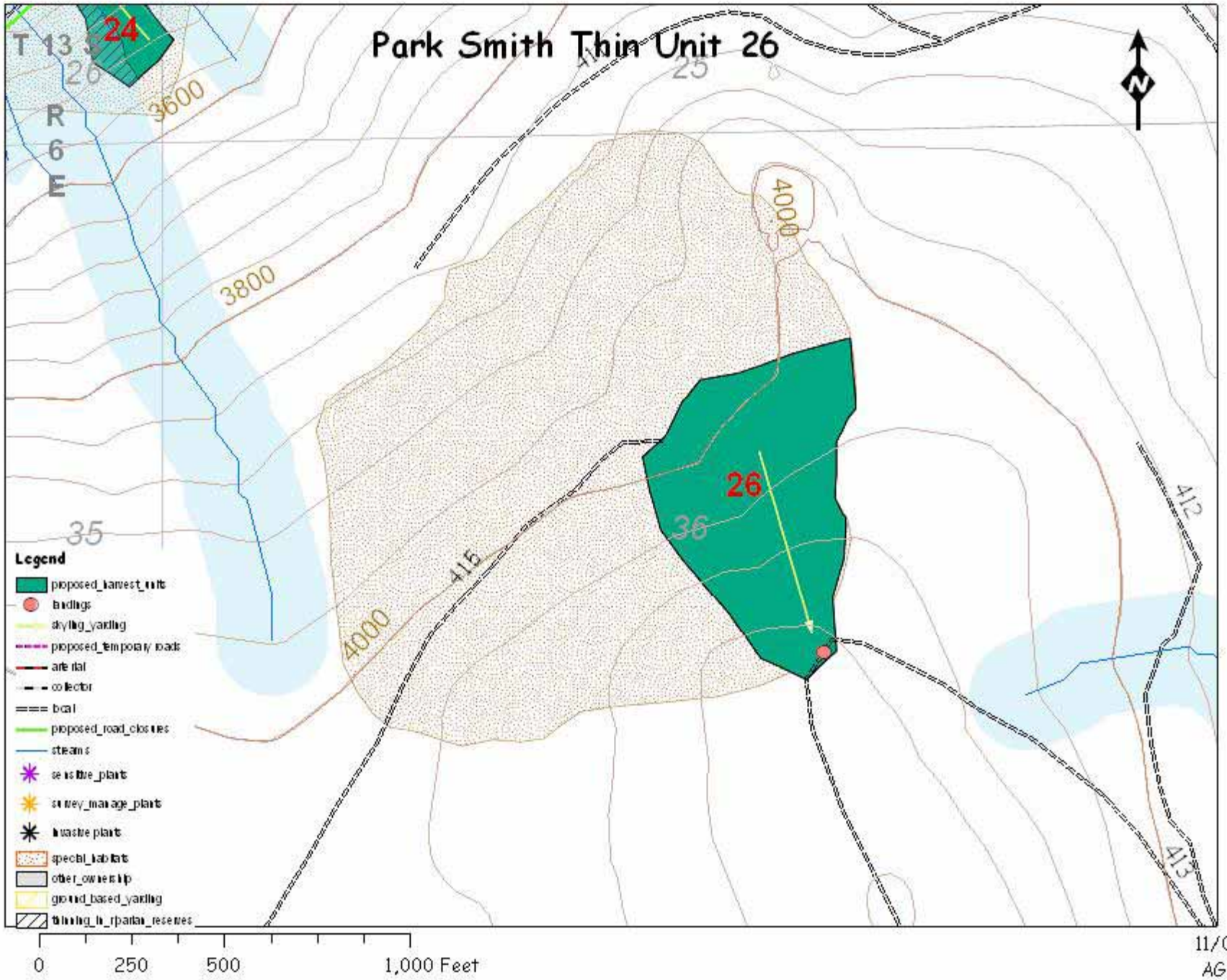

Park Smith Thin Unit 21
T 13 S
R 6 E
Toad Creek
3600
3400
284
22
21
20
26
2065
Legend
proposed_harvest_units
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plant
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL

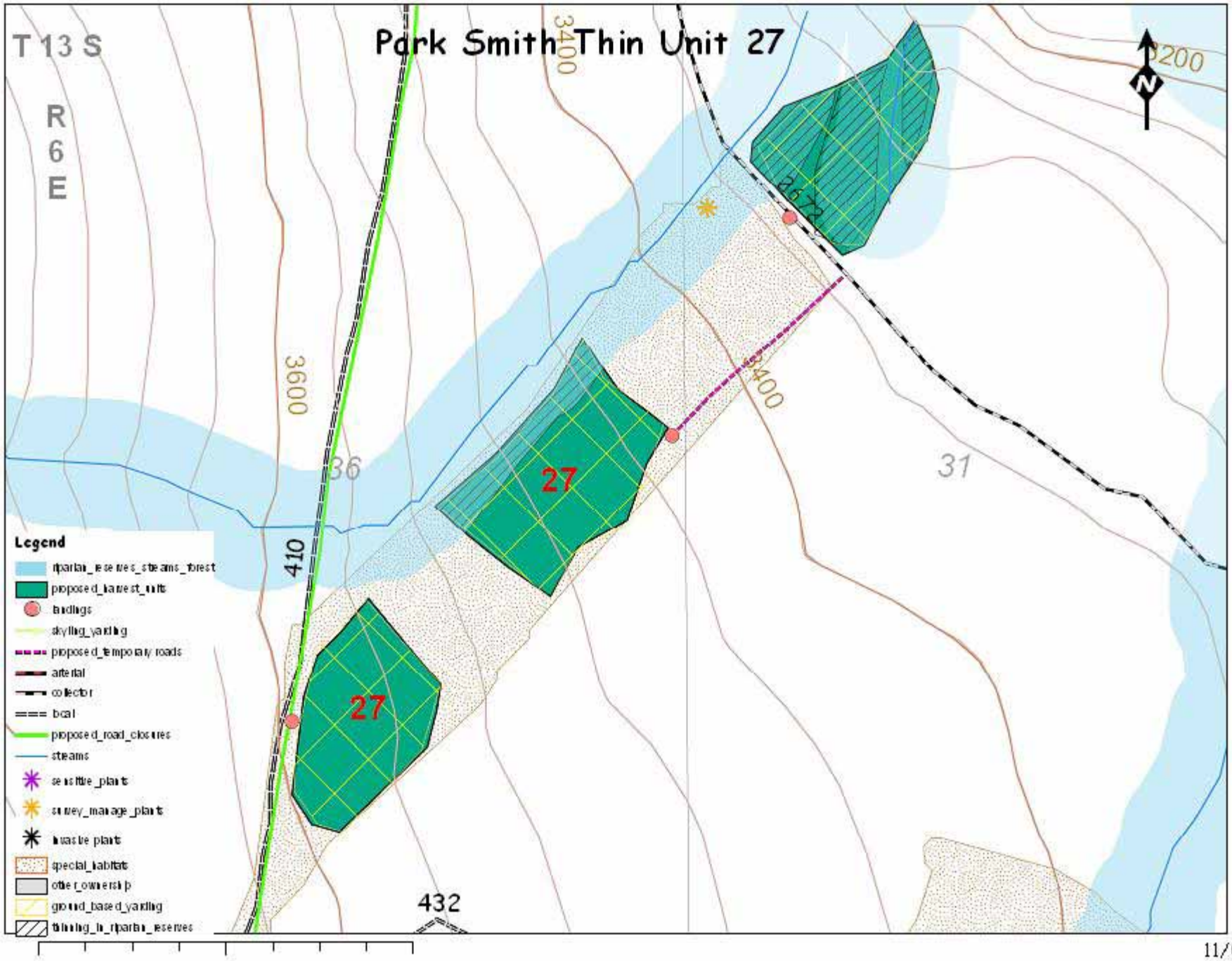

Park Smith Thin Unit 22
T 13 S
R 6 E
23
24
25
26
172
3600
174
2065
3600
185
22
3400
284
20
Toad Creek
Legend
proposed_harvest_units
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plant
invasive plants
special_habitat
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL


Park Smith Thin Unit 23
T 13 S
R 6 E
161
172
3800
24
2065
23
287
288
3400
25
20
Legend
proposed_harvest_units
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL

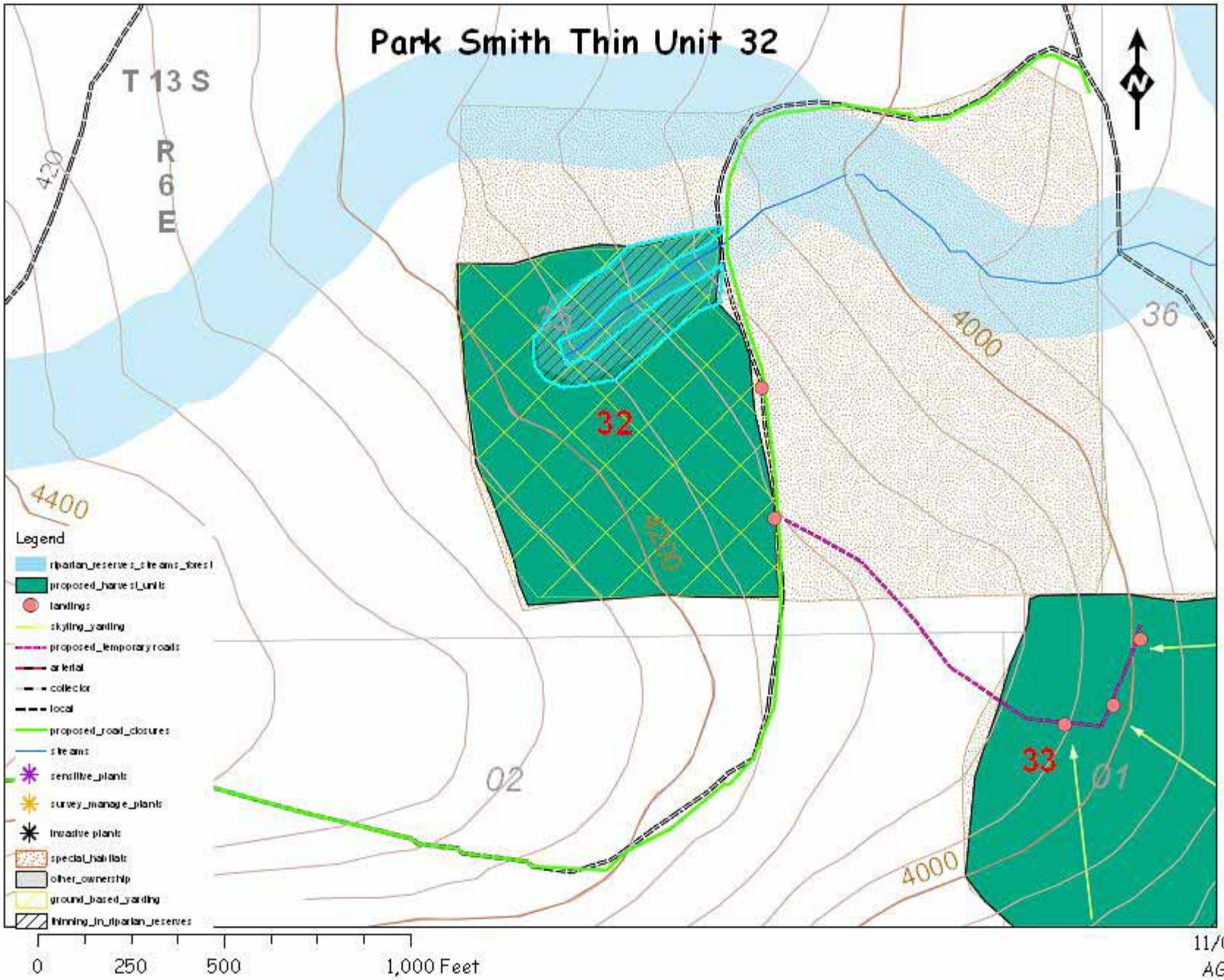

Park Smith Thin Unit 24
T 13 S
20
R
6
E
Hackleman Creek
406
26
25
24
24
24
35
36
411
3800
25
N
Legend
proposed_harvest_units
buildings
skyline_yarding
proposed_temporary_roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07

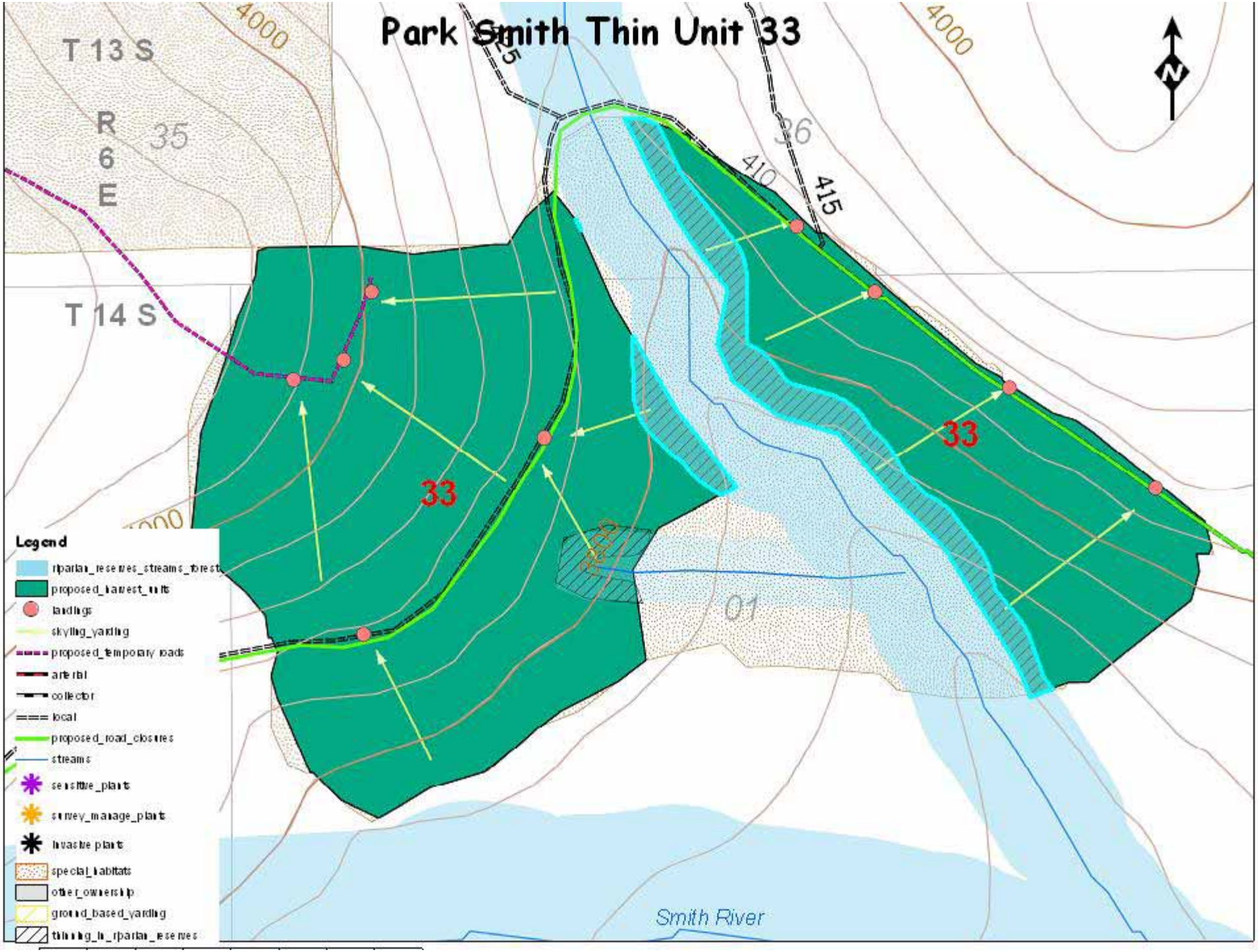

Park Smith Thin Unit 25
Hackleman Creek
T 13 S
R 6 E
2672
3200
3200
2672
400
25
25
3200
410
3600
3600
414
Legend
proposed_harvest_units
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGI

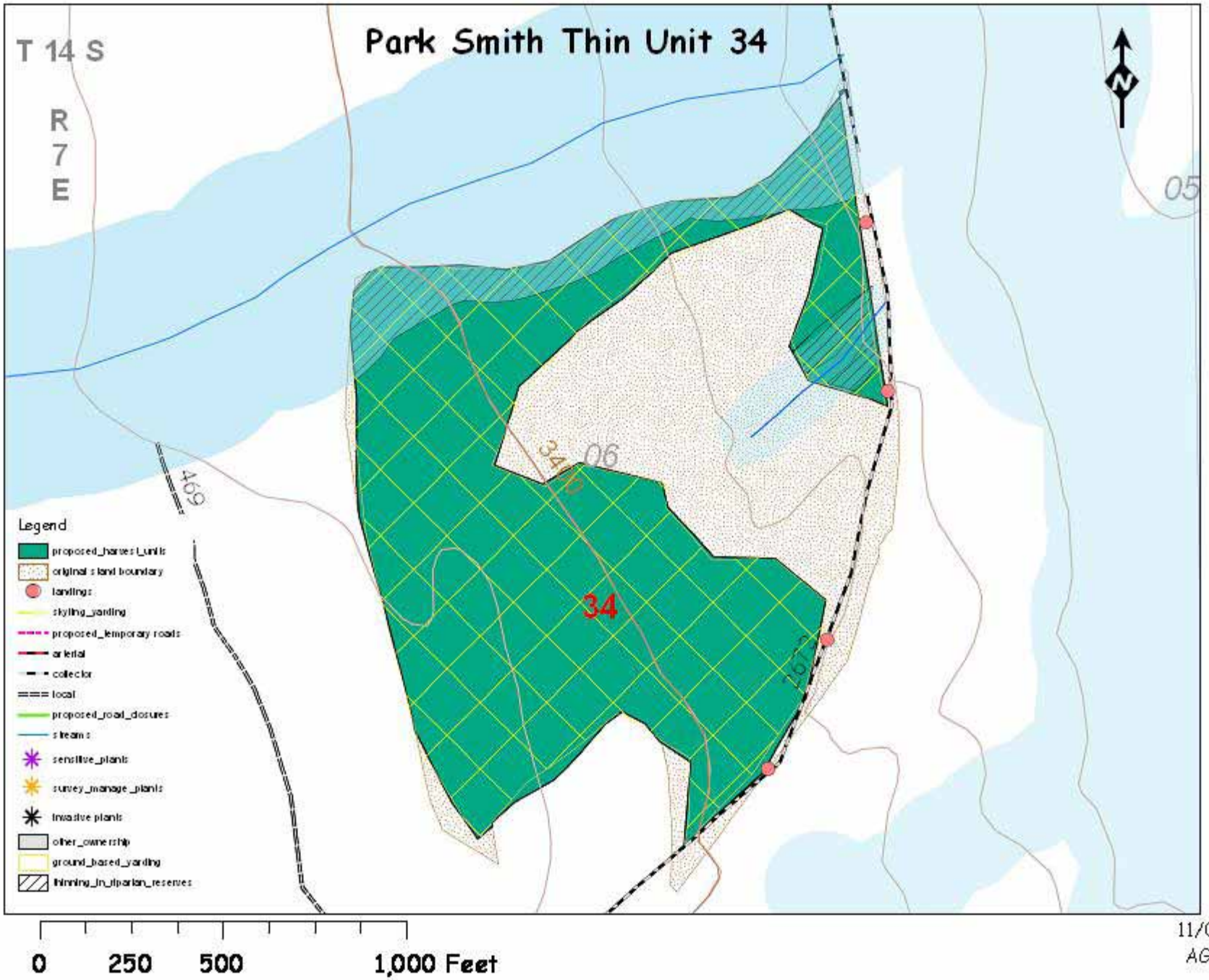

Park Smith Thin Unit 26
T 13 S
R 6 E
24
26
25
35
36
3600
3800
4000
4000
415
412
413
26
N
Legend
proposed_harvest_units
landings
skyline_yarding
proposed_temporary_roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL

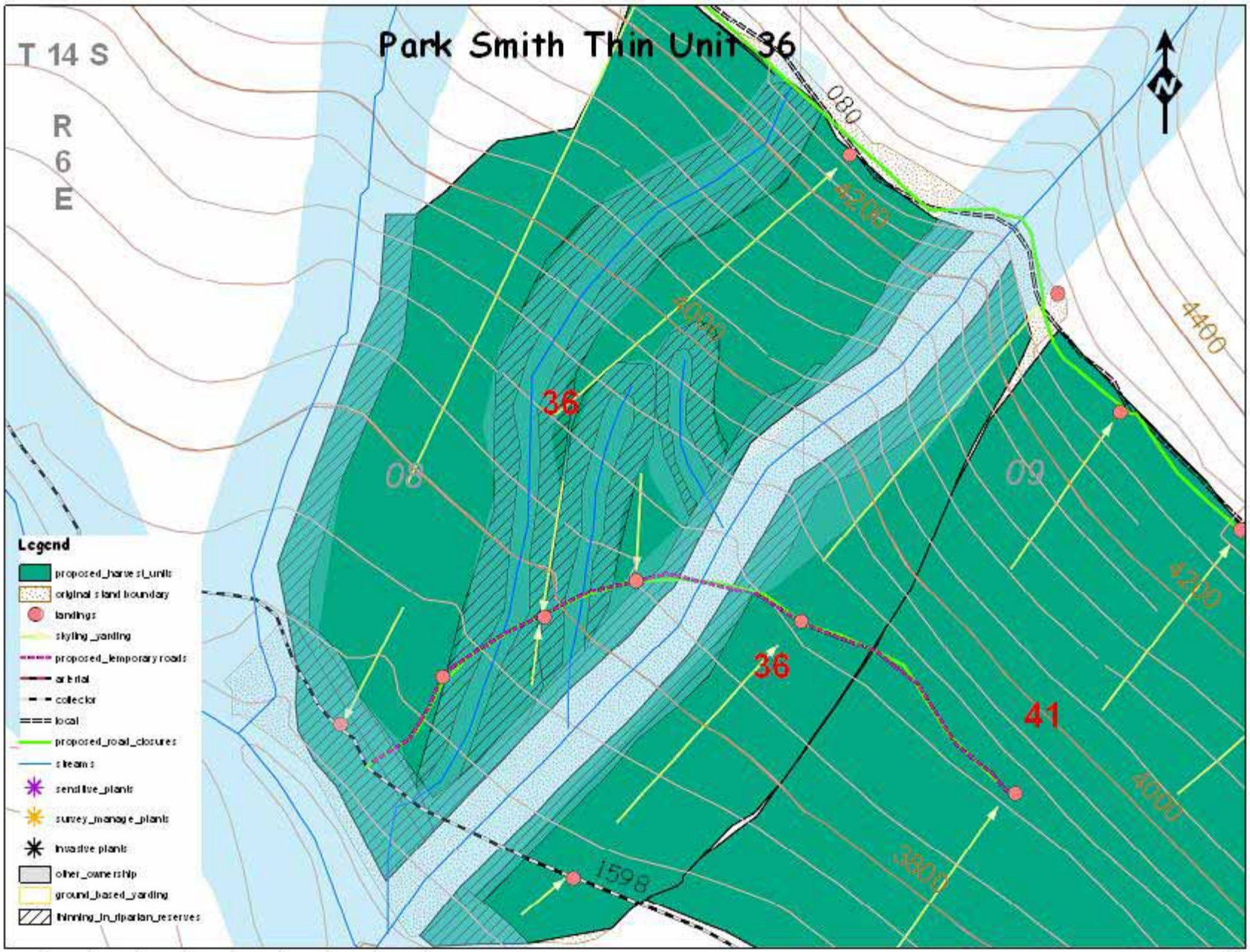

T 13 S
R 6 E
Park Smith Thin Unit 27
3400
3200
3600
3400
36
31
410
432
27
27
2672
Legend
riparian_reserves_streams_forest
proposed_harvest_units
landings
skyline_yarding
proposed_temporary_roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves

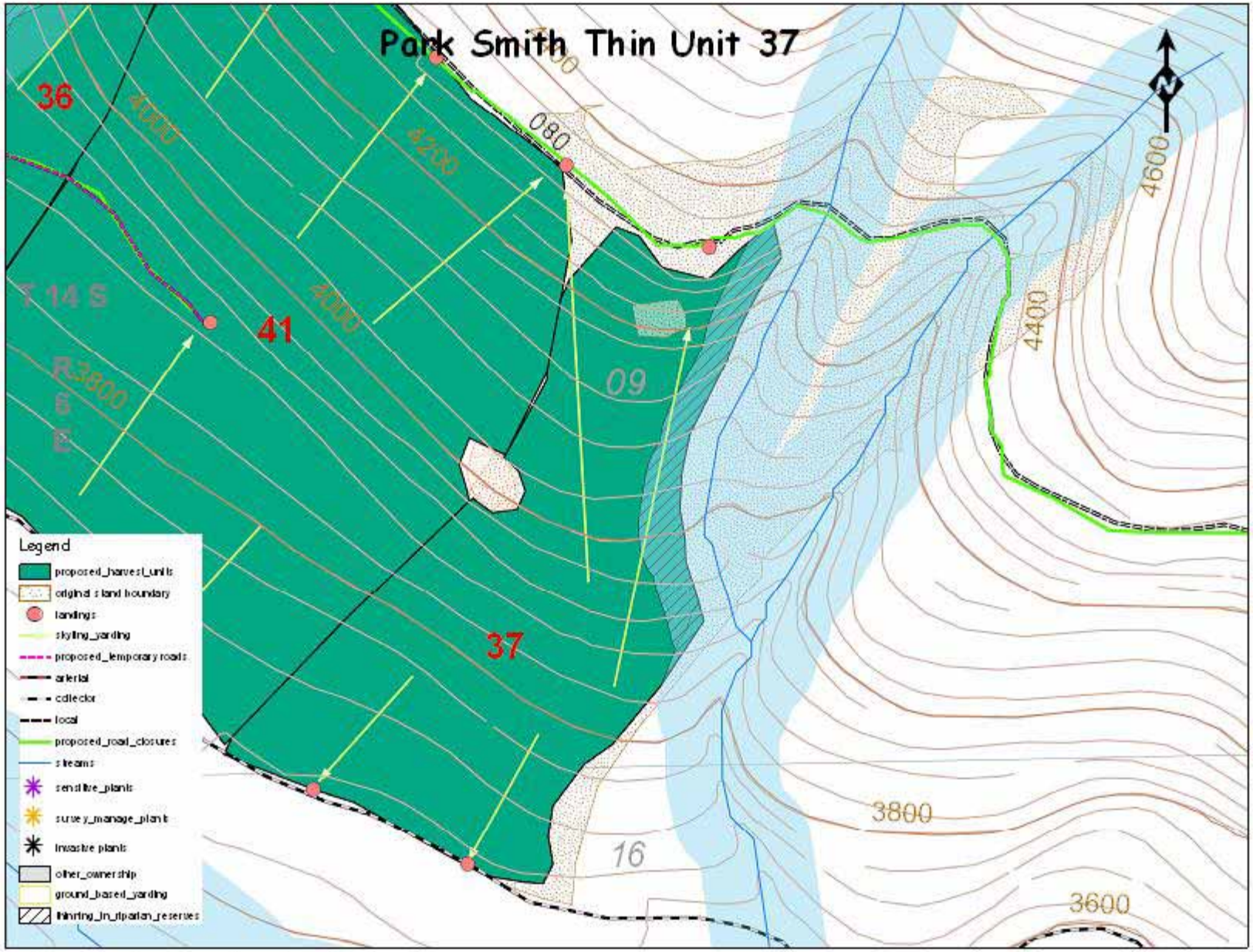
11/07

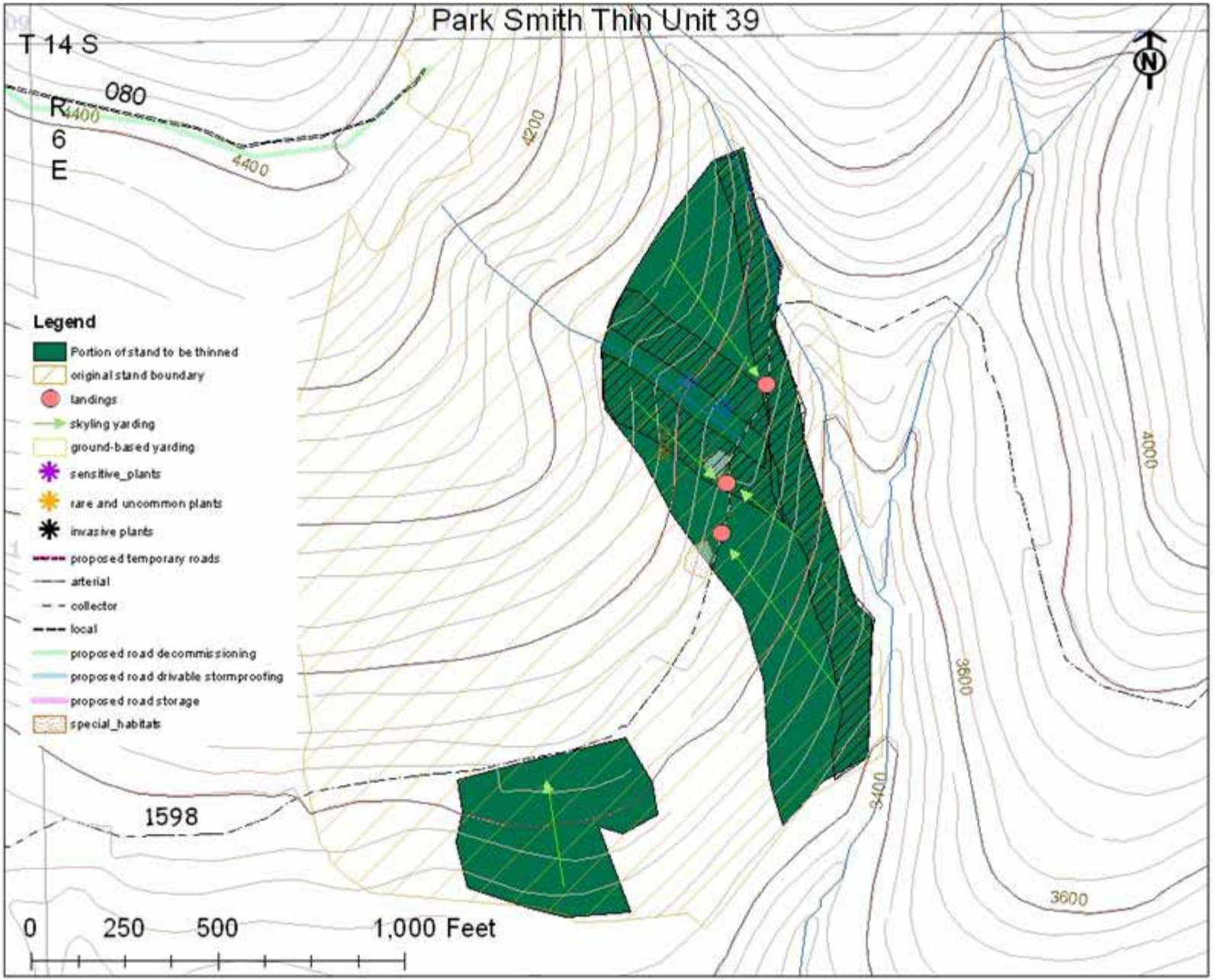

Park Smith Thin Unit 32
T 13 S
R 6 E
420
4400
4000
36
32
33
02
01
Legend
riparian_reserves_streams_forest
proposed_harvest_units
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL

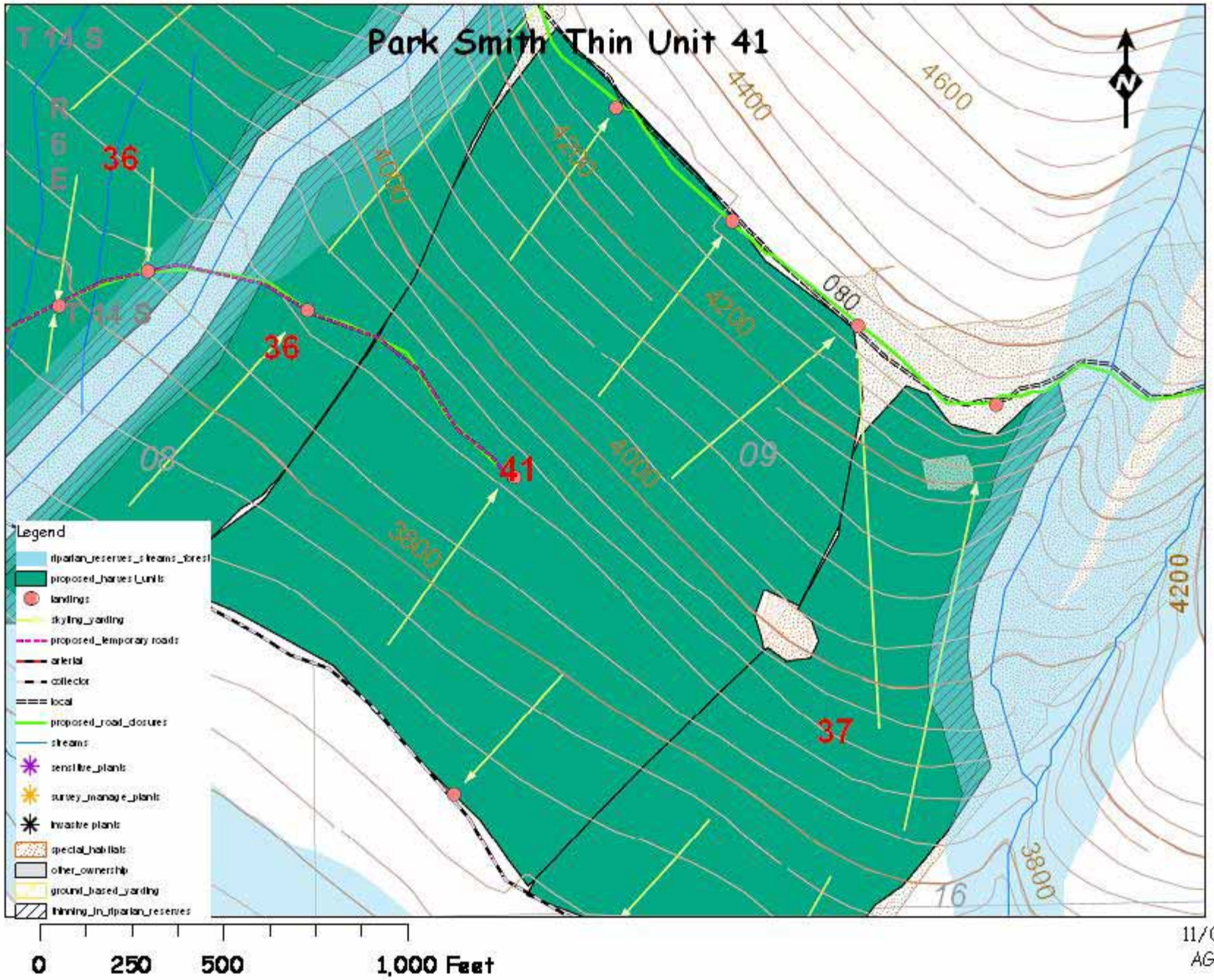

Park Smith Thin Unit 33
T 13 S
R 6 E
35
T 14 S
4000
4000
415
410
36
01
33
33
Legend
riparian_reserves_streams_forest
proposed_harvest_units
landings
skyline_yarding
proposed_temporary_roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
Smith River
N


Park Smith Thin Unit 34
T 14 S
R 7 E
05
06
34
469
1672
34
Legend
proposed_harvest_units
original stand boundary
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL


Park Smith Thin Unit 36
T 14 S
R 6 E
080
4200
4000
4400
36
08
09
36
41
4200
4000
3800
1598
Legend
proposed_harvest_units
original stand boundary
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL


Park Smith Thin Unit 37
36
41
37
T 14 S
R 3800
E
4000
4200
4000
4600
4400
09
16
3800
3600
Legend
proposed_harvest_units
original stand boundary
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL


Park Smith Thin Unit 39
T 14 S
R 6 E
080
4400
4400
4200
4000
3600
3400
3600
1598
Legend
Portion of stand to be thinned
original stand boundary
landings
skyling yarding
ground-based yarding
sensitive_plants
rare and uncommon plants
invasive plants
proposed temporary roads
arterial
collector
local
proposed road decommissioning
proposed road drivable stormproofing
proposed road storage
special_habitats
0
250
500
1,000 Feet
N


Park Smith Thin Unit 41
T 14 S
R 6 E
T 14 S
36
36
41
37
08
09
16
4000
4200
4400
4600
3800
4200
080
N
Legend
riparian_reserves_streams_forest
proposed_harvest_units
landings
skyline_yarding
proposed_temporary roads
arterial
collector
local
proposed_road_closures
streams
sensitive_plants
survey_manage_plants
invasive plants
special_habitats
other_ownership
ground_based_yarding
thinning_in_riparian_reserves
0
250
500
1,000 Feet
11/07
AGL