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Department of
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**Forest
Service**

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Environmental Assessment

Hartz Young Stand Management Project

**McKenzie River Ranger District
Willamette National Forest
Lane County, Oregon**

Legal Location: T.17 and 18S, R.4 and 5E. W.M.

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Figure 1

Willamette National Forest
McKenzie River Ranger District
Hartz Young Stand Management Project Area

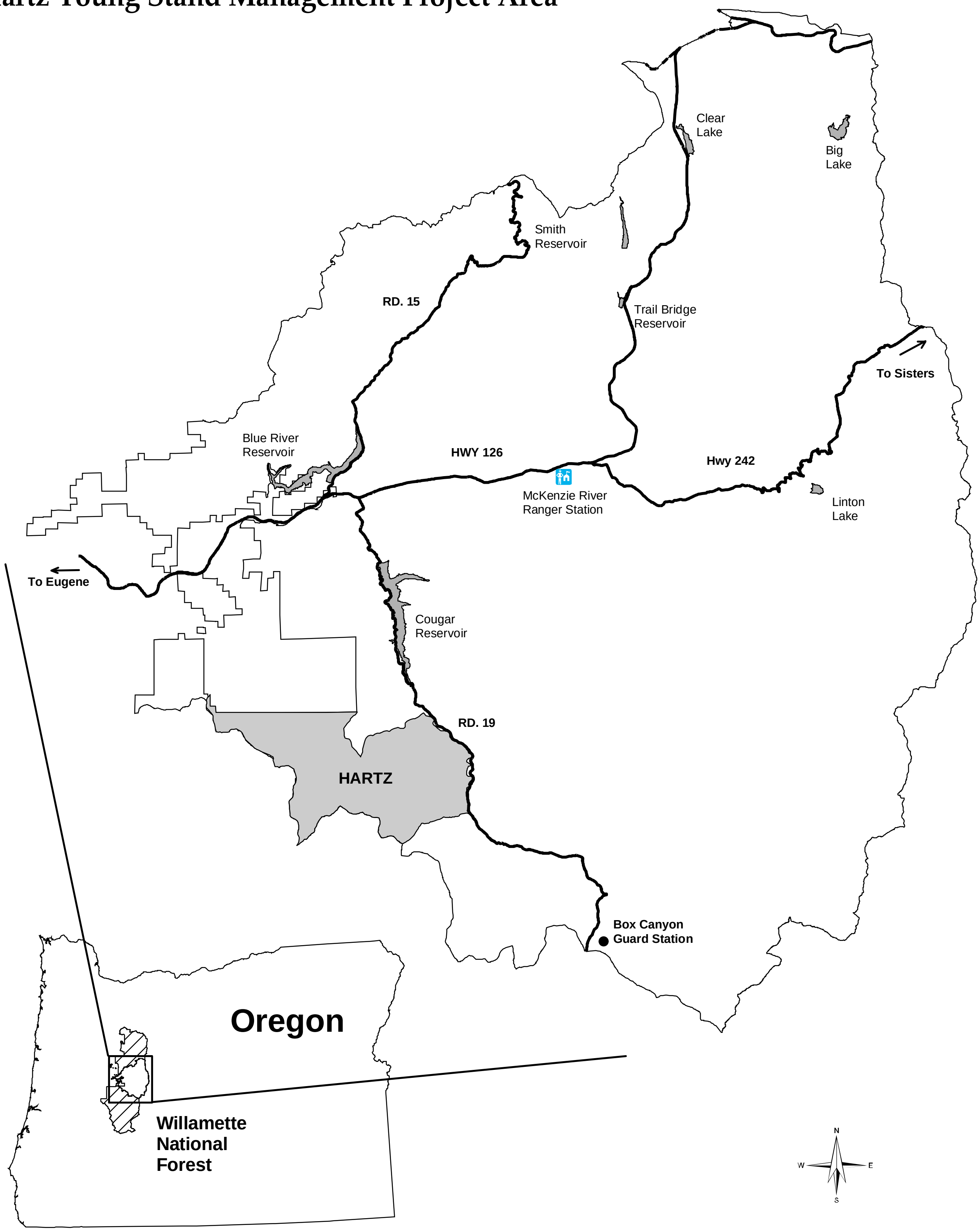

Figure 2

Hartz Project Area with 5th Field Watersheds & 6th Field Sub_watersheds

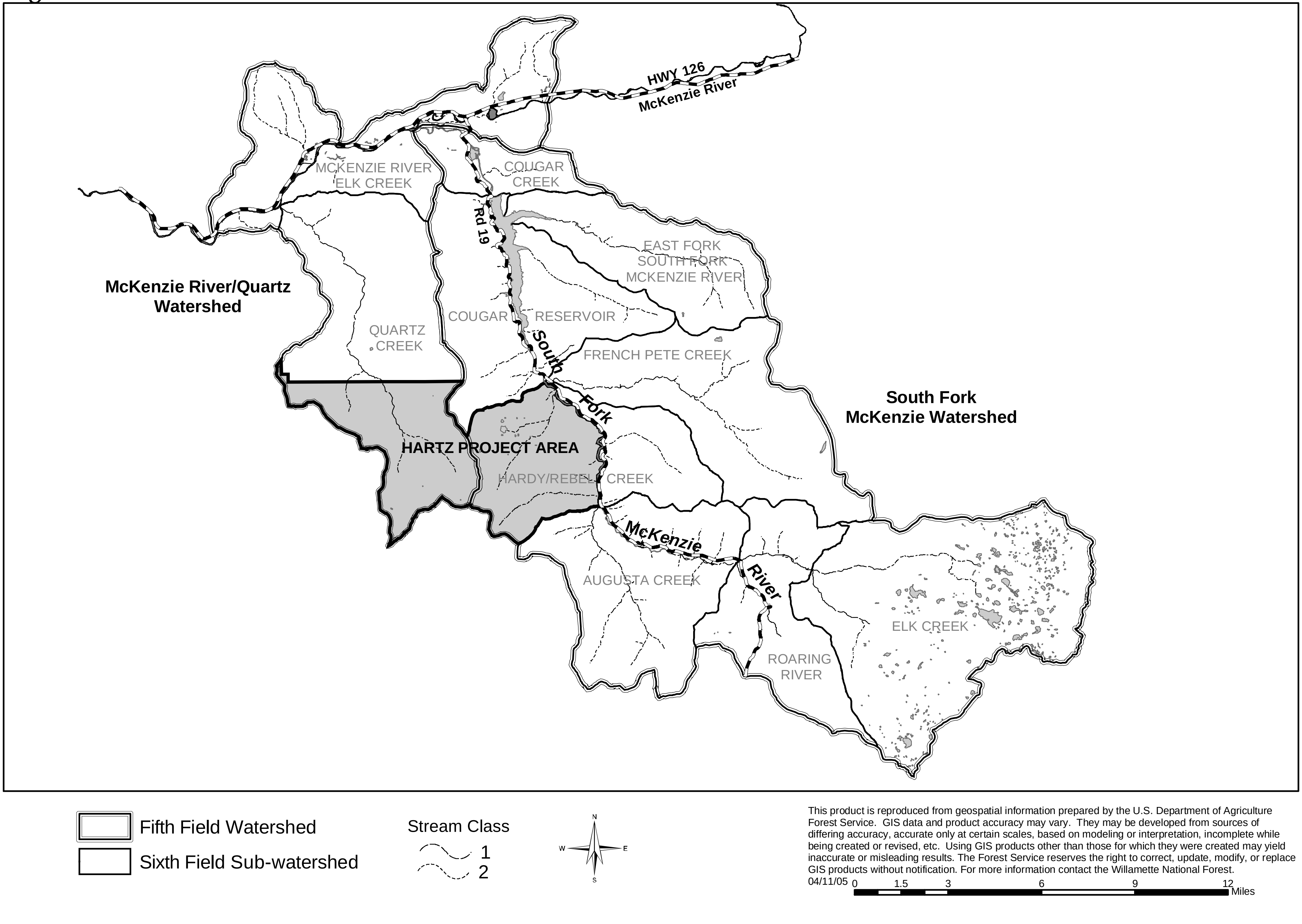

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Table of Acronyms:

ACS	Aquatic Conservation Standards
ARP	Aggregate Recovery Percentage (hydrologic recovery)
dbh	Diameter breast height
DN/FONSI	Decision Notice/Finding of No Significant Impact
EA	Environmental Assessment
EIS	Environmental Impact Statement
EWEB	Eugene Water And Electric Board
FEIS	Final Environmental Impact Statement
IDT	Inter-disciplinary Team
MIS	Management Indicator Species
MRRD	McKenzie River Ranger District
NEPA	National Environmental Policy Act
NFS	National Forest System
ODOT	Oregon Department of Transportation
OSHA	Occupational Safety and Health Administration
ODFW	Oregon Department of Fish and Wildlife
PETS	Proposed, Endangered, Threatened, Sensitive species
ROD	Record of Decision
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
SOPA	Schedule of Proposed Actions
TES	Threatened, Endangered, or Sensitive Species
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WA	Watershed Analysis
WNF	Willamette National Forest

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CHAPTER 1. PURPOSE AND NEED FOR ACTION

Document Structure

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

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

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

Introduction

The 19,994-acre Hartz Young Stand Management Project Area is on the McKenzie River Ranger District, within the South Fork McKenzie River and the McKenzie River/Quartz Creek Watersheds (Figures 1 and 2). Proposed actions presented in this analysis would occur in the southern half of the Quartz Creek sub-watershed that is west of Indian Ridge, and in the Hardy

Creek/Rebel Creek sub-watershed east of Indian Ridge. The north half of the Quartz Creek sub-watershed is mostly private land.

The Project Area is south of Cougar Reservoir and west of Forest Road 19 (Aufderheide National Scenic Byway). Primary drainages include Quartz, Indian, and Lytle Creeks in the Quartz Creek Watershed, and Hardy and Starr Creek in the South Fork McKenzie River Watershed. Elevations range from approximately 2,000 feet along the South Fork McKenzie River to over 5,400 feet on Indian Ridge.

Legal description of the project area:

T.17S, R.4E, Section 31; T.17S, R.5E, Section 31; T.18S. R.4E, Sections 1-6, 8-15, 22-24, 26, and 27; T.18S, R.5E, Sections 3-11, 14-23, and 16-30; Willamette Meridian; Lane County, Oregon.

Background

Stand conditions on National Forest System (NFS) lands in the Hartz Young Stand Management area where actions are proposed (the Hardy and Quartz Creek sub-drainages) are characterized by the young forests that were planted from the 1950s through 1980s following regeneration timber harvesting, the primary harvest method applied to the Forest for the last half century. Clearcutting and subsequent planting of primarily Douglas-fir was done to comply with sustainable yield timber management objectives of the time. Minor amounts of salvage, selection harvest, and commercial thinning also occurred in the project area (See Table 1).

Timber sales occurred in Forest Plan land allocations that were then designated for programmed timber management. Current Forest Plan management areas include Late Successional Reserves (LSRs), Matrix, and Riparian Reserves by the 1994 Northwest Forest Plan (See Relationship to the Forest Plan later in this Chapter). In most cases, young planted stands on this landscape were planted at a density that typically requires pre-commercial and commercial thinning to control density and keep the stands healthy and productive. The long-term view was to schedule final regeneration harvest when the stands reached certain ages or stand density levels, usually at 80 years.

It is important to note that regeneration harvest has been, and continues to occur, on privately owned lands within other portions of the Quartz Creek Watershed downstream from the Hartz Young Stand Management Project Area.

Table 1: Historic Stand Management on NFS Lands Within the Hartz Project Area

Decade	Acres of Managed Stands *	Acres of Regeneration Harvest
1950-1959	746	746
1960-1969	1,960	1,915
1970-1979	3,779	3,608
1980-1989	2,301	2,294
1990-Present	849	448
Totals	**9,635**	**9,011**

*Timber harvest acreage also includes salvage, commercial thinning, and partial cutting.

The following table displays the overall age distribution of stands in the Hartz Project Area. Approximately 9,421 acres or 48% of timber stands in the project area are less are than 50 years old, with many of these stands in need of commercial thinning to reduce stand density and maintain overall stand growth for meeting various resource objectives.

Table 2: Age of Timber Stands within the Hartz Project Area

Stand Age in Years	Acres
0 - 25	3,428
26 - 50	5,993
51 – 100	185
101 – 150	3,214
151 and Older	6,655
Total	19,475

Purpose and Need for Action

Actions are needed in the Hartz Young Stand Management Project area to improve the health and diversity of natural and previously harvested young stands (approximately 40 years old) which are currently in an overstocked condition. The need for action in these young stands was established from analysis of stand examinations performed in the field in 2004. Stand data shows that the maximum stand density index (SDI) levels are at about 50%, the level at which maximum stand production occurs and individual tree vigor begins to decline (Long, 1985). The purpose of this proposal is to apply silvicultural treatments to these young stands to maintain or improve tree growth and vigor, and to reduce the mortality that occurs in high-density stands when resources important to tree survival become limiting.

Silvicultural treatments primarily designed to improve tree growth in the natural and previously harvested young stands are also needed to benefit plant and wildlife habitat by allowing the understory to develop in some areas, promoting species and structural diversity.

The Willamette National Forest Land and Resource Management Plan, as amended, includes resource management goals to maintain or enhance forest conditions at the stand and landscape level. Other goals in the Forest Plan include: maintaining high quality water resources; maintaining or enhancing aquatic habitat for fish; maintaining or enhancing terrestrial habitat diversity for wildlife, and plants; maintaining scenic quality; and providing timber products.

Proposed actions designed to meet the purpose and need shall be guided by the following objectives:

- Increase the amount of large trees growing in riparian reserves capable of providing large wood to streams, especially within the Quartz Creek Watershed, which is currently identified as deficit by the Quartz Creek Watershed Analysis.
- Reduce existing road density within the project area to improve aquatic and terrestrial habitat and habitat connectivity, to reduce disturbance to elk and other wildlife species, and to reduce long-term road maintenance costs.

- Provide a variety of habitats over the landscape including early-seral stands that are less than 10 years old.
- Maintain scenic quality.
- Generate economic benefits to the economy by providing timber products.

The original purpose and need for action presented to the public in December 2003, also included objectives to promote old-growth structural characteristics over time in stands located within LSRs, and to restore past vegetative conditions in non-forested areas. The original proposed action included activities to satisfy these two objectives (see Chapter 2 – Alternatives Considered but Eliminated from Detailed Study These objectives were dropped because:

a. LSRs in the Hartz project area were located in Critical Habitat Units (CHUs) for the northern spotted owl. The District Ranger decided to delay harvest in spotted owl habitat CHUs at this time.
b. The District Ranger chose to pursue restoration of past vegetative conditions in non-forested areas as a separate project.

Management Areas and Objectives

Relationship to the Forest Plan

This environmental assessment tiers to and relies upon the analysis in the 1990 Final Environmental Impact Statement (FEIS) for the Willamette National Forest Land and Resource Management Plan (hereafter the Willamette Forest Plan or Forest Plan). The Willamette Forest Plan as amended, provides resource management goals and gives direction to apply a range of harvest methods to timber stands, which include thinning in young stands to control vegetation and establish desired species composition, density, and rates of growth. Chapters II and III from the FEIS discuss silvicultural activities expected to occur on suitable lands on the Forest. Appendix F further documents the rationale used to determine the appropriate harvest systems to be used in managing coniferous forests on the Willamette National Forest where timber production is a management goal.

The proposed action and all action alternatives detailed in Chapter 2 are designed to be consistent with direction provided throughout the Willamette Forest Plan, as amended by the following documents:

Northwest Forest Plan Amendments

In April 1994, the "Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Spotted Owl" (USDA, USDI Northwest Forest Plan ROD, 1994) modified the Willamette Forest Plan with overlaying management areas and their accompanying standards and guidelines.

In January 2001, the Forest Plan was further amended by the, "Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines" (USDA, USDI Survey and Manage ROD, 2001). This Record of Decision amended a portion of the Northwest Forest Plan by adopting new standards and guidelines for Survey and Manage and Protection Buffer species, and other mitigating measures.

The March 2004, Record of Decision "To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl", amended a portion of the Northwest Forest Plan by removing the Survey and Manage Mitigation Measure Standards and Guidelines. The decision is based on information and analysis in the Final SEIS to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines.

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

The Forest Plan, as amended, contains Forest-Wide Standards and Guidelines as well as Management Area Standards and Guidelines for specific land allocations.

Management Areas

Table 3 displays Management Area acres within the McKenzie River Ranger District (MRRD) portion of the project area, as designated in the amended Willamette Forest Plan. The table also includes the overlying land allocations from the 1994 Northwest Forest Plan. Four of the Northwest Forest Plan allocations are present and consist of Administratively Withdrawn, Late-Successional Reserves, Matrix, and Riparian Reserves. The Hartz Project Area includes 6,629 acres of Riparian Reserves, which overlap Willamette Forest Plan Management Area land allocations. Riparian Reserves are not represented in Table 3 so that original Willamette Forest Plan acres can be displayed.

Table 3: Willamette Forest Plan Management Areas in the Hartz Young Stand Management Project Area

Willamette Forest Plan Management Areas	Northwest Forest Plan Land Allocations *	Acres
5a – Special Interest Areas	Administratively Withdrawn	962
9c – Wildlife Habitat-Marten	Administratively Withdrawn	501
9d – Wildlife Habitat-Special Areas	Administratively Withdrawn	280
11a – Scenic-Modification Middleground	Matrix	3,520
11c – Scenic-Partial Retention Middleground	Matrix	800
14a – General Forest	Matrix	9,136
16a – Late Successional Reserves	Late Successional Reserves	4,059
16b – 100-acre Late Successional Reserves	Late Successional Reserves	736
Total Acres		**19,994**

MA-5a, Special Interest Areas (SIAs)

The goals of this Management Area are to preserve lands in Special Interest Areas (SIAs) that contain exceptional scenic, cultural, biological, geological, or other unusual characteristics, and foster public use and enjoyment in selected Special Interest Areas through facility development. No programmed harvest shall be scheduled (MA-5a-05). Cutting and removal of vegetation shall be prohibited except to provide for the safety of users or to maintain or enhance the values in the area (MA-5a-06).

The Hartz Young Stand Management Project does not propose harvest units in this Management Area.

MA-9c, Wildlife Habitat-Marten

The goals of this wildlife habitat area are to protect mature and old-growth habitat for all dependent flora and fauna by providing habitat networks for the marten, an ecological indicator species. It also provides a combination of core-network habitat sites and designated no-harvest sites, which would ensure continued interaction of marten individuals and populations within the Forest as well as between adjacent Forests and land ownerships. No programmed timber harvest shall be scheduled (MA-9c-16).

The Hartz Project does not propose harvest units in this Management Area.

MA-9d, Wildlife Habitat - Special Areas

The goal of this Management Area is to protect or enhance unique wildlife habitats and botanical sites, which are important components of healthy, biologically diverse ecosystems. No programmed timber harvest shall be scheduled (MA-9d-08). Vegetative treatments, including commercial harvests, should be permitted if necessary to meet established wildlife objectives. Sustained timber production is not a management area objective (MA-9d-09).

The Hartz project does not propose harvest units in this Management Area.

MA-11a Scenic – Modification Middleground

The goals for this area are to create and maintain desired visual characteristics of the forest landscape. This area would also be managed for other resource goals including timber production, recreation opportunities, watershed protection, and maintenance of wildlife habitats. Scheduled even-aged timber harvest should not exceed 12% of the suitable and available land within this Management Area during the first 10 years following plan implementation (MA-11a-04). Maximum size for even-aged regeneration harvest units should be 30 acres (15-30 preferred) (MA-11a-05).

All of thinning unit 22 (55 acres) and approximately 15 acres of regeneration Unit 25 (58 acres) are located within MA-11a, totaling 70 treatment acres.

MA-11c Scenic - Partial Retention Middleground

The goals for this visually sensitive Management Area are to maintain a moderate level of scenic quality, and to also manage for other resource goals including wildlife habitat, recreation, watershed, and timber production. Timber harvest in MA-11c is scheduled to occur at a rate of 10% for the first 10 years following Forest Plan implementation (100-year rotation). Maximum size of even-aged regeneration harvest units should be 15 acres (10-15 preferred) (MA-11c-05).

The Hartz Project does not propose to harvest timber in this Management Area.

MA-14a General Forest

The primary goal of this Management Area is to produce an optimum and sustainable yield of timber based on the growth potential of the land that is compatible with multiple use objectives and meets environmental requirements for soil, water, and wildlife habitat quality. In addition, this area can provide many opportunities for public use and enjoyment.

Units 1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 15, 23, and a portion of 25 are located within Management Area 14a, for approximately 636 acres.

MA-15 Riparian Reserves

The primary goal in this Management Area is to maintain the role and function of rivers, streams, wetlands, and lakes in the landscape ecology. This Management Area is one of the six designated Management Areas identified in the Northwest Forest Plan (USDA, USDI Northwest Forest Plan ROD, 1994).

As stated in the plan, Riparian Reserves usually include at least the water body, inner gorges, all riparian vegetation, 100-year floodplain, landslides, and landslide prone areas. Reserve widths are based on some multiple of a site-potential tree, or a prescribed slope distance, whichever is greater. Reserve widths may be adjusted based on watershed analysis to meet Aquatic Conservation Strategy (ACS) objectives from the Northwest Forest Plan. The ACS was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands by maintaining and restoring ecosystem health at watershed and landscape scales. The intent is to protect habitat for fish and other riparian-dependent species and to restore currently degraded habitats.

Concerns regarding this Management Area deal with maintaining and enhancing water quality and riparian habitat in the Riparian Reserves as prescribed by the Northwest Forest Plan. Activities such as thinning, prescribed fire, large woody debris maintenance, etc. may be prescribed within Riparian Reserves in this project only if they maintain or enhance the ability of the reserve to meet the ACS objectives.

A list of harvest units with Riparian Reserves can be found in Chapter 2. The amount of treatment acres within riparian reserves is summarized in the fisheries analysis in Chapter 3.

16a - Late Successional Reserves, and 16b – 100-acre Late Successional Reserves

Late Successional Reserves (LSRs) are intended to maintain a functional, interactive, late successional and old growth forest ecosystem. They are designed to serve as habitat for late successional and old growth related species including the northern spotted owl. LSRs are to be managed to protect and enhance old-growth forest conditions. No programmed timber harvest is allowed inside the reserves. However, thinning or other silvicultural treatments may occur in stands up to 80 years of age if the treatments are beneficial to the creation and maintenance of late successional conditions.

The Hartz Project does not propose to harvest timber in either MA-16a or MA-16b.

South Fork McKenzie Wild and Scenic Study River (Recreation)/Oregon State Scenic Waterway.

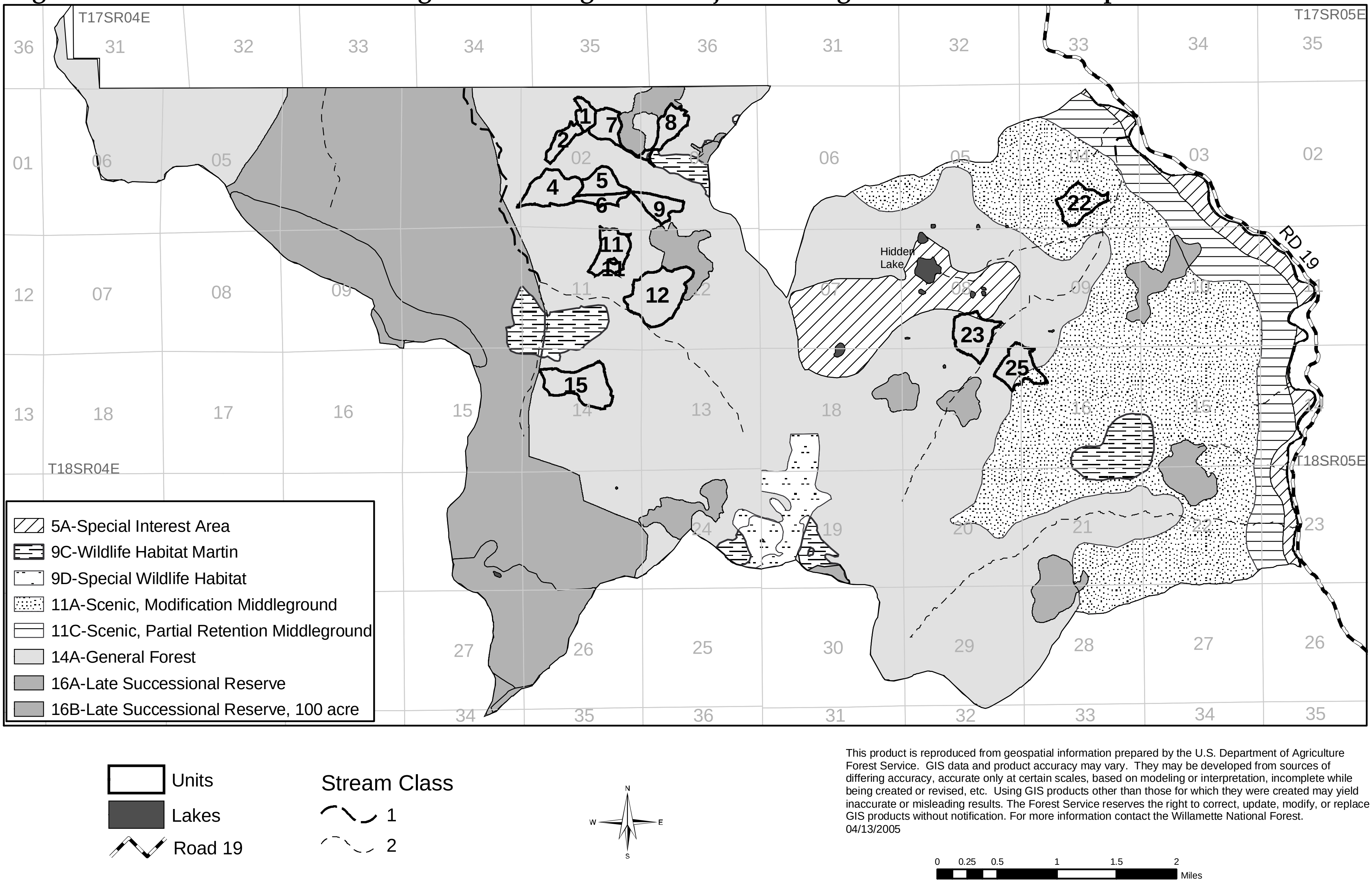
In 1988, the omnibus Oregon Wild and Scenic Rivers Act of 1988, which amended the Wild and Scenic Rivers Act of 1968 (NWSRS), called for the study of the South Fork McKenzie River to determine if it was suitable for possible inclusion into the NWSRS.

In February 1992, the Willamette released the South Fork McKenzie River Report, which found that the South Fork McKenzie met the criteria for the Outstanding Remarkable Values of Scenery, Recreation, Fish, and Prehistoric. By meeting these criteria, the Willamette National Forest Supervisor affirmed the river's eligibility for inclusion into the Wild and Scenic Rivers system.

Also in 1988, the citizens of Oregon chose to add the South Fork of the McKenzie to the State Scenic Waterway program, which is administered by the Oregon State Parks and Recreation Department.

The Hartz project does not propose harvest within the South Fork McKenzie River Wild and Scenic corridor, or Oregon State Scenic Waterway. However, harvest does occur within the viewshed in units 22 and 25 (see MA-11a above).

Figure 3: Hartz Young Stand Management Project -Management Areas with Proposed Units



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04/13/2005

Watershed Analysis

The Aquatic Conservation Strategy in the Northwest Forest Plan included a requirement to prepare comprehensive watershed analyses for all fifth field watersheds. Watershed Analysis documents (WAs) were completed for most watersheds on the Forest in the succeeding two to four years following release of the Northwest Forest Plan in 1994. The eastern portion of the project area is within the Hardy Creek/Rebel Creek sub-watershed of the South Fork McKenzie River Watershed, and is within the area designated as Key Watershed. The South Fork WA was completed in October 1994. The western portion of the project is within the Quartz Creek sub-watershed of the Quartz Creek/McKenzie Tributaries within Watershed (not Key Watershed). The Quartz Creek/McKenzie Tributaries WA was completed in April 1998.

The March 2004, Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy, requires that “a project record for a project with Riparian Reserves must: (1) describe the existing condition, including the important physical and biological components of the fifth field watersheds in which the project area lies; (2) describe the effect of the project on the existing condition; and (3) demonstrate that in designing and assessing the project the decision maker considered and used, as appropriate, any relevant information from applicable watershed analysis.”

The proposed action in the Hartz Project Area includes Riparian Reserves, descriptions and disclosure of effects can be found in Chapters 2 and 3, and in Appendix B, (Fisheries Biological Assessment).

Proposed Action

The proposed action is an alternative developed early in the NEPA planning process to meet the need of improving the health and diversity of natural and previously harvested young stands, and to accomplish other stated purposes and objectives based on the best information available at the time. The initial proposed action, which was presented at a public at a meeting and in a scoping letter in December 2003, was modified during the course of internal and external scoping, and the modified version has been used to identify issues and develop other alternatives for further study. The original version of this proposal is described in Chapter 2 under, “Alternatives Considered but Eliminated from Detailed Study.” The modified proposed action, or Alternative 2, is summarized below and in detail in Chapter 2.

The McKenzie River District Ranger proposes to harvest timber on approximately 706 acres in the Hartz Young Stand Management Project Area. This action, represented as Alternative 2, includes commercial thinning on 622 acres and regeneration harvest on 84 acres. Commercial thinning would consist of 190 acres of moderate thinning and 432 acres of heavy thinning. Commercial timber harvest volume is estimated at 11.6 million board feet (MMBF). Harvest activities would likely occur from 2006 through 2009.

Ground-based yarding systems would be used on approximately 139 acres, skyline yarding on about 210 acres, shovel yarding on about 5 acres, and helicopter yarding on about 352 acres. Six helicopter landings would be needed, which range from 0.5 to 1.0 acre in size. Fuel treatment methods would include yarding with tops attached, hand piling and burning, and broadcast burning.

Two units that are prescribed for regeneration harvest (84 acres) would be planted with seedlings after harvest. Elsewhere, natural regeneration is expected to occur within most of the commercially thinned units, especially those treated with heavy thinning.

All units would have live green trees retained for future down wood and snag creation. Green Tree Retention areas, or GTRs, would be located within the two regeneration units. GTRs are scattered no-harvest patches consisting of at least 15% of the stand, that would provide diversity and future snags and large down wood.

Alternative 2 would construct 2,050 feet of temporary roads to allow access to harvest areas. In addition, approximately 4,500 feet of an existing unclassified roadway would be re-used as a temporary road. Upon completion of sale activities, both the constructed temporary roads and the re-used unclassified road would be decommissioned. Road closures are proposed on 7.8 miles of existing open Forest roads that access harvest units to reduce current open road densities. Closures would be accomplished with the use of gates or berms. The gated roads would be closed year-round, but would provide access for administrative or fire suppression vehicles.

Approximately 29.3 miles of Forest system roads would be maintained to allow better access to harvest areas and to reduce impact to resources. Roadwork planned for the project area includes cutting roadside brush, felling hazard trees, surface blading and shaping, replacing aggregate surfacing, replacing culverts, and other typical maintenance needs. In the past, this work has been referred to as reconstruction, and may be described as reconstruction elsewhere in this document. An additional 6.1 miles of road would require road maintenance for sale activities (maintenance rock haul). Because of the need for crushed rock to support the planned roadwork, the project requires further development of the Upper Green Mountain rock pit on Forest road 1985124. The rock pit development would enlarge the existing pit floor area by removing existing rock outcrops along the east side of the pit floor. This development would require removal of soil overburden, felling of hazard trees, clearing other small trees, drilling and blasting, reducing existing oversize material, and then eventual rehabilitation of the site after completion of the project.

In addition to the actions described above, a variety of post-sale activities are also included and are described in detail in Chapter 2, page 39.

Decision Framework

The Responsible Official for this proposal is the McKenzie River District Ranger. While considering the purpose and need for improving the health and diversity of densely stocked natural and previously harvested young stands, the responsible official shall review the proposed action and the other alternative actions, and may decide to:

- select the proposed action, or
- select another action alternative that has been considered in detail, or
- modify an action alternative, or
- select the no-action alternative.

The Responsible Official would also determine if the selected alternative is consistent with the Willamette Forest Plan or if the Forest Plan should be amended in this action.

Public Involvement

The Hartz Project was listed in the Fall 2003 through Winter 2005 editions of the *Willamette Forest Focus*, the quarterly Schedule of Proposed Actions (SOPA) for the Willamette National Forest. The initial proposed action was presented to the public with a solicitation for comments on December 18, 2003, when the District Ranger mailed a project scoping letter to a mailing list comprised of 44 other agencies, elected officials, tribal organizations, and individuals and interest groups known to have an interest in similar McKenzie River Ranger District projects.

On April 3, 2004, the Hartz Project was introduced to the public in Walterville, Oregon during an Open House that was hosted by the McKenzie Watershed Council. The meeting held at the Walterville Grange displayed projects from multiple federal agencies, including the Forest Service, Bureau of Land Management, and Corps of Engineers. Approximately two-dozen members of the public attended the open house, but no comments were received at the meeting specific to the Hartz Project.

Two written comment letters were received on the proposal in response to the open house and mailing of the scoping letter to the public:

Chandra LeGue of the Oregon Natural Resources Council expressed three concerns specific to the proposed action in her scoping comments:

Comment 1: *"There appears to be some acreage of unventoried roadless areas within the project area (see enclosed roadless area map.) Please refrain from road building and other commercial treatments within these areas."* Ms. LeGue provided a map titled, Hartz Timber Sale - ONRC Roadless Map, which overlays units 9 and 12 within unroaded areas.

Response to Comment 1: The Hartz Project proposes thinning treatments within units 9 and 12, using a combination of helicopter and skyline yarding. Both stands have been previously clearcut and were planted with seedlings. Existing roads provide access to portions of both units. The environmental assessment analyzes the potential impacts to roadless characteristics with the implementation of action alternatives (Chapter 3).

Comment 2: *"Avoid commercial timber harvest, roads, and mining in late-seral forests."*

Response to Comment 2: The original proposed action (represented by Alternative 2) once included units that would thin mid to late-seral forest, but these units were dropped Alternative 2. See discussion in Chapter 2 – Alternatives Considered but Eliminated from Detailed Analysis.

Comment 3: *"Any commercial harvest activities and road construction within key watersheds should be avoided in order to protect water quality."*

Response to Comment 3: The eastern portion of the Hartz project area in Hardy Creek/Rebel Creek sub-watershed of the South Fork McKenzie River sub-watershed, is within a key watershed. The proposed action and other action alternatives would harvest and construct temporary roads within the project area. Temporary roads would be decommissioned upon completion of harvest activities. The amended Forest Plan includes Standards and Guidelines to protect key watersheds from adverse effects from these activities and this project complies with all Standards and Guidelines.

Josh Laughlin of Cascadia Wildlands Project submitted a scoping comment in an email.

Comment: *"The proposal should include variable density thinning in one of the action alternatives."*

Response to Comment: An alternative was developed early in the project to address Mr. Laughlin's comment to include variable density thinning. The Variable Density Thinning Alternative was determined to be similar to other action alternatives therefore eliminated from those receiving detailed analysis. See Chapter 2 – Alternatives Considered but Eliminated from Detailed Analysis.

Issues

Issues addressed in the Hartz Project have been separated into two groups: Significant and Other Analysis Issues, not significant. Significant issues are defined as those directly or indirectly caused by implementing the proposed action. Issues are "significant" because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict (40 CFR 1508.27). The significant issues are used to formulate alternatives, prescribe mitigation measures and analyze environmental effects.

Significant issues are normally considered the basis for alternative development. However, there are a variety of ways to address significant issues within any specific alternative. Significant issues may be addressed by simply avoiding environmental consequences by elimination of an action that would impact a given resource. For example, if impacts to a specific stream segment are a significant issue, the project alternatives that avoid all potential impacts to the stream segment address this issue. Mitigation attached to specific alternatives may also address significant issues.

In addition to significant issues identified by the IDT, there are "other analysis" issues addressed in the effects analysis and often used to compare alternatives. For example, heritage resources would always be addressed in actions that have site-specific, ground disturbing actions. Although alternatives may not be designed specifically to address heritage resources, the consequences of all the alternatives must be measured against compliance with direction to provide adequate protection for these resources (see Other Analysis Issues and Concerns, this chapter).

Significant issues have measurement indicators to allow members of the public and the Responsible Official to determine how well issues are addressed by the alternatives. This project identified one significant issue.

The Significant Issue

Significant Issue – Aquatic and Riparian Habitat

The Proposed Action of timber harvest and associated road management activities may affect the condition of riparian habitat through alteration of stand structure. Timber harvest and road management may also affect aquatic habitat, including water quality and availability of large wood, within and downstream from the project area. These components are important for maintaining quality habitat for spring chinook salmon and bull trout, both listed as Threatened and protected under the Endangered Species Act.

The following measurements are used to compare the alternatives in Chapter 2 of this document:

- Diameter of trees adjacent to streams available through time.
- Acres of riparian reserves treated.
- Sediment yield by sub-watershed to include, a) Total Erosion, and b) Percent Increase.
- Aggregate Recovery Percentage (ARP) for Hardy Creek and Lytle-Indian Planning Sub-watersheds.

Other Analysis Issues and Concerns

Non-significant issues or "other" 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)…"

The following other issues were raised either by the public or by resource specialists on the IDT. The issues did not drive the alternatives but they are important and were taken in consideration as this project was developed and analyzed. The description of other issues includes reasons why they are not significant, and reference to a location in this EA where the issue is addressed. In some cases for issues responding to the above project objectives, the IDT chose to include measurements with which to compare the alternatives.

Stand Health and Vigor

The Hartz Young Stand Management Project area has many young managed stands that are currently overstocked. Silviculture treatments such as commercial thinning, could improve tree growth and vigor and reduce mortality that occurs in high-density stands when resources for tree survival become limiting.

This issue was not considered significant for designing alternatives because stand health and vigor is an integral part of the purpose and need for action. The effects of the proposed actions on stand health and vigor are measured by the resulting average tree growth in inches per decade and are discussed in Chapter 3 for each alternative.

Distribution and Amount of Early-Seral Stands

Past management activities have resulted in a lack of early-seral stands that are less than 10 years old, reducing overall landscape level diversity. Management activities may alter the amount and distribution of early seral stands in the project area that are used by a variety of wildlife species and provides a variety of plant species.

This issue was not considered significant for designing alternatives because it is part of the purpose and need for action. The effects of the proposed actions on the distribution and amount of early seral stands are measured by the resulting acres and location of early seral stands, and are addressed in Chapter 3 for each alternative.

Variable Density Thinning

A comment was received that suggested that one of the alternatives should include the use of variable density thinning. The comment stated that there are reduced amounts of late seral forests (in the past 50-80 years) and therefore, less structural complexity usually characteristic of late seral forests. Variable density thinning would help to create late seral characteristics over time by using a variety of spacing in the marking description instead of more uniformly spaced thinning that best utilizes available growing space in the stand.

An alternative was considered in the early stages of analysis to address variable density thinning while meeting the purpose and need for action, but it was later dropped from consideration because it was so similar to other alternatives, especially Alternative 4. See Chapter 2, Alternatives Considered but Eliminated from Detailed Study, and Chapter 3 – Stand Health and Vigor.

Threatened Northern Spotted Owl

Northern spotted owl habitat can be classified as nesting, roosting, foraging, or dispersal. Management activities may change the quality of current and future northern spotted owl habitat, and are of particular concern when located within Critical Habitat Units (CHUs). CHUs are areas that were designated in 1992 by the US Fish and Wildlife Service in response to the listing of the Northern Spotted Owl as a Threatened Species.

While developing the proposed action and other action alternatives, certain proposed treatment units that are currently considered suitable nesting, roosting, or foraging habitat, were dropped. Proposed treatment units located within CHUs were also dropped. Refer to Chapter 2, Alternatives Considered but Eliminated from Study. The issue surrounding the threatened northern spotted owl was thereafter not considered to be significant.

Effects of the proposed actions on the northern spotted owl are measured by the acres of dispersal habitat removed or degraded based on canopy cover and are addressed in Chapter 3 for each alternative.

Threatened, Endangered, and Sensitive Terrestrial Species (TES)

Activities that remove or degrade forest habitats may affect a variety of wildlife and botanical TES species. Activities that create noise above the ambient levels may impact or affect wildlife TES species. Wildlife TES species that are either known or likely to exist in the project area includes the northern spotted owl, harlequin duck, peregrine falcon, and bald eagle.

This issue was not considered significant for designing alternatives to meet the purpose and need because actions that remove or degrade Forested habitat would follow conservation and protection guidelines provided by the Willamette Forest Plan. Activities that generate noise above ambient levels near nest sites of TES species would be seasonally restricted.

Design measures and mitigation measures address this issue in Chapter 2. The effects of the proposed action and other alternatives on various TES species are addressed in Chapter 3.

Migratory Land Bird and Management Indicator Species (MIS)

The Hartz Project could affect Neotropical Migratory Birds and their habitat, which varies broadly for this large group of species. Required protection for these species are outlined in an Executive Order on January 11, 2001, titled "Responsibilities of Federal Agencies to Protect Migratory Birds."

Proposed actions could affect Management Indicator Species, which include the northern spotted owl, pileated woodpecker, marten, elk, deer, cavity excavators, bald eagle, peregrine falcon, and fish as addressed in the Willamette Forest Plan. Through Region-wide coordination, each Forest identified the minimum habitat distribution and habitat characteristics needed to satisfy the life history needs of MIS.

This issue was not considered significant because the felling of trees associated with this project, which may unintentionally affect individual migratory birds, is not expected to have a measurable negative effect of bird populations because of the limited extent of the habitat removal. Additionally, management recommendations to ensure the viability of Management Indicator Species were incorporated into all Forest Plan action alternatives. Action alternatives from the Hartz Young Stand Management Project meet all applicable Standards and Guidelines from the Forest Plan designed to protect these species. The effects of the proposed action and other alternatives on migratory land birds and MIS are addressed in Chapter 3.

Road Density and Elk Habitat

Elk Emphasis Areas are areas are managed for elk habitat under guidance from the Willamette Forest Plan. Current open road densities exceed Forest Plan Standards and Guidelines for two of three Moderate Elk Emphasis Areas. Open road densities can be reduced through road closures to improve elk habitat. Other management activities such as timber harvest, may also affect the quality and abundance of elk habitat by changing the amount of forage, hiding, thermal, and optimal thermal cover.

This issue was not considered significant for designing alternatives because reducing open road density is a stated objective to pursue in the purpose and need for action. The effects of the proposed actions on road density and elk habitat are measured by the resulting miles of open roads and change in acres of forage, hiding, thermal, and optimal thermal cover. This issue is discussed in Chapter 3 for each alternative.

Fire and Fuels

Proposed actions could alter the affects of wildland fires on the landscape. Management actions may affect the amount and distribution of fuels within the stands. Influencing factors that affect potential fire spread and resistance to control are stand densities, ladder fuels, and the amount of fuel available on the forest floor.

This issue was not considered significant for designing alternatives to meet the purpose and need, because fuels treatment would be implemented to meet Forest Plan standards and guidelines for the project area. The effects of the proposed actions on fire and fuels are measured by the resulting acres of untreated fuels, tons per acre of fuels above recommended levels, and acres of heavy and moderate thinned stands. This issue is discussed in Chapter 3 for each alternative.

Noxious Weeds

Proposed actions may introduce or spread noxious and non-native invasive plants. Off road vehicle and equipment use, ground disturbance, and created openings in the forest canopy resulting from any action alternative, can provide an opportunity for noxious and non-native plants to be established and out-compete the desirable native vegetation.

This issue was not considered significant for designing alternatives to meet the purpose and need because specific measures would be used in all action alternatives to prevent expansion of existing noxious weed populations. See "Design Measures for Noxious Weed Control" in Chapter 2. The affects of the proposed action and other alternatives on noxious weeds are discussed in Chapter 3.

Soil Productivity and Slope Stability

Soil compaction and displacement can occur during timber harvest and road construction activities, which could adversely affect the re-establishment of vegetation and the hydrologic capacity of the soils. Road construction and timber harvest can reduce slope stability on potentially unstable slopes.

All timber harvest and road construction activities would be designed to comply with the Willamette Forest Plan, and therefore this issue is not considered significant for designing alternatives to meet the purpose and need. All action alternatives would meet or exceed standards and guidelines for soil protection from the Willamette Forest Plan, through incorporation of Best Management Practices for the protection of soil resources. Design measures are prescribed to address this issue in Chapter 2. The affects of the proposed action and other action alternatives on this issue are discussed in Chapter 3.

Roads and Access

Management decisions could increase or decrease the roaded condition of the landscape, potentially affecting slope stability, water quality, and recreational access. Many of the roads within the project area are below current maintenance standards and are not driveable. The project may provide opportunities to improve current conditions on roads needed for haul. Existing roads that pose potential adverse affects to riparian resources may require improvements to comply with existing Best Management Practices.

This issue was not considered significant for designing alternatives to meet the purpose and need, because all action alternatives perform maintenance on roads where need is identified. The affects of the proposed action and other alternatives on roads and access are discussed in Chapter 3.

Recreation

The project area is popular for recreational use that includes big game hunting, recreational driving, and dispersed camping. Logging operations could affect big game hunting and recreational driving by opening roads or by limiting road access to harvest areas with road closures. Timber haul on Forest roads during weekends and holidays could create traffic hazards for recreational use by the public. Forest Road 19 in the project area is designated a National Scenic Byway and receives heavy recreation traffic in the summer, especially near Terwilliger Hot Springs Day-Use Area on weekends

All action alternatives would include a restriction on log haul during weekends and summer holidays. See mitigation measures in Chapter 2. Effects of the proposed action and other alternatives on recreation are discussed in Chapter 3.

Scenic Quality

Some action alternatives propose regeneration harvest in units units 22 and 25, which are within Management Area 11a – Modification Middleground. Regeneration harvest creates openings that alter form and texture and could affect scenic quality within this visual management allocation. The scenic quality of the South Fork McKenzie Wild and Scenic Study River corridor and Oregon State Scenic Waterway may be affected by openings from these regeneration units.

The proposed action does not propose timber harvest within the designated South Fork McKenzie Wild and Scenic Study River corridor or the Oregon State Scenic Waterway. Action alternatives are designed to be within Forest Plan standards and guidelines for created openings within this visual allocation. The affects of the proposed action and other action alternatives on scenic quality are discussed in Chapter 3.

Roadless and Unroaded Areas

Even though no Inventoried Roadless Areas (IRAs) exist within the Hartz Project area, there are unroaded areas greater than 1,000 acres. Chandra LeGue of the Oregon Natural Resources Council, expressed a concern about building roads and harvesting timber in unroaded areas, and provided an ONRC map that includes portions of units 9 and 12 within an unroaded area.

The IDT considered this issue early in the project and developed an alternative that would avoid harvesting timber within the unroaded areas in units 9 and 12. This alternative was eliminated from detailed study after preliminary analysis showed that dropping the unroaded acres in these managed stands would result in an alternative very similar to other action alternatives, and there was limited roadless character since the units were previously managed and were accessed by existing roads. See Chapter 2 – Alternatives Considered but Eliminated from Detailed Study, and Chapter 3 – Roadless and Unroaded areas.

Social/Economics

The IDT had concerns regarding timber sale volume and operational feasibility. Volume generated from the proposed timber sale units varies with different silviculture prescriptions and types of logging system needed. Logging some stands at this time may not be feasible due to the size of trees and volume being removed, and the logging system required for the harvest.

Some units originally proposed for treatment have been dropped, as discussed in Chapter 2 – Alternatives Considered but Eliminated from Detailed Study. This issue is also discussed within the Social and Economic analysis in Chapter 3.

Heritage Resources

The project area has some known cultural resource sites and contains high probability areas for additional undiscovered sites. No known sites are within any of the harvest units or areas where ground-disturbing activities would occur. However, timber harvest and other ground-disturbing actions could potentially affect previously unknown sites.

Design measures are included to address this issue in Chapter 2. The effects of the proposed action and other action alternatives on heritage resources are discussed in Chapter 3.

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

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

Alternatives considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). The following three alternatives were considered, but eliminated from detailed consideration for the reasons stated.

Original Proposed Action Alternative

The original proposed action included commercial thinning in stands located within Critical Habitat Units for the northern spotted owl (CHUs), some of which were located within LSRs. The stands were considered dispersal habitat for the northern spotted owl. The proposal also included stands within CHUs that are currently suitable foraging and roosting habitat for the spotted owl identified for partial cutting. Even though the inclusion of the stands would have met with the project's purpose and need, they were dropped from the proposed action. The District Ranger decided to delay thinning in northern spotted owl habitat within a CHU at this time.

The original proposed action included other commercial thinning units located outside of CHUs and LSRs, but which were dropped for feasibility reasons after the analysis showed the current size of trees and volume per acre did not support the cost of logging at this time.

The original proposed action also included a 17-acre prescribed burn. This restoration broadcast burn was intended to reduce encroaching conifers and to encourage the growth of huckleberry. This broadcast burn was dropped in favor of proposing and analyzing it as separate action.

No Harvest in Unroaded Areas (Considered initially in Alternative 3)

Chandra LeGue, of the Oregon Natural Resources Council, expressed concerns with building roads and harvesting timber in unroaded areas. The IDT considered an alternative that would not commercially thin units 9 and 12, which were located within the unroaded area depicted in a map created by ONRC and included with Ms. LaGue's comment.

This alternative was dropped from further consideration because timber stands in both units have been previously clearcut, and were planted with seedlings. The units area also accessed by existing roads. See Chapter 3 – Roadless and Unroaded areas.

Variable Density Thinning Alternative

A comment from Josh Laughlin of the Cascadia Wildlands Project, requested that an alternative be developed that would use variable density thinning instead of standard commercial thinning. The comment stated that there are reduced amounts of late seral forests (in the past 50-80 years), and the structural complexity characteristic of late seral stands.

If prescribed, variable density thinning would meet the purpose and need for the Hartz Project while accelerating the development of late successional forest conditions. However, variable density thinning is more appropriate in areas where late successional characteristics are a primary objective, such as in LSRs. The District Ranger earlier chose to avoid harvesting in LSRs (see above).

An alternative specifically prescribing variable density thinning was not considered because of the similarity to Alternative 4. The wider spacing of the heavier commercial thinning in Alternative 4 would in contribute to variations in tree density, considering the natural openings known to exist within the proposed units.

Alternatives

Alternative 1 – the No Action Alternative

Under the No Action Alternative, current management plans would continue to guide management of the project area. None of the proposed projects would be implemented in the Hartz Project area at this time. The "No Action" alternative serves as a baseline to compare and describe the differences and the effects between taking no action and implementing action alternatives in order to accomplish project goals.

Only those management activities considered part of normal maintenance requirements, or those allowed under previous decision documents, would continue on this landscape if Alternative 1 were selected. No new activities would take place as a result of this project.

Alternative 1 would not implement timber harvest or subsequent reforestation by planting seedlings. There would be no creation of snags and large down wood for wildlife habitat enhancement. No fuels treatments would occur. No road construction, decommissioning, closure, or maintenance reconstruction would occur. However, normal road maintenance such as brushing, culvert cleaning and surface blading would continue. Roads would be maintained in accordance with annual maintenance plans.

Alternative 1 would not meet the purpose and need for improving the health and diversity of densely stocked natural and previously harvested young stands. No activities would be implemented to meet other goals in the Willamette Forest Plan that include: maintaining high quality water resources; maintaining or enhancing aquatic habitat for fish; maintaining or enhancing terrestrial habitat diversity for wildlife, and plants; maintaining scenic quality; and providing timber.

Alternative 2 - The Proposed Action

Forest Vegetation/Structure

Alternative 2 would meet the purpose and need for improving the health and diversity of densely stocked natural and previously harvested young stands with timber harvest on approximately 706 acres (see Table 4). The proposed action would include commercial thinning on 622 acres and regeneration harvest on 84 acres. Commercial thinning would consist of 190 acres of moderate thinning and 432 acres of heavy thin (see page 47 for complete stand treatment prescriptions). Total volume of commercial timber harvested is expected to be 11.6 million board feet (MMBF).

Yarding methods would include ground based systems on approximately 139 acres, skyline yarding on about 210 acres, shovel yarding on about 5 acres (use of a loader with a long arm to reach logs, capable of either full or partial suspension), and helicopter yarding on about 352 acres. Six helicopter landings would be needed that are each 0.5 to 1.0 acres.

Approximately 84 acres would be planted with Douglas-fir, western white pine, western hemlock, and sugar pine in regeneration harvest units. Reforestation would provide for future timber harvest and for a diverse habitat for various plant and wildlife species. Planting would not be necessary in most of the commercially thinned units because some natural regeneration is expected, especially in heavy commercial thinning units.

Aquatics and Riparian Habitat

Alternative 2 includes thinning within 155 acres of Riparian Reserves, which is intended to accelerate development of large trees adjacent to streams and provide the potential for future large wood input to stream channels. This alternative improves watershed conditions affected by existing Forest roads through road maintenance, road reconstruction, and road closure and decommissioning.

Fuels

Fuel treatment methods would include yarding with tops attached, hand piling and burning, and broadcast burning (see Table 4). Yarding with tops attached, a method that removes the tops of trees from the unit during harvest operations, would be used in units or portions of units where ground based logging systems would be used. Yarding with tops attached will not occur in units or portions of units where skyline or helicopter logging is used due to the cost of operations and greater risk of damaging the residual trees. These units total approximately 458 acres where fuels reduction treatments would not occur. Hand piling of activity-created slash would occur 100 feet on each side of the roads within harvest boundaries to lesson the risk from human caused fires, and to make the roads more effective as fuel breaks for wildfire suppression. Hand piling along roads and burning would occur in 11 units for a total of 114 acres. Broadcast burning would occur on 84 acres in regeneration units. Utilization of the biomass in landing piles could occur if a market exists for wood fiber or firewood. Otherwise, the landing piles would be burned.

Table 4: Alternative 2 Harvest Units

Unit	Acres	Harvest Prescription	Logging Systems	Temp. Roads	Fuels Treatment	Estimated Timber Volume (MBF / CCF)	
1	20	Moderate Thin	Skyline / Ground Based (GB)		YTA/NT/HP	433	843
2	26	Regeneration	Helicopter/Skyline/ GB		BC	642	1,253
4	59	Heavy Thin	Helicopter		NT	844	1,613
5	39	Heavy Thin	Helicopter/Skyline		NT/HP	568	1,083
6	19	Moderate Thin	Helicopter/Skyline		NT/HP	126	234
7	31	Moderate Thin	Shovel/GB		YTA/NT/HP	372	773
8	38	Heavy Thin	Skyline	600'	NT/HP	608	1,201
9	36	Heavy Thin	Helicopter/Skyline		NT/HP	759	1,488
11	53	Moderate Thin	Skyline/GB		YTA/NT/HP	528	1,001
12	115	Heavy Thin	Helicopter		NT/HP	2,730	5,195
15	90	Heavy Thin	Helicopter		NT/HP	1,512	3,087
22	55	Heavy Thin	Skyline/GB	*150' / 4,500'	NT/HP	563	1,109
23	67	Moderate Thin	Skyline/GB	1,300'	YTA/NT/HP	818	1,480
25	58	Regeneration	Helicopter/GB		BC	1,105	2,229
Total	**706**			2,050 / 4,500		**11,608**	**22,589**

* Unit 22 requires 150 ft. of temporary road construction, plus the use of 4,500 ft. of existing "unclassified" road as temporary road, which would be decommissioned after use.

HP- Hand Pile (and burn)
YTA-Yard Tops Attached
BC- Broadcast Burn
NT-No Treatment

MBF- Thousand Board Feet
CCF- Hundred Cubic Feet

Roads/Access

Alternative 2 would construct about 2,050 feet of temporary roads to allow access to harvest. In addition, approximately 4,500 feet of an existing unclassified roadway would be re-used as a temporary road. Upon completion of sale activities, both the new temporary roads, and the existing unclassified road that was re-used, would be decommissioned.

Alternative 2 would prescribe spot rocking and other road maintenance activities on approximately 6.12 miles of road, in addition to the roads needing maintenance for timber haul. Approximately 29.3 miles of existing forest roads would have road work performed, to allow better access to harvest areas and to reduce adverse impacts to resources. Road maintenance activities would include felling hazard trees, clearing and grubbing, surface blading, replacing drainage structures, reshaping ditches, and placement of aggregate surfacing. Road closures with the use of gates or berms are proposed for 7.76 miles in order to meet the purpose and need for reducing current road densities. The gated roads would be closed year-round, but will allow access for administrative or fire suppression vehicles.

The existing Upper Green Mountain rock pit would be developed to produce crushed aggregate, pit run aggregate, and riprap for the road maintenance needs. Removing rock outcrops along the east side would enlarge the existing pit floor area. Development would be confined to the previously cleared area and includes removal of soil overburden, felling hazard trees, clearing small trees, drilling and blasting, reducing existing oversize material, and eventual rehabilitation of the site.

Table 5: Road Treatments for Alternative 2

Road Number	Existing Condition	Proposed Road Treatment	Description of Associated Maintenance Activities	Miles Affected
1980-225	Open	Close	Install gate at Jct. 1980	4.32
1980 Unclassified	Open	Close	Berm entrance and decommission full length after haul (as temporary road)	0.85
1980-500	Closed	Re-classify last 800 ft. of road as decommissioned. *	Haul Route. Berm entrance following use.	0
1985-140	Open	Close	Haul Route. Install gate at Jct 1985	2.48
1985-352	Open	Close	Berm entrance, maintain drainage	0.11
Total				**7.76**

* Segment at end of road is no longer needed to meet resource management objectives and it is in a stable condition.

Wildlife Habitat

Alternative 2 would include leaving live green trees within each of the proposed units for future snag and down wood creation (see Table 6). The treatment would occur approximately 4 to 5 years following harvest activities and would help meet the need for enhancing terrestrial habitat diversity for wildlife by improving stand structure. In the proposed regeneration units, mortality of some of the remaining trees is expected to occur following broadcast burning for slash removal and site preparation. Follow-up snag and down wood creation would occur to meet prescribed post harvest levels for snags and down wood.

Table 6: Alternative 2 Snags and Large Down Wood Retention

Unit	Acres	Current Snags Per Acre (>=14"dbh)	Current Large Down Wood (LWD) (>=14"dbh) Approximate Lineal Feet Per Acre	Live Leave Green Trees for Snags	Live Green Trees Left for Down Wood
1	20	0	100	2	2
2	26	0	100	5	3
4	59	0	0	3	3
5	39	0	184	3	3
6	19	1	184	2	2
7	31	0	100	2	2
8	38	8	6	3	3
9	36	0	184	3	3
11	53	0	0	2	2
12	115	0	0	3	3
15	90	0	0	3	3
22	55	0	0	3	3
23	67	0	70	2	2
25	58	0	70	5	3
Total	706				

Snags: Prescribed snag creation from green trees would benefit Pacific fringe-tailed bats, peregrine falcons, and California wolverines that may be present in the area, as well as cavity nesting species, by improving or protecting habitat quality for them or their prey. Existing snags greater than 14 inches diameter breast height (dbh) in decay classes I and II would be left standing in units unless hazardous to logging operations. In addition to any existing snags, 2 to 5 live green trees per acre would be left in all units for future snag creation.

Down Wood: Existing down wood pieces greater than 20 feet long and 14 inches diameter may currently exist in some units. In addition to any current down wood, 2 to 3 live trees per acre would be left in all units for future down wood creation. Pieces should be left as full tree lengths to maximize ecological benefits and should reflect the size and species mix of the stand. This would equal approximately 100 to 200 lineal feet per acre in decay classes I and II.

Green Tree Retention Areas: Green Tree Retention Areas (GTRs) would be located within the regeneration units. GTRs are scattered no-harvest patches of various size making up at least 15% of the stand, that would provide diversity and future snags and large down wood.

Figure 4: Hartz Project Area - Quartz Creek Watershed - Alternative 2

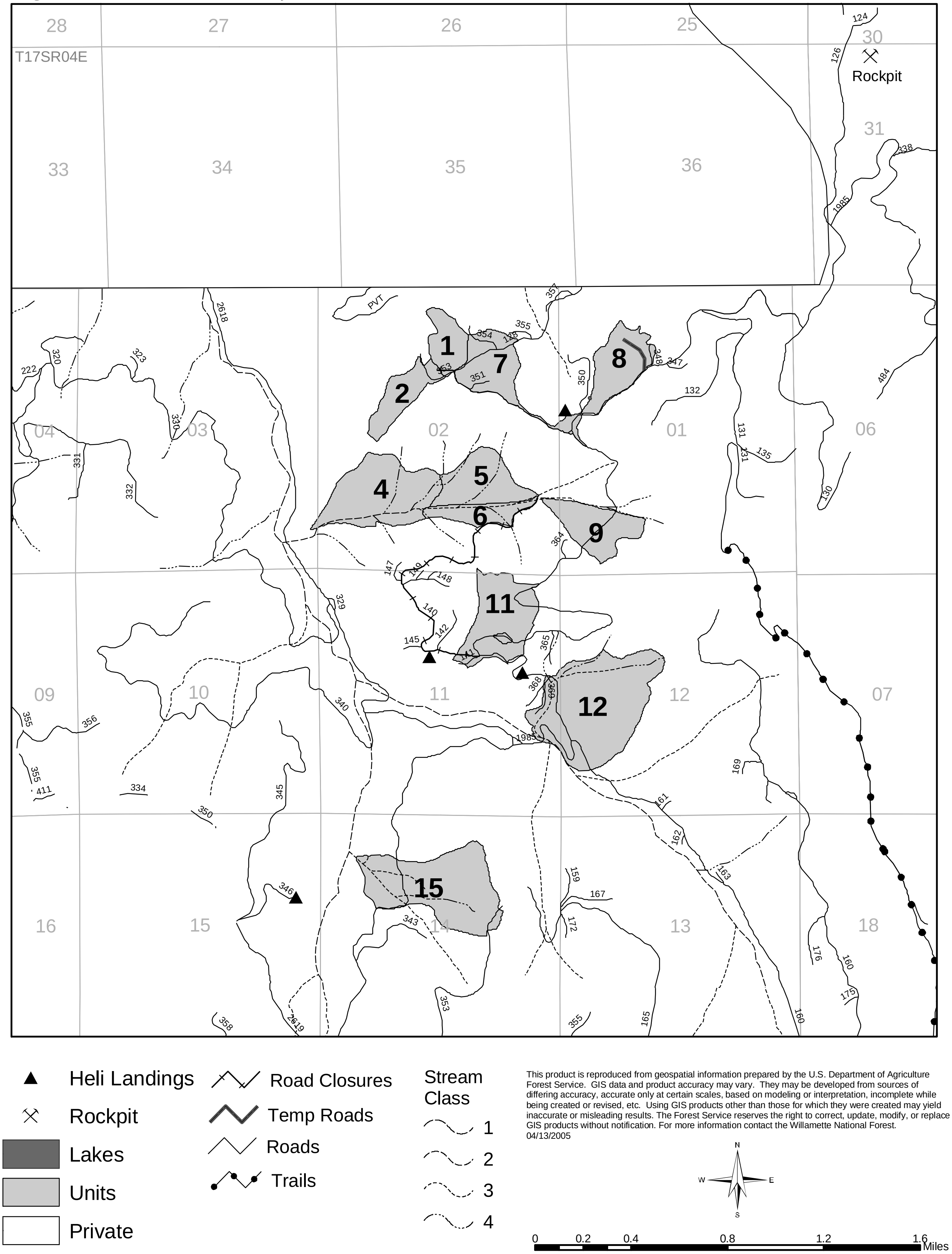
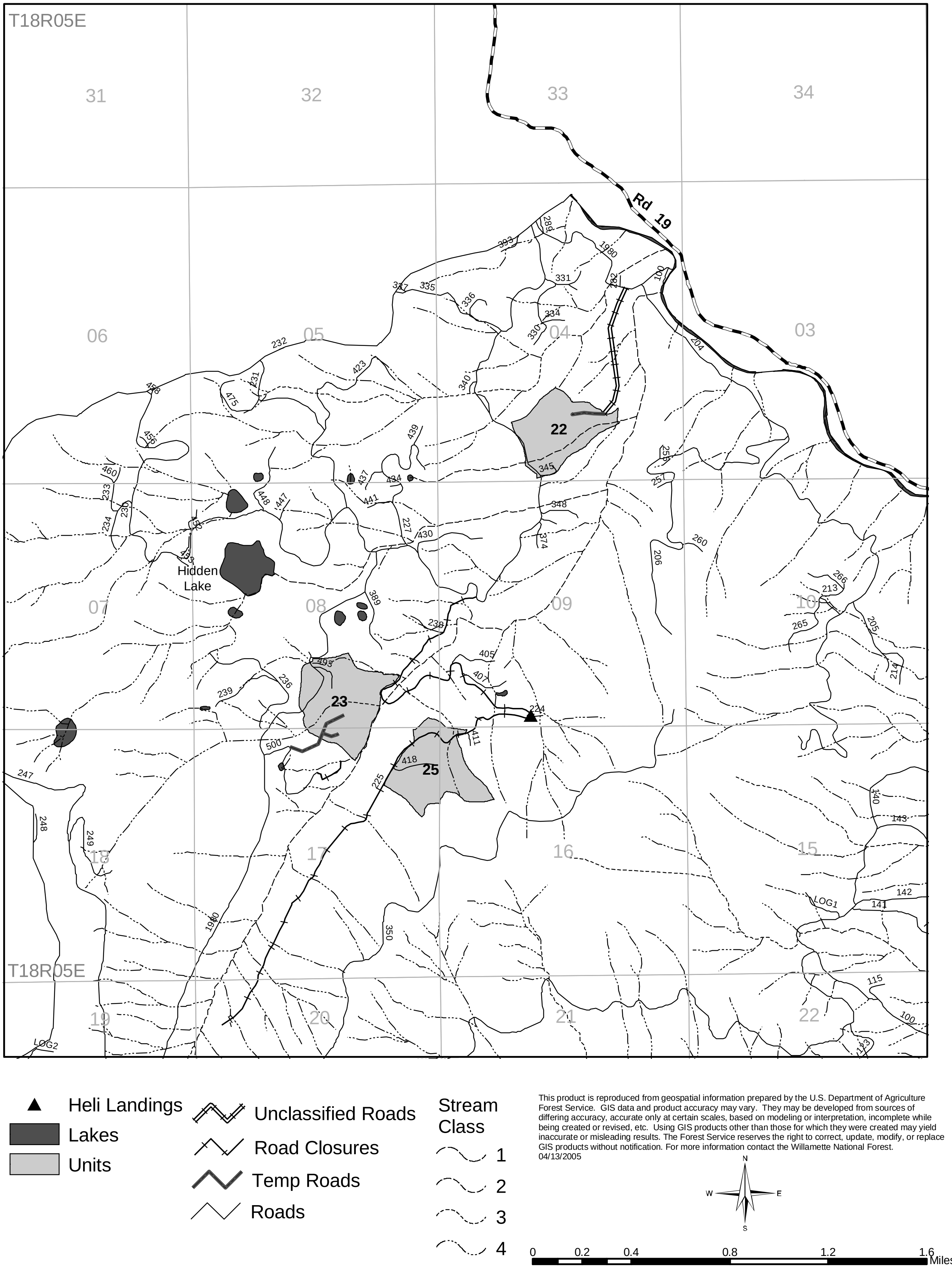


Figure 5: Hartz Project Area - Hardy Ridge Watershed - Alternative 2



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Alternative 3

Forest Vegetation/Structure

Alternative 3 would harvest timber on approximately 648 acres (see Table 7). The proposed harvest would include commercial thinning on all 648 acres and no regeneration harvest. Commercial thinning would consist of 341 acres of moderate thinning and 307 acres of heavy thin (See page 47 for complete stand treatment prescriptions). Total volume of commercial timber harvested is expected to be about 9.4 million board feet (MMBF).

Yarding would be accomplished with ground based yarding systems on approximately 123 acres, skyline yarding on about 210 acres, shovel yarding on about 5 acres, and helicopter yarding on about 310 acres. Five helicopter landings would be needed that are each approximately 0.5 to 1.0 acres.

Planting would not be necessary with this alternative since no regeneration harvest would occur. Natural regeneration is expected on most of the commercially thinned units, especially those treated with heavy thinning.

Aquatics and Riparian Habitat

Alternative 3 includes thinning within 148 acres of Riparian Reserves, which is intended to accelerate development of large trees adjacent to streams and provide the potential for future large wood input to stream channels. This alternative improves watershed conditions affected by existing Forest roads through road maintenance, road reconstruction, and road closure and decommissioning.

Fuels

Fuel treatment methods would include yarding with tops attached, and hand piling and burning (see Table 7). Yarding with tops attached would be used in those units with ground based logging systems. Yarding with tops attached will not occur in units or portions of units where skyline or helicopter logging is used. These units total approximately 482 acres where fuels reduction treatments would not occur. Hand piling of activity created slash would occur 100 feet on each side of the roads within harvest boundaries to lesson the risk from human caused fires and to make the roads more effective as fuel breaks for wildfire suppression. Hand piling along roads and burning would occur in 10 units totaling about 116 acres. Utilization of the biomass in landing piles could occur if a market exists for wood fiber or firewood. Otherwise, the landing piles would be burned.

Table 7: Alternative 3 Harvest Units

Unit	Acres	Harvest Prescription	Logging Systems	Temp. Roads	Fuels Treatment	Estimated Timber Volume (MBF / CCF)	
1	20	Moderate Thin	Skyline / Ground Based (GB)		YTA/NT/HP	433	843
2	26	Heavy Thin	Helicopter/Skyline/ GB		NT/HP/YTA	342	641
4	59	Heavy Thin	Helicopter		NT	844	1,613
5	39	Heavy Thin	Helicopter/Skyline		NT/HP	568	1,083
6	19	Moderate Thin	Helicopter/Skyline		NT/HP	126	234
7	31	Moderate Thin	Shovel/GB		YTA/NT/HP	372	773
8	38	Heavy Thin	Skyline	600'	NT/HP	608	1,201
9	36	Moderate Thin	Helicopter/Skyline		NT/HP	475	971
11	53	Moderate Thin	Skyline/GB		YTA/NT/HP	528	1,001
12	115	Moderate Thin	Helicopter		NT/HP	2,257	4,275
15	90	Heavy Thin	Helicopter		NT	1,512	3,087
22	55	Heavy Thin	Skyline/GB	*150' / 4,500'	NT/HP	563	1,109
23	67	Moderate Thin	Skyline/GB	1,300'	YTA/NT/HP	818	1,480
Total	**648**			2,050 / 4,500		**9,446**	**18,311**

* Unit 22 requires 150 ft. of temporary road construction, plus the use of 4,500 ft. of existing "unclassified" road as temporary road, which would be decommissioned after use.

HP- Hand Pile (and burn)
YTA-Yard Tops Attached
BC- Broadcast Burn
NT-No Treatment

MBF- Thousand Board Feet
CCF- Hundred Cubic Feet

Roads/Access

Alternative 3 would construct about 2,050 feet of temporary roads to allow access to harvest. In addition, approximately 4,500 feet of an existing unclassified road way would be re-used as a temporary road. Upon completion of sale activities, both the new temporary roads, and the existing unclassified road that was re-used, would be decommissioned.

Alternative 3 would prescribe spot rocking and other road maintenance activities on approximately 6.12 miles of road in addition to the roads needing maintenance for timber haul. Approximately 26.8 miles of existing forest roads would have road work performed, to allow better access to harvest areas and to reduce adverse impacts to resources. Road maintenance activities would include felling hazard trees, clearing and grubbing, surface blading, replacing drainage structures, reshaping ditches, and placement of aggregate surfacing. Road closures with the use of gates or berms are proposed for 3.44 miles in order to meet the purpose and need for reducing current road densities. The gated roads would be closed year-round, but will allow access for administrative or fire suppression activities. Roads closed by berms will prevent access for all vehicles.

The existing Upper Green Mountain rock pit would be developed to produce crushed aggregate, pit run aggregate, and riprap for the road maintenance needs. Removing rock outcrops along the east side would enlarge the existing pit floor area. Development would be confined to the previously cleared area and includes removal of soil overburden, felling hazard trees, clearing small trees, drilling and blasting, reducing existing oversize material, and eventual rehabilitation of the site.

Table 8: Road Treatments for Alternative 3

Road Number	Existing Condition	Proposed Road Treatment	Description of Associated Maintenance Activities	Miles Affected
1980 Unclassified	Open	Close	Berm entrance and decommission full length after haul (as temporary road)	0.85
1980-500	Closed	Re-classify last 800 ft. of road as decommissioned.*	Haul Route. Berm entrance following use.	0
1985-140	Open	Close	Haul Route. Install gate at Jct. 1985	2.48
1985-352	Open	Close	Berm entrance, maintain drainage	0.11
Total				**3.44**

* Segment at end of road is no longer needed to meet resource management objectives and it is in a stable condition.

Wildlife Habitat

Alternative 3 would include leaving live green trees within each of the proposed units for future snag and down wood creation (see Table 9). The treatment would occur approximately 4 to 5 years following harvest activities and would help meet the need for enhancing terrestrial habitat diversity for wildlife by improving stand structure.

Table 9: Alternative 3 Snags and Large Down Wood Retention

Unit	Acres	Current Snags Per Acre (>=14"dbh)	Current Large Down Wood (LWD) (>=14"dbh) Approximate Lineal Feet Per Acre	Live Leave Green Trees for Snags	Live Green Trees Left for Down Wood
1	20	0	100	2	2
2	26	0	100	3	3
4	59	0	0	3	3
5	39	0	184	3	3
6	19	1	184	2	2
7	31	0	100	2	2
8	38	8	6	3	3
9	36	0	184	2 / 3*	2 / 3*
11	53	0	0	2	2
12	115	0	0	2	2
15	90	0	0	3	3
22	55	0	0	3	3
23	67	0	70	2	2
Total	**648**				

* 3 trees/acre in riparian reserves, 2 trees/acre in the rest of the unit.

Snags: Prescribed snag creation from green trees would benefit Pacific fringe-tailed bats, peregrine falcons, and California wolverines that may be present in the area, as well as cavity nesting species, by improving or protecting habitat quality for them or their prey. Existing snags greater than 14 inches diameter breast height (dbh) in decay classes I and II would be left standing in units unless hazardous to logging operations. In addition to any existing snags, 2 to 3 live green trees per acre would be left in all units for future snag creation.

Down Wood: Existing down wood pieces greater than 20 feet long and 14 inches diameter may currently exist in some units. In addition to any current down wood, 2 to 3 live trees per acre would be left in all units for future down wood creation. Pieces should be left as full tree lengths to maximize ecological benefits and should reflect the size and species mix of the stand. This would equal approximately 100 to 200 lineal feet/acre in decay classes I and II.

Figure 6: Hartz Project Area - Quartz Creek Watershed - Alternative 3

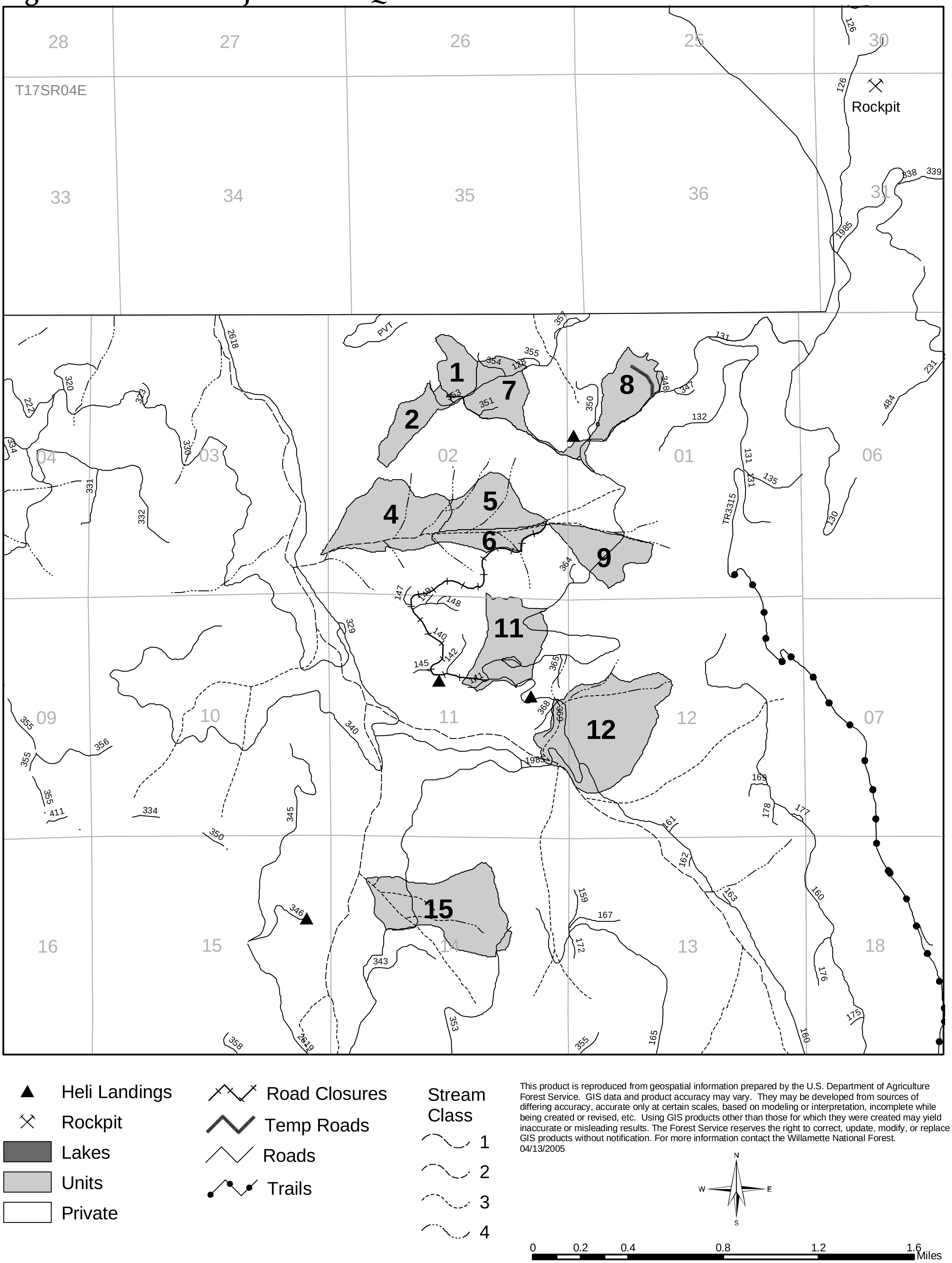

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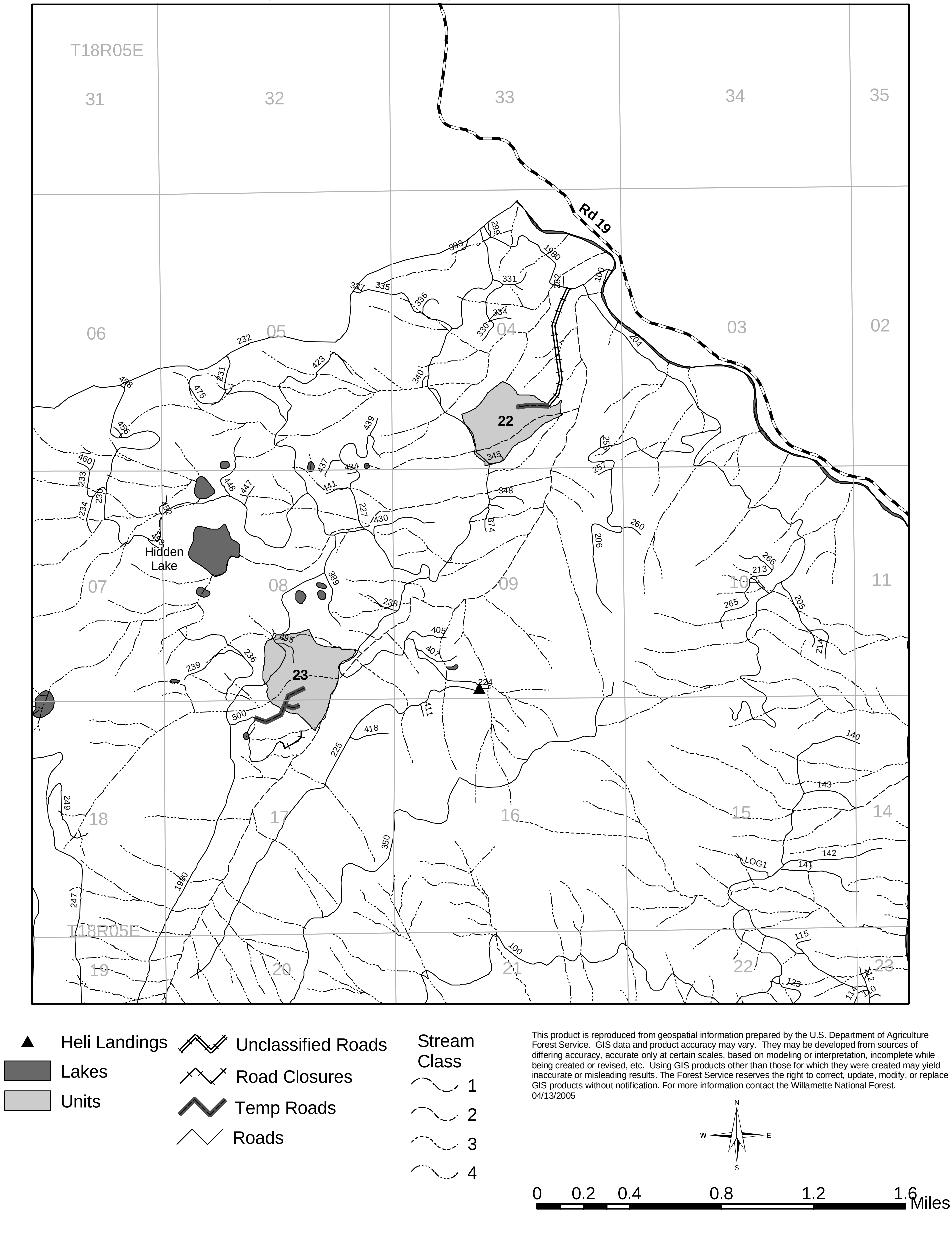
Figure 7: Hartz Project Area - Hardy Ridge Watershed - Alternative 3



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Alternative 4

Forest Vegetation/Structure

Alternative 4 would harvest timber on approximately 706 acres (see Table 10). This alternative meets the purpose and need by including commercial thinning on 563 acres and regeneration harvest of 143 acres. Commercial thinning would consist of 50 acres of moderate thinning, and 513 acres of heavy thinning (See page 47 for complete stand treatment prescriptions). Total volume of commercial timber harvested is expected to be about 13.4 million board feet (MMBF).

Harvest would be accomplished with ground based yarding systems on about 139 acres, skyline yarding on about 210 acres, shovel yarding of about 5 acres, and helicopter yarding on about 352 acres. Six helicopter landings would be needed that are each approximately 0.5 to 1.0 acre.

Approximately 143 acres would be planted with Douglas-fir, western white pine, western hemlock, and sugar pine in regeneration harvest units. Reforestation would provide for future timber harvest and for a diverse habitat for various plant and wildlife species. Planting would not be necessary in most of the commercially thinned units because some natural regeneration is expected, especially in heavy commercial thinning units.

Aquatics and Riparian Habitat

Alternative 4 includes thinning within 155 acres of Riparian Reserves, which is intended to accelerate development of large trees adjacent to streams and provide the potential for future large wood input to stream channels. This alternative improves watershed conditions affected by existing Forest roads through road maintenance, road reconstruction, and road closure and decommissioning.

Fuels

Fuel treatment methods would include yarding with tops attached, hand piling and burning, and broadcast burning (see Table 10). Yarding with tops attached would be used in those units where ground based logging systems would be used. Yarding with tops attached will not occur in units or portions of units where skyline or helicopter logging is used. These units total approximately 399 acres where fuels reduction treatments would not occur. Hand piling of activity-created slash would occur 100 feet on each side of the roads within harvest boundaries to lesson the risk from human caused fires and to make the roads more effective as fuel breaks for wildfire suppression. Hand piling along roads and burning would occur in 11 units, for a total of 114 acres. Broadcast burning would occur on the 143 acres in regeneration units. Utilization of the biomass in landing piles could occur if a market exists for wood fiber or firewood. Otherwise, the landing piles would be burned.

Table 10: Alternative 4 Harvest Units

Unit	Acres	Harvest Prescription	Logging Systems	Temp. Roads	Fuels Treatment	Estimated Timber Volume (MBF / CCF)	
1	20	Heavy Thin	Skyline / Ground Based (GB)		YTA/NT/HP	634	1,247
2	26	Regeneration	Helicopter/Skyline /GB		BC	642	1,253
4	59	Regeneration	Helicopter		BC	1,803	3,532
5	39	Heavy Thin	Helicopter/Skyline		NT/HP	568	1,083
6	19	Moderate Thin	Helicopter/Skyline		NT/HP	126	234
7	31	Moderate Thin	Shovel/GB		YTA/NT/HP	372	773
8	38	Heavy Thin	Skyline	600'	NT/HP	608	1,201
9	36	Heavy Thin	Helicopter/Skyline		NT/HP	759	1,488
11	53	Heavy Thin	Skyline/GB		YTA/NT/HP	934	1,859
12	115	Heavy Thin	Helicopter		NT/HP	2,730	5,195
15	90	Heavy Thin	Helicopter		NT/HP	1,512	3,087
22	55	Heavy Thin	Skyline/GB	*150' / 4,500'	NT/HP	563	1,109
23	67	Heavy Thin	Skyline/GB	1,300'	YTA/NT/HP	1,130	2,121
25	58	Regeneration	Helicopter/GB		BC	1,105	2,229
Total	**706**			2,050 / 4,500		**13,486**	**26,411**

* Unit 22 requires 150 ft. of temporary road construction, plus the use of 4,500 ft. of existing "unclassified" road as temporary road, which would be decommissioned after use.

HP- Hand Pile (and burn)
YTA-Yard Tops Attached
BC- Broadcast Burn
NT-No Treatment

MBF- Thousand Board Feet
CCF- Hundred Cubic Feet

Roads/Access

Alternative 4 would construct about 2,050 feet of temporary roads to allow access to harvest. In addition, approximately 4,500 feet of an existing unclassified road way would be re-used as a temporary road. Upon completion of sale activities, both the new temporary roads, and the existing unclassified road that was re-used, would be decommissioned.

Alternative 4 would prescribe spot rocking and other road maintenance activities on approximately 6.12 miles of road in addition to the roads needing maintenance for timber haul. Approximately 29.3 miles of existing forest roads would have road work performed to allow better access to harvest areas and to reduce adverse impacts to resources. Road maintenance activities would include felling hazard trees, clearing and grubbing, surface blading, replacing drainage structures, reshaping ditches, and placement of aggregate surfacing. Road closures with the use of gates or berms are proposed for 7.76 miles in order to meet the purpose and need for reducing current road densities.

The existing Upper Green Mountain rock pit would be developed to produce crushed aggregate, pit run aggregate, and riprap for the road maintenance needs. Removing rock outcrops along the east side would enlarge the existing pit floor area. Development would be confined to the previously cleared area, and includes removal of soil overburden, felling hazard trees, clearing small trees, drilling and blasting, reducing existing oversize material, and eventual rehabilitation of the site.

Table 11: Road Treatments for Alternative 4

Road Number	Existing Condition	Proposed Road Treatment	Description of Associated Maintenance Activities	Miles Affected
1980-225	Open	Close	Install gate at Jct 1980	4.32
1980 Unclassified	Open	Close	Berm entrance and decommission full length after haul (as temporary road)	0.85
1980-500	Closed	Re-classify last 800 ft. of road as decommissioned. *	Haul Route. Berm entrance following use.	0
1985-140	Open	Close**	Haul Route. Install gate at Jct 1985	2.48
1985-352	Open	Close	Berm entrance, maintain drainage	0.11
Total				**7.76**

* Segment at end of road is no longer needed to meet resource management objectives and it is in a stable condition.

Wildlife Habitat

Alternative 4 would include leaving live green trees within each of the proposed units for future snag and down wood creation (see Table 12). The treatment would occur approximately 4 to 5 years following harvest activities and would help meet the need for enhancing terrestrial habitat diversity for wildlife by improving stand structure. In the proposed regeneration units, mortality of some of the remaining trees is expected to occur following broadcast burning for slash removal and site preparation. Follow-up snag and down wood creation would occur to meet prescribed post harvest levels for snags and down wood.

Table 12: Alternative 4 Snags and Large Down Wood Retention

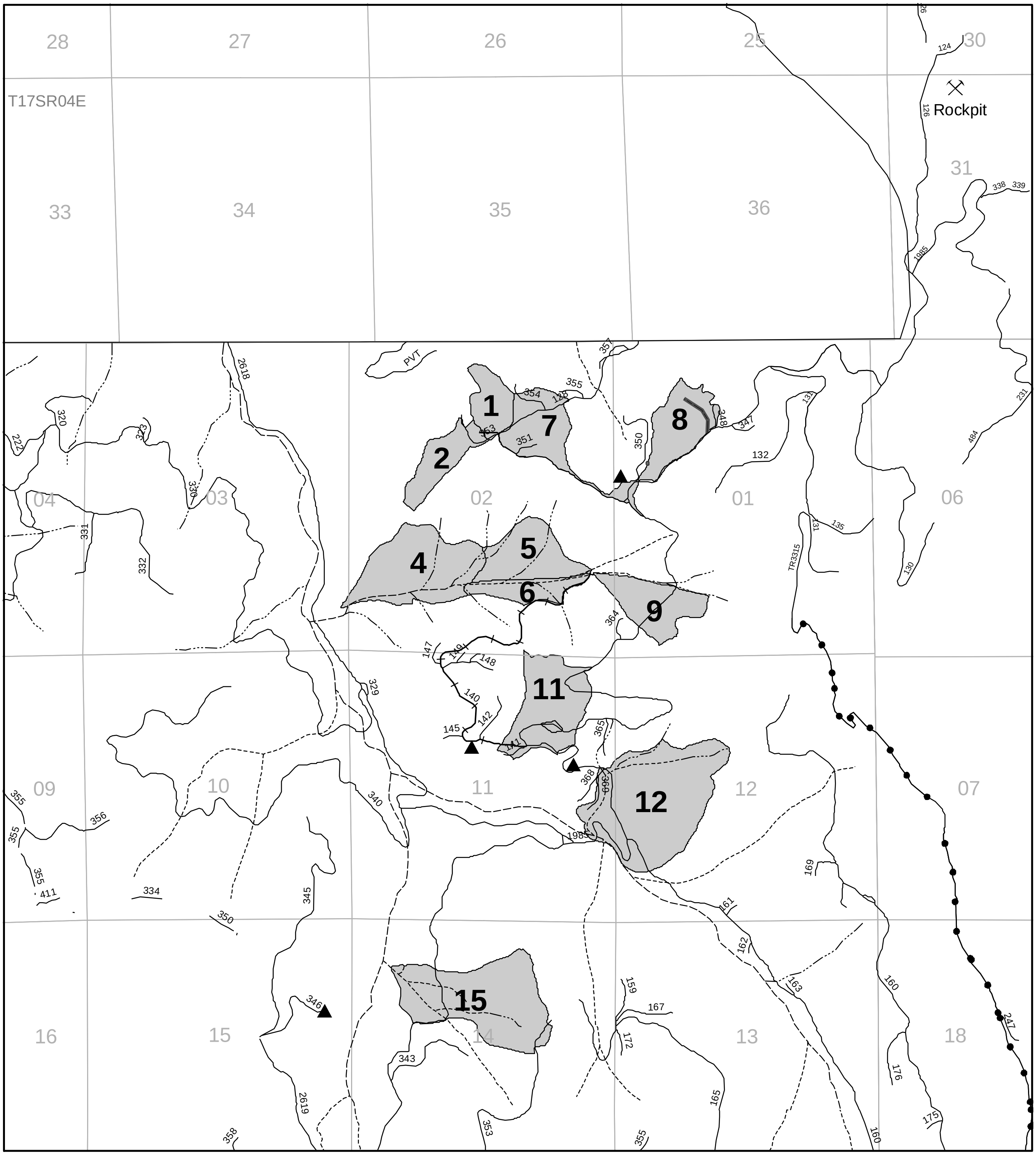
Unit	Acres	Current Snags Per Acre (>=14"dbh)	Current Large Down Wood (LWD) (>=14"dbh) Approximate Lineal Feet Per Acre	Live Leave Green Trees for Snags	Live Green Trees Left for Down Wood
1	20	0	100	3	3
2	26	0	100	5	3
4	59	0	0	7	4
5	39	0	184	3	3
6	19	1	184	2	2
7	31	0	100	2	2
8	38	8	6	3	3
9	36	0	184	3	3
11	53	0	0	3	3
12	115	0	0	3	3
15	90	0	0	3	3
22	55	0	0	3	3
23	67	0	70	3	3
25	58	0	70	5	3
Total	706				

Snags: Prescribed snag creation from green trees would benefit Pacific fringe-tailed bats, peregrine falcons, and California wolverines that may be present in the area, as well as cavity nesting species, by improving or protecting habitat quality for them or their prey. Existing snags greater than 14 inches diameter breast height (dbh) in decay classes I and II would be left standing in units unless hazardous to logging operations. In addition to any existing snags, 2 to 7 live green trees per acre would be left in all units for future snag creation.

Down Wood: Existing down wood pieces greater than 20 feet long and 14 inches diameter may currently exist in some units. In addition to any current down wood, 2 to 4 live trees per acre would be left in all units for future down wood creation. Pieces should be left as full tree-lengths to maximize ecological benefits and should reflect the size and species mix of the stand, and would equal approximately 100 to 200 lineal feet/acre in decay classes I and II.

Green Tree Retention Areas: GTRs would be located within the regeneration units. GTRs are scattered no-harvest patches that would provide diversity and future snags and large down wood. They would be various sizes making up at least 15% of the stand.

Figure 8: Hartz Project Area - Quartz Creek Watershed - Alternative 4



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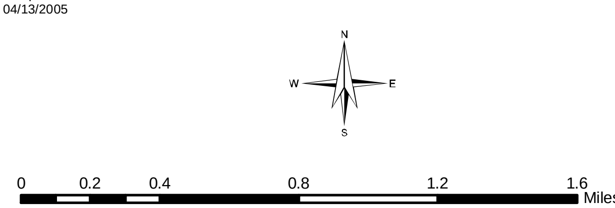
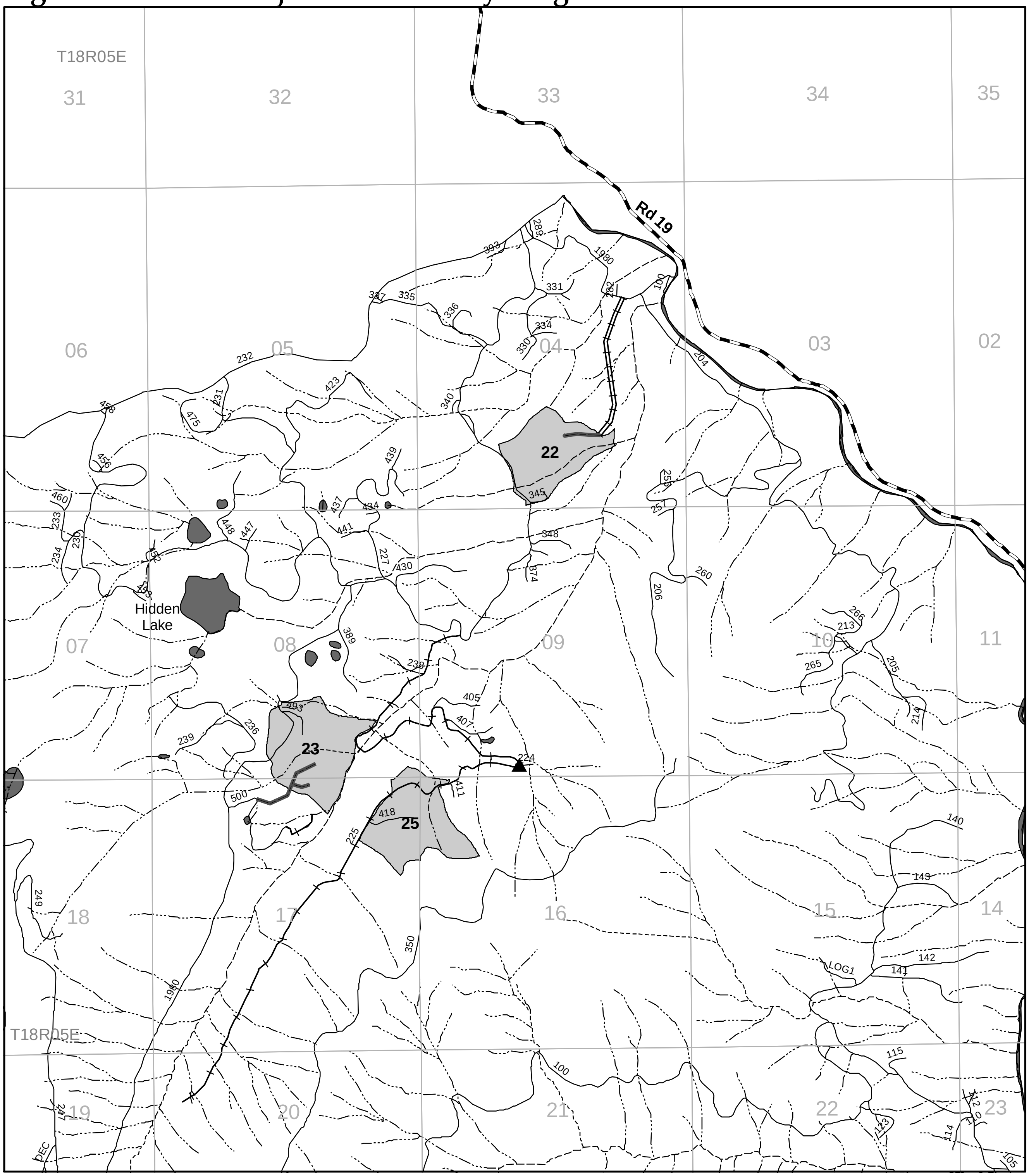


Figure 9: Hartz Project Area - Hardy Ridge Watershed - Alternative 4



▲ Heli Landings
Lakes
Units
Unclassified Roads
Road Closures
Temp Roads
Roads

Stream Class
1
2
3
4

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N
W E
S

0 0.2 0.4 0.8 1.2 1.6 Miles

KV Coordination Common to All Action Alternatives

The following items are important actions that could be funded through KV collections associated with sales from this Environmental Analysis. The KV projects would occur as post harvest activities for all action alternatives. They are listed in order of priority for work accomplishment based on funding.

Reforestation – Reforestation of regeneration units as described in chapter 2 for each of the action alternatives.

Soil and Water – As described in the Mitigation Measures section of chapter 2, follow up application of native seed at 20 pounds per acre would be applied two years after sale activities when the initial purchaser application of cereal grain to areas of exposed soil is beginning to decline in vigor.

Noxious Weeds – As described in the Mitigation Measures section of chapter 2, noxious weeds would be treated with manual methods such as pulling and cutting. Treatments would occur in all harvested units and the area ¼ mile around these units. Monitoring of the treated sites would occur to determine if multiple treatments are necessary.

Snag and Down Creation – Snags and down wood would be created as previously described in chapter 2 for each action alternative.

Pre-Commercial Thinning – Pre-commercial thinning (PCT) of 31 units totaling 538 acres would occur over the 5 year period following harvest. PCT involves selectively cutting excess trees in stands from 10 to 20 years old to reduce competition for sunlight, moisture, and soil nutrients. By reducing competition the remaining trees are healthier, reach maturity faster, are less vulnerable to wind and snow damage and attack from insects and diseases. A 10' no cut buffer is required along class 4 streams and a 20' foot no cut buffer is required along class 1-3 streams. Roadside buffers to provide hiding cover for wildlife may also be required as described in individual unit prescriptions. No-cut thickets may be prescribed in some units for wildlife habitat diversity. Slash pullback and scatter is required along all forest roads to provide a fuel break.

Diversity Thinning – Adjacent to Hartz unit #11 located within the Late Successional Reserve (LSR), stand 1003719 is 16 acres and is proposed for diversity thinning. Diversity Thinning and enhancement techinques would create and maintain plant species diversity, horizontal and vertical structural diversity, protect sensitive plant habitat, protect and create wildlife habitat accelerating the late successional characteristics. Pre-commerical thinning using the diversity enhancing techniques such as varible spacing with gaps, leave islands or clumps, open grown trees, cluster trees and special habitat enhancements would accomplish these goals. Diversity thinning may occur in 2007 at age 15 or within the 5-year KV period.

Road Decommissioning – As discussed above for each action alternative, the last 800 feet of the existing closed road 1980-500, would be decommissioned following timber haul. Decommissioning may include: blocking the beginning of this segment to traffic, placement of slash on the road prism, application of seed, re-vegetation of the road prism, and the road database record changed to decommissioned status.

Conifer release – Conifer release would occur in 5 stands totaling approximately 69 acres. Conifer release will ensure survival and enhance the growth potential of young conifers by reducing the competition for sunlight, moisture, and soil nutrients. This treatment consists of manually cutting encroaching vegetation in a 4-foot radius circle around approximately 300 conifers per acre. Conifer release will also produce new sprouts for forage habitat. A 10-foot no cut buffer is required along class 4 streams and a 20-foot no cut buffer is required along class 1-3 streams.

Browse Cutback – To enhance deer and elk forage habitat on up to 40 acres, browse cutback may occur on portions of 3 adjacent harvest units as well as within Hartz units 7, 8, & 11. Browse cutback would cut shrubs with high forage values to encourage sprouting. Areas would be examined for effectiveness in improving deer and elk forage prior to treatment. Treatments in adjacent units would occur as soon as KV becomes available, treatments in Hartz units would occur toward the end of the KV 5-year period.

Forage Seeding –To enhance deer and elk forage habitat, approximately 20 acres in and adjacent to Hartz units 7, 8, & 11 may be seeded with native seed if ground conditions warrant. Seed would be distributed in the smaller areas with bare soil, on slopes less than 40% and along road edges. Seeding treatment would provide high forage value in summer and fall. Treatment may occur after harvest and site preparation within units.

Pond Habitat Improvement – In stand 1003917, adjacent to Hartz #7, artificially created potholes or ponds would be restored to enhance amphibian populations. Treatment may include weeds control, plant berry producing shrubs and willow, seed with native seed along the perimeter of the ponds and add woody material. Monitoring would be included to determine if treatments are effective in enhancing amphibian populations and habitat. Treatment can be done as early as KV is available.

Aerial Fertilization – Fertilization would occur in 115 stands totaling about 2,903 acres. Research and trials have shown that nitrogen fertilizer can significantly increase tree growth and vigor. Stands selected for fertilizer treatment are generally 20 to 40 year old second growth stands that are predominantly Douglas-fir. A 100-foot buffer will be maintained along class 1 to 3 streams and along lakes, ponds or other wet areas. Fertilization may occur in Riparian Reserves of class 4 streams if they are dry at the time of application. However, if class 4 streams are flowing water at the time of application, a 100-foot buffer will be maintained.

Conifer Pruning – Conifer pruning would occur in an estimated 10 stands for a total of 222 acres. Conifer pruning involves removing the lower limbs from 70 to 110 trees per acre on trees 20 to 40 years old. The lower limbs are removed from the base of the tree up to ½ the height of the tree. By removing the lower branches sooner than they would naturally fall off, pruning can produce higher quality lumber by allowing clear wood to form sooner. Pruning may also reduce the incidence of foliage diseases, such as Swiss Needle Cast and White Pine Blister Rust that thrive in humid environments, and increase fire resistance within the stand by removing "ladder fuels". There are no known relevant resource impacts with pruning that would support or prohibit the activity in Riparian Reserves, but it does not appear that pruning is needed to meet Aquatic Conservation Strategy objectives. From the viewpoint of managing for water quality and stream bank and channel stability, there would be no restriction on pruning in Riparian Reserves. Slash pullback and scatter is required along all forest roads to provide a fuel break.

Recreation – Site maintenance and visual cleanup, which includes picking up litter at 10 dispersed sites near or adjacent to Hartz units 8, 11, 12, 22, 23, and 25.

The last ½ mile of the Indian Ridge Trail would be reconstructed. Signage would be added at the trailhead.

The sign at Hard Rock group site campground would be replaced.

Mitigation and Design Measures Common to All Action Alternatives

Mitigation Measures: Council of Environment Quality (CEQ) Regulations (§ 1508.20) defines Mitigation as:

1. Avoiding the impact altogether by not taking a certain action or certain parts of an action.
2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
3. Rectifying the impacts the impact by repairing, rehabilitating, or restoring the affected environment.
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action.
5. Compensating for the impact by replacing or providing substitute resources or environments.

Design Measures are standard operating procedures to follow so that activities remain consistent with Willamette Forest Plan Standards and Guidelines.

The following measures would be implemented through project design and layout, contract specifications, contract administration, and with monitoring performed by Forest Service officers.

Mitigation

Mitigation Measures for Soil, Watershed, and Fisheries Protection

1. Any project activity such as culvert replacement that must occur within fish bearing and other perennial streams would comply with Oregon Department of Fish and Wildlife (ODFW) seasonal restrictions on in-stream work activities. Best Management Practices (BMPs), including placement of sediment barriers, provision of flow bypass, and other applicable measures, would be included in project design as necessary to control off-site movement of sediment. In the Quartz Creek sub-watershed, in-stream work must occur between July 1 and October 15. In Hardy Creek and other fish bearing streams tributary to the South Fork of the McKenzie River, in-stream work must occur between July 1 and August 15.

2. Native surfaced roads would be restricted for hauling during the winter rainy season between November 1 and May 31. The objectives are to maintain water quality and fish habitat.

3. Construction and or maintenance of roads would not be done when soils are saturated or run off occurs, to minimize erosion and sedimentation, and a stable fill would be constructed across all streams.

4. All haul roads would be maintained in stable condition. Winter hauling may be allowable when the road surface is either covered with a relatively continuous snow pack or when void of snow when runoff from the road surface is unlikely. Watering the road surface would be used if roads become excessively dusty during the summer.

5. Ground-based yarding systems would operate only when soils are relatively dry following the rainy season in the spring though the summer, or during the winter months when there is a continuous snow pack of at least eighteen inches deep or when soils are frozen to a depth of six inches or greater. Operations would be suspended if rainfall or precipitation results in pooling of water in skid trials or landings.

6. Designated skid trails would be required in all ground based yarding units. Skid trails would be located outside drainages, seeps, springs and or concave landforms, which could accumulate and transport overland flow and sediment. Existing skid trails that are outside drainages, seeps and springs that meet the needs of the yarding system should be used wherever possible.

7. Ground based equipment would be limited to slopes less than 30 percent for harvester/forwarder and conventional ground skidding operations. Short, isolated pitches up to 40 percent on otherwise suitable slopes may be approved after consultation with soil/watershed specialist determines that sediment transport to streams would not occur as a result. Adverse skidding conditions would be avoided through skid trail layout and use of alternative yarding systems

8. Traditional ground based yarding equipment would not be permitted within Riparian Reserves of Class I and Class II (fish bearing) streams. Alternative low disturbance ground based equipment such as shovel yarding would not be permitted within 150 feet of fish bearing streams. Traditional ground based equipment would not be permitted within 50 feet of the stream channel in Class III and Class IV (non-fish bearing) streams. In the remainder of the riparian reserve, traditional ground based equipment is permitted, but would be restricted to existing skid trails from previous entries. Alternative low disturbance ground based equipment such as shovel yarding are also permitted in the remainder of the riparian reserve.

9. Regardless of unit harvest prescription, portions of harvest units that lie within riparian reserves would be managed to meet riparian objectives. Prescription elements designed to accomplish this are detailed in Table 14. Minimum canopy closure of 40% would be permitted in units harvested by helicopter to facilitate operational safety requirements.

10. Full suspension would be required when yarding over perennial stream channels. Where full suspension is not obtainable over intermittent streams, partial suspension would be required and yarding would be limited to when the stream is dry.

11. Where cable yarding requires corridors through a riparian reserve, corridors would be laid out to result in the least number of trees cut. Trees located within no-harvest buffers that must be cut to facilitate yarding corridors would be felled into the channel and left on site.

12. All skid trails and landings would be water barred to provide adequate drainage. Water bars location should occur where local terrain facilitates effective drainage of the skid trail or landing. In general, water bars should be constructed every 100 feet on slopes less than 15 percent, and every 50 feet on slopes greater than 15 percent. Water bars should be "keyed in" to the cut bank and have a clear outlet on the down hill side. Where available, slash should be placed on skid trails and landings.

13. Skid trails in thinning units with ground based yarding would be scarified to a depth of 3-6 inches. Skid trails in regeneration treatments and all landings would be sub-soiled to a depth of 18-22 inches.

14. All areas of exposed soil, such as landings, skid trails, decommissioned roads, and cut and fill slopes associated with road construction or maintenance would be seeded with non-invasive cereal grains such as winter wheat, and native perennial species.

15. Temporary roads would be decommissioned after completion of logging operations. Decommissioning of roads may include: berming the entrance, removal of culverts, out-sloping the road surface, pulling-back side slope fill material onto the cut slope, installation of water-bars, removal of placed rock, and re-vegetation of the road prism.

16. In units containing stream channels, all existing large woody debris would be retained within riparian reserves to maintain channel stability; provide nutrients and food for aquatic plants and insects, and to provide buffering so as to filter sediment from runoff and maintain water quality.

Mitigation Measures for Wildlife

17. Felling of hazard trees along the haul route on Forest Road 2618 would be limited to the period August 1 to January 1, which is the non-breeding season for Threatened, Endangered and Sensitive (TES) birds. The intent is to protect harlequin ducks from noise disturbance during the nesting season in unsurveyed nesting habitat along Quartz Creek. This measure would also protect non-listed cavity nesters using snag habitat.

18. A seasonal operating restriction on falling, yarding, heavy equipment operation, helicopter use, burning, snag and log creation is required if shown in the following table. These restrictions may be lifted if surveys are conducted and non-nesting is verified for the year of operation.

Table 13: Seasonal Restrictions.

Unit	Seasonal Restriction for falling, ground-based yarding, burning, snag and down log creation, helicopter landing and rock pit development without blasting.	Seasonal restriction for helicopter use and blasting at rock pit development.
1	No	Yes, March 1-July 15
2	No	Yes, March 1 - July 15
4	No	Yes, March 1 - July 15
5	No	Yes, March 1 - July 15
6	No	Yes, March 1 - July 15
7	Yes, West half only: January 15 - July 15, Entire unit: March 1 - July 15	Yes, January 15 - July 15 and March 1 - July 15
8	Yes, January 15-July 15	Yes, January 15 - July 15 and March 1 - July 15
9	Yes, January 15-July 15	Yes, January 15 - July 15 and March 1 - July 15
11	No	Yes, March 1 - July 15
12	No	Yes, March 1 - July 15
15	No	Yes, March 1 - July 15
22	Yes, January 15 - July 15	Yes, March 1 - July 15
23	Yes, April 1 - July 30 bottom 150 feet near Hardy Creek	Yes, March 1 - July 15
25	No	Yes, March 1 - July 15
Helicopter Landing 1	No	Yes, March 1 - July 15
Helicopter Landing 2	No	Yes, March 1 - July 15
Helicopter Landing 3	No	Yes, March 1 - July 15
Helicopter Landing 4	No	Yes, March 1 - July 15
Rock Pit Development	Yes, March 1 - July 15	Yes, March 1 - September 30
Road Maintenance	Not needed if work activity is not stationary. Seasonally restrict work during March 1 - July 15 if work time would exceed 3 hours duration at one location.	Yes, March 1 - September 30 in AMA; March 1 - July 15 in Matrix

Mitigation Measures for Sensitive Botanical Species

19. A no-disturbance buffer would be placed around known occurrences of sensitive plant species. Sizes of buffers are listed Appendix D, pg. 10. Broadcast burning would not be implemented within the no-disturbance buffer. Trees would be felled away from the no-disturbance buffer.

Mitigation Measures for Special Habitat Areas

20. A no-harvest buffer would be placed around special habitats listed in Table 38. Sizes of buffers are listed Appendix D, pg. 11. Trees would be felled away from the no-disturbance buffer.

Mitigation Measure for Recreation

21. Log hauling would not be allowed on Forest Road 19 (West Cascades National Scenic Byway) on weekends and during long holiday periods for Memorial Day, 4th of July, and Labor Day. The restriction would be from Box Canyon at Forest road 1957 to State Highway 126. The intent is to avoid conflicts with heavy weekend and holiday recreation traffic on Road 19 along Cougar Reservoir.

Design Measures

Design Measures for Wildlife

22. Minimize damage to existing adjacent trees and vegetation when falling and yarding hazard trees along the haul-route, especially the large diameter trees and snags retained.

23. If Threatened, Endangered, or Sensitive (TES) wildlife species are found in future field work or during activities associated with this project, and potential for adverse effects exists, project modifications would be pursued and Contract Provision C6.25 would be implemented.

24. The wildlife biologist shall be notified of any changes made to this project that would alter the need for seasonal restrictions, resulting in either waiving or applying additional restrictions. Examples include changes in locations of helicopter landings, additional helicopter use, or blasting.

25. A seasonal operating restriction is required for the Cascade Elk Rifle season, which is typically the third week of October. All vehicle traffic would be restricted on closed roads beginning the Friday before this week through the end of the following Friday.

26. Implement planned road closures as soon as possible after logging is completed to benefit wolverines, Pacific fisher, and other wildlife species needing seclusion.

Design Measures for Noxious Weed Control

27. All off-road equipment would be pressure washed to remove all dirt and debris prior to entering National Forest System lands and when moving from infested to non-infested areas within the project area. This includes a thorough cleaning of the undercarriage in a designated cleaning area. Follow up and control of weed seed that germinate in designated cleaning areas following logging activity.

28. Haul truck turn arounds would not be constructed in known noxious weed populations (FS can provide map).

29. Start work in non-infested areas and then move to infested areas (FS can provide map).

30. Pre-treat road systems before road maintenance and harvest activities to get rid of weeds to lessen the seed bank.

31. Post harvest survey and control of noxious weeds would be applied to all harvest units and associated roads in the planning area.

32. Clean fill (soil or rock free of slash and debris) should be used for construction of temporary roads. Sources of rock and fill material need to be free of noxious weeds. Rock quarries that may be used will be surveyed for noxious weeds prior to use. If noxious weeds are found, they would be treated prior to quarry use.

33. Disturbed areas (culverts, road shoulders) would be re-vegetated with weed-free native seed to compete with noxious weed seed. Weed-free mulch would be used if necessary.

34. Roads to be bermed or decommissioned would be treated for noxious and non-native weeds prior to blocking. All roads with disturbed soil would be planted with native plant material to prevent invasion by non-native species.

35. Bermed and decommissioned roads would be monitored for noxious weeds for three years after the road treatment is completed. Identified weed populations are treated.

Design Measures for Fuels Treatment

36. Handlines for slash burning would not be constructed along no-cut riparian buffer areas. Fire would only be allowed to back into the riparian area.

37. All burning operations would comply with the Oregon State Implementation Plan (SIP).

Design Measures for Cultural Resources

38. When previously unknown cultural resources are discovered during ground-disturbing operations, work would be halted and the cultural resource site in question would be evaluated as to National Register of Historic Places (NRHP) eligibility by a qualified professional archaeologist.

If the cultural resource (site) were found to be eligible for listing on the NRHP (and thus significant), the project operation would be modified to avoid impacting the cultural site. Such avoidance may take the form of timber sale unit boundary withdrawl (avoiding direct impact and establishing a safety buffer of 100 feet around the cultural site boundary.) Similarly, a cultural site discovered during road construction may necessitate redesign of the road, protective overburden, or use of an alternative route. Other mitigations that may be utilized include a change in equipment or season of operation. More complex mitigation may require consultation with the State Historic Preservation Office (SHPO) and federally recognized Indian tribes before the project work can resume.

Silviculture Prescriptions

Table 14: Stand Treatment Prescriptions

Stand Treatment	Post Harvest % Maximum Stand Density Index (SDI)	Post-Harvest % Canopy Closure	Approx. Residual Trees Per Acre (TPA)	Alt. 1 Acres	Alt. 2 Acres	Alt. 3 Acres	Alt. 4 Acres
Moderate Commercial Thinning	30-40	40-50	80-100	0	190	341	50
Heavy Commercial Thinning	20-30	30-40	45-65	0	432	307	513
Regeneration Harvest	N/A	N/A	N/A	0	84	0	143
Total Acreage				0	706	648	706

Silviculture Descriptions:

Thinning

Intermediate cuttings of younger stands that are used for the reduction of stand density or management of species composition are called thinning. The objectives include increasing the overall growth potential of the residual trees while removing trees that would ultimately die from suppression. Thinning from below removes trees from the lower crown classes. The thinning can be applied in a range of densities. With a very light or salvage thinning, removals are confined to overtopped or suppressed trees where the canopy remains unbroken or only slightly broken. With the heavier thinning, additional trees with higher crown classes are removed, and the canopy is opened to accelerate growth and crown expansion of the remaining trees. The remaining trees also develop into a healthier and more stable stand over time.

Regeneration (Clearcut)

Regeneration method is the removal of the old stand, the establishment of a new one, and any treatments of vegetation, slash, or soil that are applied to create and maintain conditions favorable to the start and early growth of reproduction (Smith, et al. 1997). Methods of regeneration include clearcutting, which is an even-aged silvicultural method that is applied to stands when the main objective is to promote regeneration. Even-aged systems provide optimal seedling environment for the establishment and growth of the shade intolerant species presently on site.

Stand Density Index

The stand treatments developed for the Hartz project units are based on the Stand Density Index (SDI), which is a relative measure of the stand's density with a maximum SDI that varies for each tree species. At approximately 50% maximum SDI, maximum stand production occurs and individual tree vigor would begin to decline (Long, 1985). Thus, lower levels of SDI should be maintained in order to meet stand objectives such as growth for sustainable timber and mean tree growth for various wildlife habitat objectives.

Stand Treatments:

Moderate Commercial Thinning

With this prescription the stands would be thinned to a maximum SDI of 30% to 40% primarily through the removal of smaller diameter Douglas-fir trees. Approximately 80 to 100 trees per acres would be left as residuals plus 4 to 6 trees would be left for future snag and large down wood creation. The spacing would be approximately 15 to 30 feet, with variation occurring with the marking prescription as well as natural variation in the stand. Identified laminated root rot pockets may be treated with the removal of susceptible species and planting of tolerant or resistant species. Some areas would be designated as no harvest as determined by various mitigations outlined in Chapter 2.

This treatment would maintain or improve the overall stand growth and vigor by reducing competition for limiting resources such as light, water, and soil nutrients. Thinning would also increase individual tree stability making them more resistant to wind-throw as they mature. Trees would also be more resistant to insect infestations and disease. Understory shrubs and other vegetation would become established, or expand beyond areas where they currently exist into the openings created. Some natural regeneration of trees may also occur, primarily of shade tolerant species. Residual trees would respond over time with enhanced diameter growth and crown expansion; another commercial thinning would likely be necessary in approximately 15 to 20 years when the maximum SDI levels again exceed 50%.

Heavy Commercial Thinning

With this prescription the stands would be thinned to a maximum SDI of 20% to 30% through the removal of mostly smaller and some larger diameter trees. The primary species for removal would be Douglas-fir, maintaining most non/Douglas-fir species for diversity. Approximately 45 to 65 trees per acres would be left as residuals, plus 4 to 6 trees would be left for future snag and large down wood creation. The spacing would be approximately 20 to 35 feet, with variation occurring with the marking prescription as well as natural variation in the stand. Identified laminated root rot pockets may be treated with the removal of susceptible species and planting of tolerant or resistant species. Some areas would be designated as no harvest as determined by various mitigations outlined in Chapter 2.

This treatment would improve overall stand growth as well as improve average tree growth. Thinning would also increase individual tree stability making them more resistant to wind-throw as they mature. Trees would be more resistant to insect infestations and disease. The heavy thinning would create various large-sized openings providing more opportunity for understory shrubs and other vegetation to become established, or expand beyond areas where they currently exist. Natural regeneration of trees, primarily shade tolerant, is also expected to occur. Residual trees would respond over time with diameter growth and crown expansion; however, the heavy thinning would allow more time before another commercial thinning would be necessary for continued growth and vigor. The maximum SDI levels are expected to exceed 50% in approximately 40 or more years.

Regeneration Harvest (Clearcut)

This prescription is proposed for units 2 and 25 in Alternative 2; and 2, 4, and 25 in Alternative 4. With this prescription the stands would be clearcut, removing all trees except those left in GTRs, and those left for future snags and large down wood. The stands would planted with 430 trees per acre with a mix of Douglas-fir, western hemlock, sugar pine and western white pine. This treatment would provide for early seral stand conditions with the establishment of young trees and herb and shrub species. The variety of planted trees species would provide more vegetative diversity in the stand over time.

Riparian Reserve Management

Neither the South Fork McKenzie River or the Quartz Creek and Minor Tributaries Watershed Analyses recommended riparian reserve widths different than interim widths described in the Northwest Forest Plan (NWFP). The Hartz Project would use the following riparian reserve widths established from site specific plant associations, as determined by the certified silviculturist: 300 to 320 feet on fish-bearing (Class II) streams, consisting of two site specific tree heights; 150 to 160 feet on permanently flowing non-fish-bearing (Class III) streams, consisting of one site specific tree height; and 150 feet on intermittent (Class IV) streams and small wetlands, consisting of one site specific tree height. Riparian reserve widths, listed as ranges from 150 to 160 feet along Class III streams and 300 to 320 feet along Class II streams, are because of the differing plant associations by site. Hence, units 6 and 9 would require 160 and 320 feet, respectively. These reserve widths, based on site potential tree heights, represent the option creating the greatest reserve widths as required in the NWFP.

Both the South Fork McKenzie River and the Quartz Creek and Minor Tributaries Watershed Analyses identify additional large wood in streams as an important need for healthy stream habitats. Silvicultural thinning of young managed stands provides an opportunity enhance the production of large wood for riparian and aquatic habitat. Table 14 below summarizes design elements that are intended to facilitate development of large wood while minimizing both soil disturbance and the reduction of shading vegetation. The design elements include no harvest buffer requirements and required levels of canopy retention in portions of the riparian area that will be thinned. Table 15 summarizes water bodies that lie within or adjacent to proposed harvest units.

Table 15: Riparian Reserve Management for All Action Alternatives.

Stream Class	All Silvicultural Treatments where full suspension can be maintained during harvest activities. (Includes treatment of activity fuels)	All Silvicultural Treatments where only partial suspension can be maintained during harvest activities. (Includes treatment of activity fuels)
Fish-Bearing, Class II Streams	60’ No-Harvest (NH) and retain a minimum 50% canopy closure in the remainder of the 300’ to 320’ riparian reserve.	75’ NH and retain a minimum 50% canopy closure in the remainder of the 300’ to 320’ riparian reserve.
Permanently Flowing non Fish-Bearing Class III Streams	30’ NH and retain a minimum 50% canopy closure in the remainder of the 150’ to 160’ riparian reserve.	50’ NH and retain a minimum 50% canopy closure in the remainder of the 150’ to 160’ riparian reserve.
Intermittent Class IV Streams	Retain bank stability trees and a minimum 50% canopy closure in the remainder of the 150’ riparian reserve.	30’ NH and retain a minimum 50% canopy closure in the remainder of the 150’ riparian reserve.
Ponds and Wetlands less than 1 acre	30’ NH and retain a minimum 50% canopy closure in the remainder of the 150’ riparian reserve.	50’ NH and retain a minimum 50% canopy closure in the remainder of the 150’ riparian reserve.

Note: Minimum canopy closure of 40% would be permitted in units harvested by helicopter to facilitate operational safety requirements.

Table 16: Stream Class/Riparian Reserve Present in Proposed Units.

Proposed Unit	Stream Class Present
1	None
2	None
4	II, III, IV
5	II, III, IV
6	II, III, IV
7	None
8	Wetland
9	III, IV
11	None
12	II, III, IV
15	III, IV, Wetland
22	II, Wetland
23	II, III, IV, Wetland
25	III, IV

Comparison of Alternatives

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

Table 17: Comparison of Alternatives by Activity

Management Activity	Units of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Harvest Prescription					
Moderate Commercial Thinning	Acres	0	190	341	50
Heavy Commercial Thinning	Acres	0	432	307	513
Regeneration Harvest	Acres	0	84	0	143
Total Harvest Area	Acres	0	706	648	706
Estimated Timber Volume	(MBF/CCF)		11,608 / 22,589	9,446 / 18,311	13,486 / 26,411
Logging System					
Ground	Acres		139	123	139
Skyline	Acres		252	210	252
Shovel	Acres		5	5	5
Helicopter	Acres		310	310	310
Prescribed Broadcast Burning	Acres		84	0	143
Roads					
Maintenance	Miles		29.3	26.8	29.3
Road Closures	Miles		7.76	3.44	7.76
Road Decommissioning*	Feet		7,350	7,350	7,350
Temp Roads Constructed	Feet		2,050	2,050	2,050
Temp Roads Unclassified	Feet		4,500	4,500	4,500

* Includes newly constructed temporary roads, existing unclassified roads, and existing Forest roads.

Table 18: Comparison of Alternatives by the Significant Issue and Measurements

Aquatic and Riparian Habitat

Issue Measurement	Units of Measure	Area	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Average Diameter of Trees Adjacent to Streams Available Through Time	Average DBH (inches)		17.24	20.47	20.69	20.47
Riparian Reserves Treated	Acres	Hardy Creek	0	100.8	100.8	100.8
		Quartz Creek	0	53.9	47.3	53.9
Sediment Yield by Sub-watershed	Total Erosion (cubic yards/year)	Hardy Creek	1,842.21	1,858.42	1,848.39	1,858.42
		Quartz Creek	3,495.33	3,518.90	3,516.30	3,524.75
	% Increase Compared to No Action	Hardy Creek	n/a	0.88	0.34	0.88
		Quartz Creek	n/a	0.67	0.6	0.84
Aggregate Recovery Percentage (ARP)		Hardy Creek	95	93.6	95	93.6
		Lytle-Indian	91.2	90.7	91.2	89.5

Table 19: Other Issue Measures that Compare Project Objectives by Alternatives

Resource Issue	Units of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Stand Health and Vigor	Average Growth Inches/Decade	1.26	1.50	1.49	1.55
Distribution and Amount of Created Early Seral Stands	Acres in Hardy Ridge	0	58	0	58
	Acres in Quartz Creek	0	26	0	85
	Acres Removed (canopy <40%)	0	516	307	656
Road Density and Elk Habitat	Miles of Open Roads	83.38	77.57	81.27	77.57
	Acres of Change in Forage Habitat	0	706 increase	648 increase	706 increase
	Acres of Change in Hiding Cover	0	58 decrease	58 decrease	58 decrease
	Acres of Change in Thermal Cover	0	648 decrease	590 decrease	648 decrease

CHAPTER 3. EXISTING CONDITION AND ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in Chapter 2.

Activities that Contribute to Cumulative Effects

Cumulative effects are discussed as part of the environment consequences for each of the alternatives. Cumulative effects are based on the past, present, and reasonably foreseeable future management actions including the proposed action for the planning area. The following past management activities have occurred in the analysis area.

Timber Harvest: Since 1950, approximately 9,635 acres have been managed for timber harvest. Of those, 9,011 were regeneration harvests including clearcuts and shelterwoods. The other 624 acres were managed with the use of commercial thinning, partial cutting, or salvage logging. (See Appendix H)

Timber Stand Improvement: Pre-commercial thinning has been a major part of past forest management. The thinning treatments usually reduced stand densities to about 300 trees per acre. In the past 3 years, approximately 184 acres have been pre-commercially thinned within the Hartz Project area. Other TSI projects that have occurred include conifer pruning, conifer release, aerial fertilization, and reforestation.

Prescribed Burning/Fuels Treatment: Most of the acres managed for timber harvest since the 1950's have had broadcast burning, hand pile burning or another fuel treatment activity. Broadcast burning was used primarily after clearcutting. Fuels treatment was a common practice in order to reduce the hazardous fuels and to provide suitable planting spots for regeneration.

Roads: Past road building has resulted in approximately 112 miles of system/classified Forest Roads in the Hartz Planning area. There are 18.71 miles of road currently closed with gates, berms or other structures.

Past actions located outside the Hartz Project area, but within the Quartz Creek Watershed would include timber harvest and road building by private industry. The timber harvest occurring is primarily clearcuts on possibly a 40-50 year rotation. Actual acres and miles of road are unknown at this time.

Road maintenance on all open roads and a prescribed burn in the 17-acre unit, originally included in the proposed action, are foreseeable actions that would occur in the analysis area in the next five years. No other timber harvest projects are planned for the Hartz project area over the next five years. However, firewood cutting and salvage logging including routine hazard tree felling is expected.

Reasonably foreseeable actions outside the Hartz Planning area, but within the Quartz Creek watershed would include continued timber harvest and road building by private industry.

Aquatic and Riparian Habitat

For each of the analysis items in this section, a discussion of the affected environment precedes the analysis of environmental consequences. The affected environment discussion provides a description of the existing condition, including important physical and biological components of the 5th field watersheds in which the project occurs. It also identifies relevant information from applicable watershed analyses that was used to design and assess the project. The environmental consequences discussion describes the effects of the project on the existing condition.

Affected Environment – Stream Temperatures

There are no streams within the Quartz Creek sub-watershed listed by Oregon Department of Environmental Quality as water quality limited, based on water temperature.

It is worth noting however, that outside of the Project area but within the Hardy Creek/Rebel Creek sub-watershed, an un-named tributary of Rebel Creek is 303(d) listed by Oregon Department of Environmental Quality as water quality limited based on water temperature during the summer season. This stream is within the analysis area for the Aquatic and Riparian Habitat issue. The stream is listed for exceeding the summer temperature criteria of 18 degrees C. for salmon and trout rearing habitat, and is located east of the South Fork of the McKenzie River and predominantly located in the Three Sisters Wilderness. The Hartz project does not propose activities that would result in effects to stream temperature in this stream.

From June through September of 2004, stream temperature data were collected at four locations within the Hartz Project area to support project analysis. The summer temperature criteria of 18 degrees C. for salmon and trout rearing habitat would apply to all of these streams. A summary of this data is provided in Table 20 below, along with data from Walker Creek, which is an unmanaged wilderness stream of similar size and basin characteristics.

Table 20: Stream Temperatures

Stream Name	Management Status	Geology	Maximum 7 Day Average of Maximum Temperatures	Date of Maximum value
Hardy Creek at Road 204	Managed	West Cascades	16.09	8/14/2004
Hardy Creek at Road 225	Managed	Glacial	11.32	8/10/2004
Quartz Creek at Forest Boundary	Managed	West Cascades	16.08	8/10/2004
Indian Creek above Quartz Creek	Managed	West Cascades	15.64	8/11/2004
Walker Creek	Un-managed	West Cascades	15.53	8/12/2004

The temperature data suggest that geology is a stronger influence on stream temperature regime than past management. All four streams situated on West Cascades geology exhibited similar maximum temperatures of approximately 15.5 degrees C., while the site in upper Hardy Creek on glacial terrain had a maximum temperature of only 11.32 degrees C. The glacial terrain is characterized by a relatively wider valley bottoms and deeper accumulation of soil and alluvium. This provides the stream with greater opportunity for hyporheic interaction with the valley bottom, or in other words, the movement of water between the stream and underlying substrate. Recent research is beginning to indicate that substrate may play a substantial role in stream temperature regulation through hyporheic activity. (Johnson, 2004)

The date on which the annual maximum values occurred was roughly the same for each station, suggesting that shifts in the annual timing of maximum values have not occurred as a result of management activities and is not substantially affected by geologic type.

Beginning in the 1950s, road construction and timber harvest began in both of these sub-watersheds, peaking on National Forest system lands in the 1970s. Much of this activity that occurred prior to the implementation of the Willamette Forest Plan in 1990, resulted in removal of riparian vegetation that provided shade to streams in the project area. The removal of shade likely resulted in elevated stream temperatures that are not represented by the current temperature data. The results of the 2004 data collection suggest that 15 to 30 years of re-growth of these harvested areas, and requirements to retain shading vegetation in riparian areas in the Forest Plan, as amended in 1994, have largely mitigated the effects of these past harvests on stream temperatures on National Forest System lands.

Similarly, road construction and timber harvest also began on private lands located downstream from the National Forest in the Quartz Creek sub-watershed in the 1950s. These lands are managed intensively and are not subject to the same level of riparian protection afforded to National Forest System lands. Over the past 50 years, most of the private lands have been harvested, and harvest of second growth has now begun. Only on the largest streams has meaningful shade been retained, and even there, much of the retained shade consists of hardwood species. Stream temperature data is not available for private lands in the Quartz Creek watershed, but it is reasonable to conclude that the continued elimination of shading vegetation downstream from the National Forest has resulted in elevation of stream temperatures.

Environmental Consequences – Stream Temperatures

Effects of Alternative 1(No Action)

Direct and Indirect Effects

No activities would occur with Alternative 1 that could affect stream-shading vegetation. Consequently, there are no direct, indirect, or cumulative effects on stream temperature. Conditions and processes discussed above on the affected environment for temperature would continue. Continued harvest on private lands would likely result in continued elevation of stream temperatures in Quartz Creek downstream from the National Forest System lands.

Effects of Alternative 2-4

Direct and Indirect Effects

For all action alternatives, treatment within riparian areas has been designed to comply with “Sufficiency Analysis for Stream Temperature – Evaluation of the adequacy of the Northwest Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards” (USDA Forest Service and USDI BLM, 2004). This document was prepared in collaboration with Oregon Department of Environmental Quality and United States

Environmental Protection Agency to provide documentation of Northwest Forest Plan compliance with the Clean Water Act with regard to state water quality standards for stream temperatures. As such, it redeems several of the Forest Service responsibilities identified in "Memorandum of Understanding between USDA Forest Service and Oregon Department of Environmental Quality To Meet State and Federal Water Quality Rules and Regulations" (USDA Forest Service and Oregon DEQ, May 2002). The Sufficiency Analysis provides current scientific guidance for management of riparian vegetation to provide effective stream shade, including appropriate methods of managing young stands for riparian objectives other than shade, such as production of large wood for future recruitment.

Trees within the stands proposed for treatment are currently 70 to 80 feet tall, and slopes typically fall within a 30% to 60% range. Crown closures for most stands currently range at or above 80%. Buffers intended to retain effective shade in the riparian areas are described in Table 14: Riparian Reserve Management for All Action Alternatives.

Units that would be skyline yarded may require cable corridors through the primary buffers. These corridors are typically 10 to 15 feet wide and eliminate very little actual effective shade. Based on professional experience, this type of activity may result in increases in stream temperature, but typically too small to measure. Any effect that does occur would be short-lived as these young trees would be expected to re-close these openings in 3 to 5 years, based on rates of new growth for these stands (Personal communication with J.Mayo, District Silviculturist, 2004).

Thinning in riparian reserves would increase both diameter and height of trees compared to the no action alternative. Larger trees create desirable larger size pieces when they are eventually recruited into streams in these sub-watersheds. Over time, this would result in additional stability and resistance to the effects of peak flood events, both in those streams directly adjacent to treatment, and indirectly to downstream stream reaches but over a greater time frame.

Wood in streams would also provide structure permitting sediment storage and creation of additional hyporheic interaction, which could enhance late season low flows and likely result in lower stream temperatures in areas where past management activities have resulted in channel simplification.

These are especially important long-term benefits from the thinning treatments in the Quartz Creek sub-watershed, where the supply of large key pieces of wood have been largely removed from downstream reaches on private land, and the intensive harvest methods currently employed there, would limit development of replacement material downstream.

The silvicultural prescriptions listed in Chapter 2 are consistent with recommendations in the Sufficiency Analysis for "riparian areas that are overstocked and thinning would benefit water quality and aquatic conditions". Based on this consistency, no measurable direct or indirect effects on stream temperature are anticipated from this project.

Cumulative Effects

Analysis for cumulative effects is based on management activities that have or will occur within both the 6^{th} field sub-watersheds. As previously discussed in the Affected Environment section, past management activity has resulted in elevated stream temperatures from the removal of riparian vegetation that provided shade to streams. Overall, however, past management has had little influence on average maximum stream temperatures in the project area. No measurable direct or indirect effects on stream temperatures are anticipated from this project, and there is no other future management activities planned within the Hartz Project area that would contribute incrementally to the cumulative effects from past management.

Effects to Aquatic Habitat: The temperature of water in streams is an important component of aquatic habitat quality, and important to the health of the aquatic species that occupy these habitats. Additional discussion of the project effects on stream temperatures and how it relates to aquatic habitat and fisheries, are presented with sections that pertain to Aquatic Habitat and Fisheries.

Affected Environment – Stream Flows/Disturbance History

There are no gauges in the Hardy Creek/Rebel Creek or the Quartz Creek sub-watersheds. Indications of potential changes in peak flow in the South Fork McKenzie River Watershed Analysis (Willamette N.F. 1994), and the Quartz creek and Minor Tributaries Watershed Analysis (Willamette N. F. 1998) are based upon other indicators. These watershed analyses suggest that peak flows may have increased in streams in the sub-watersheds as a result of timber harvest, and especially road construction. Road densities in these drainages are quite high and create a high likelihood that stream network extension has occurred.

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

As a result of current vegetative conditions, all planning sub-watersheds (Psubs) in the Hardy Creek/Rebel Creek sub-watershed are well-above desired levels of recovery. Current vegetative conditions place most of the Psubs in the Quartz Creek sub-watershed at or above desired levels of recovery, with the exception of Cane Coffee Psub, which is just below the midpoint value. Tables 21 and 22 below summarize the current levels of recovery for the planning sub-watersheds affected by the project area, and the Forest Plan Midpoint ARP levels. These current levels are derived from data in the Forest’s VEGIS database, which includes all past harvest activities. The table also includes estimates of past and ongoing harvest activities on private lands.

Table 21: Calculated Versus Desired Mid-point ARP for Psubs in the Hardy Creek/Rebel Creek Sub-watershed as of 2005.

Psub	Calculated ARP	Mid-point ARP
Hardy Creek	91.4	80
Starr Creek	90.0	75
Trail Creek	98.9	80
Rebel Creek	99.0	80

Table 22: Calculated Versus Desired Mid-point ARP for Psubs in the Quartz Creek 6th Field Watershed as of 2005.

Psub	Calculated ARP	Mid-point ARP
Fawn Buck	88.4	80
Wycoff-Sugar	82.8	80
Lytle-Indian	88.4	85
Upper Quartz	91.3	85
Lower Quartz	80.9	80
Cane Coffee	84.5	85

Although the Cane Coffee Psub is slightly below mid-point levels, Recovery levels remain well above desired levels in the sub-watersheds. Despite relatively high road densities that may have increased the drainage network and efficiency, it is not likely that peak flows are currently outside the historic range. Indicators of adverse channel response to peak flows noted in the watershed analyses, such as coarse bed-load, channel incision, and bank instability, are more likely the result of natural geomorphic instability as in Hardy Creek, or removal of large wood from these reaches (Montgomery, 2004). What this means is that peak flows that have not substantially changed in magnitude from historic peaks, are relatively more damaging due to increased channel vulnerability. The result is the presence of these indicators.

These same impacts to stream function associated with wood removal could also cause a reduction in base flow with poorer floodplain connectivity and storage of groundwater, and more efficient interception and delivery of precipitation by roads built in the watershed.

Environmental Consequences – Stream Flows/Disturbance History

Effects of Alternative 1(No Action)

Direct and Indirect Effects

Recovery continues to occur in all Psubs in both Hardy Creek/Rebel Creek and Quartz Creek sub-watersheds. Even Cane Coffee Psub is currently just below the recommended mid-point value in the Forest Plan. Consequently, no direct, indirect, or cumulative changes in flow regime are anticipated with selection of Alternative 1 – No Action.

Effects of Alternatives 2-4

Direct and Indirect Effects

Any effects from proposed harvest activities could be expected to be greatest immediately after implementation. It is assumed that sales generated by the Hartz Young Stand Management Project would be sold in 2005, and could be completed by 2009. Conditions and ARP levels in 2005 prior to implementation were previously discussed. Proposed activities that would affect ARP values only occur in the Hardy Psub within the Hardy Creek/Rebel Creek sub-watershed, and only occur in the Lytle-Indian Psub in the Quartz Creek sub-watershed. Tables 23 and 24 below summarize levels of recovery immediately after implementation of the project by alternative for the two sub-watersheds where the project is located. The analysis shows that little to no change in ARP recovery should be expected with implementation of any action alternative.

Table 23: Recovery Levels Immediately after Project Implementation in Hardy Creek/Rebel Creek Sub-watershed

Psub	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative4	LRMP Midpoint
Hardy Creek	95	93.6	95	93.6	75
Starr Creek	93.0	93.0	93.0	93.0	80
Trail Creek	98.9	98.9	98.9	98.9	80
Rebel Creek	99.0	99.0	99.0	99.0	70

Table 24: Recovery Levels Immediately after Project Implementation in Quartz Creek Sub-watershed

Psub	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4	LRMP Midpoint
Fawn Buck	90.0	90.0	90.0	90.0	80
Wycoff-Sugar	83.7	83.7	83.7	83.7	80
Lytle-Indian	91.2	90.7	91.2	89.5	85
Upper Quartz	96.4	96.4	96.4	96.4	85
Lower Quartz	81.4	81.4	81.4	81.4	80
Cane Coffee	85.2	85.2	85.2	85.2	85

Cumulative Effects

Analysis for cumulative effects is based on management activities that have or will occur within Psubs within the 6th field sub-watersheds. Conditions and ARP levels based on past management were discussed in the Affected Environment section. Little to no change in ARP recovery is expected with implementation of any action alternative. No other future management is planned within the Hartz Project area that would contribute incrementally to the cumulative effects from past and currently proposed activities.

Effects to Aquatic Habitat: The quantity of water in streams is an important component of the quality of aquatic habitat, and the to health of the aquatic species that occupy these habitats. Additional discussion of the project effects on stream flows and how they relate to aquatic habitat and fisheries are presented in sections that pertain to Aquatic Habitat and Fisheries.

Affected Environment – Sediment

Terrain analysis and field reconnaissance suggest that sediment transport processes in the Hardy Creek/Rebel Creek sub-watershed and the Quartz Creek sub-watershed are dominated by mass wasting processes. Throughout the sub-watershed, material moves into channels slowly via soil creep where it is stored. Along larger perennial channels, this material is removed relatively frequently by winter storm flows. In smaller intermittent channels this material is commonly stored for longer periods until a relatively large event carries the stored materials down stream in a debris torrent.

Management activities in the Quartz Creek sub-watershed and Hardy Creek have influenced these processes in several ways. Road construction on steep inner gorge slopes and steep headwater swales create crossings with culverts and large fills. Historically, undersized or poorly designed installations resulted in failure during storm events. As the surge of water and fill material move downstream, stored sediments are also mobilized and debris torrents can be generated. Also, clearcut harvest of riparian reserves on National Forest System lands prior to implementation of the Willamette Forest Plan in 1990 removed anchoring trees that provided stability to banks and stored materials in these channels (Montgomery, 2004). Existing large woody debris that anchored stored sediments was frequently removed from the channels as well. The net result was that smaller storm events were needed to mobilize stored sediments into debris torrents, and the frequency of these torrents increased. These management-induced effects are much less pronounced in Rebel Creek, as harvest and road activities are limited because the majority of the drainage is Wilderness. These harvest practices and their resulting impacts on sediment delivery to streams have also occurred on private forest lands in Quartz Creek, and are likely to continue.

In addition to the role that road crossings play in torrent events, roads in the sub-watershed are also a source of chronic erosion and sediment delivery to streams through erosion and transport of fine-grained surface soils, or “surface fines”, especially on rutted and poorly maintained roads.

Hardy Creek specifically possesses an additional geomorphic process that is producing a large source of sediment and turbidity. A large Quaternary failure of material perched along the east flank of Indian Ridge generated an earth-flow covering several square miles that moved eastward towards the South Fork of the McKenzie River and southward toward Hardy Creek. In the process, approximately 2.5 miles of the lower portion of Hardy Creek was displaced by up to a ½ mile to the southeast, and up against the more resistant rock of the adjacent ridge. The earth-flow itself is a relic structure that is no longer active. However Hardy Creek has been eroding and continues to erode, back into the toe of the earth-flow in an attempt to return to its former location and gradient. This results in a very active source of sediment of all sizes. Field examination has identified the existence of lens deposits of fine clay minerals embedded in the earth-flow deposits. As these clay deposits are encountered by Hardy Creek, high levels of turbidity are generated due to the relatively high rate of suspension of these minerals in water.

Environmental Consequences – Sediment

To evaluate the effects of the alternatives on sediment delivery, an annual sediment budget was prepared. Rates of sediment delivery were calculated for surface erosion, roadway erosion, debris torrents, and earth-flow related erosion; which in the case of Hardy Creek really constitutes accelerated bank erosion. Temporary road construction and culvert replacement were evaluated qualitatively. A discussion of the analysis methods and the results of the analysis are presented below.

Surface erosion was modeled using rates for natural erosion and sediment yield and activity related yields derived from Swanson and Grants analysis. (Swanson and Grant, 1982) To analyze past management activities, it was assumed that erosion would be proportional to disturbance. For the purpose of analysis, the percent of the analysis area considered “un-recovered” in the ARP analysis was considered to behave as clear-cut areas in terms of sediment yield and recovered areas were considered to have returned to natural rates.

Roadway erosion was separated out from surface erosion as a different tool was used to complete the analysis. Roads within the sub watersheds were placed into 5 categories for analysis: Paved, Gravel Mainline, Lower Slope, Mid Slope, and Ridge top, and mileages of each category were estimated based on map review. The Road WEPP module of the FSWEPP model (found at http://forest.moscowfsl.wsu.edu/fswepp/) was used to estimate sediment yields for each category of road. Several runs for each category were completed to account for differing levels of use and maintenance condition. The results were used to analyze Affected Environment, the sediment yield while sale operations are in progress, and post sale conditions.

Sediment delivery resulting from debris torrents was identified as a major source of sediment in watershed analysis and during field investigation of the project area. Based on reconnaissance observations during the analysis, it was estimated that debris torrents were at least twice as important as a sediment source in these sub-watersheds as surface erosion. Also during field reconnaissance, torrents were estimated to have occurred two to three times as frequently on private lands in Quartz Creek as on National Forest System lands in the sub-watershed as expected, reflecting the dramatic reduction of existing and potential large wood in channels on the private lands. Actual analysis for sediment yield for debris torrents was basically the same as for surface erosion, except that rates of sediment yield were adjusted upward in the analysis based on the results of the field observations.

The situation in Hardy Creek, where the stream is aggressively eroding away at the toe slope of the earth-flow, was analyzed separately. Average heights of bank scarps and an annual rate of incision were estimated based on field reconnaissance and stream survey information. The amount of erosion was a simple calculation of volume using this information and the length of stream adjacent to the earth-flow.

Effects of Alternatives 1 - 4

Direct and Indirect Effects

Quantitative Analysis:

Tables 25 and 26 below summarize the results of these analytical procedures for the Hardy Creek/Rebel Creek Sub-watershed and the Quartz Creek Sub-watershed for all alternatives. All values are expressed as cubic yards of sediment delivered per year unless otherwise noted. Sources are displayed for National Forest System lands and Private lands individually and cumulatively for Quartz Creek.

Table 25: Sediment Yield Summary for the Hardy Creek/Rebel Creek Sub-watershed

Sediment Source	Alternative1 No Action	Alternative 2	Alternative 3	Alternative 4
Surface Erosion	405.06	415.16	409.94	415.16
Debris Torrents	719.73	729.83	724.61	729.83
Earth flow	612.00	612.00	612.00	612.00
Roadway Erosion	105.42	101.43	101.84	101.43
Total Erosion	1,842.21	1,858.42	1,848.39	1,858.42
Percent Increase Compared to No-Action	NA	0.88	0.34	0.88
Actual Increase Compared to No-Action	NA	16.21	6.18	16.21

Effects of each alternative on sediment yield in the Hardy Creek/Rebel Creek Sub-watershed are displayed for each mechanism. In all action alternatives, sediment yields from surface erosion and debris torrents increase from the no action based on increased levels of management disturbance. Actual increases in sediment yield range from 6.18 cu. Yd./year to 16.21 cu. Yd./year, and when expressed as a percent increase from the no action alternative, all of the action alternatives increase sediment yield in the sub-watershed by less than 1%.

Sediment yield from roadway erosion decreases from the no action for all action alternatives as a result of road condition improvement associated with maintenance and improvement activities. Sediment yield associated with the Hardy Creek earth flow remains unchanged as no activities occur that would affect that mechanism.

Table 26: Sediment Yield Summary for the Quartz Creek Sub-watershed

Sediment Source	Alternative1 No Action	Alternative 2	Alternative 3	Alternative 4
Surface Erosion – NFS	407.10	429.45	428.15	431.90
Surface Erosion – Private	407.10	407.10	407.10	407.10
Debris Torrents – NFS	711.82	734.16	732.86	737.56
Debris Torrents – Private	1,131.57	1,131.57	1,131.57	1,131.57
Roadway Erosion – NFS	113.53	102.47	102.47	102.47
Roadway Erosion- Private	158.42	148.36	148.36	148.36
Total Erosion – NFS	1,232.45	1,266.08	1,263.48	1,271.93
Total Erosion- Private	2,262.88	2,252.82	2,252.82	2,252.82
All Total Erosion	3,495.33	3,518.90	3,516.30	3,524.75
Percent Increase Compared to No- Action	NA	0.67	0.60	0.84
Actual Increase Compared to No-Action	NA	23.57	20.97	29.42

The actual direct and indirect effects of each alternative on sediment yield in the Quartz Creek Sub-watershed are displayed for each mechanism in Table 26. Values for both private and National Forest lands are displayed. In all action alternatives, sediment yields from surface erosion and debris torrents increase from the no action based on increased levels of management disturbance. Actual increases in sediment yield range from 20.97 cu. Yd./year to 29.42 cu. Yd./year, and when expressed as a percent increase from the no action alternative, all of the action alternatives increase sediment yield in the sub-watershed by less than 1%.

For all action alternatives, sediment yield from roadway erosion decreases from the levels of no action as a result of improvement in road conditions associated with maintenance and reconstruction activities.

Qualitative Analysis

In addition to the sediment yields summarized in the tables, two specific road related items were analyzed qualitatively.

Implementation of the project requires use of approximately 6,550 feet of temporary road. Of the total needed, 2,050 feet would be newly constructed and 4,500 feet from an existing unclassified road, which would be re-used to access unit 22 following basic maintenance activities. Upon completion of sale activities, all 6,550 feet of temporary road would be decommissioned and re-vegetated. All of the temporary roads that would be constructed are situated on relatively flat, stable terrain outside of riparian reserves, where the potential for extension of drainage networks is negligible. The existing unclassified road to unit 22 crosses one ephemeral draw in the 4,000 feet portion of that parallels Hardy Creek. These conditions make run-off and transport of sediment from disturbed soils unlikely, and consequently, no measurable amounts of sediment are expected to reach stream channels as a result of this activity.

As part of the road reconstruction work included in the project, a number of culverts would be replaced that are currently in poor repair or inadequately sized to pass "Q100 flows", or a flood that has a 1% probability of occurring in any given year. Replacement would require in-stream work in these streams. Work would be done during non-flow periods for intermittent streams, and engineering practices such as sediment barriers and flow bypass would minimize impacts on perennial streams. Flows in perennial streams are all expected to be less than 0.5 cubic feet per second when work occurs, based on mean August flow data from 1964 to 1991 for USGS Gage 14161100 – Blue River below Tidbits, and drainage area relationships developed between the gage site and the culvert replacement locations. This approach is reasonable since the drainage that is tributary to the Blue River gage site is geologically and climatically similar to streams where culverts are being replaced. It is not possible to do this work without some sediment delivery, and accurate estimates are not predictable. Depending on weather behavior and other variable factors, sediment yields should fall between 0.1 and 1.0 cubic yards per installation based on professional experience. Because culverts to be replaced are in poor condition or are undersized for Q100 flows, they represent an elevated risk of fill failure. Discussion with engineering personnel resulted in an average fill volume of 450 cubic yards. This material is at risk of entering the streams and potentially generating debris torrents if the existing culvert fails. Table 27 provides a summary of these replacements and the potential amount of fill material that would have a reduced risk of entering streams.

Table 27: Culvert Replacement in Perennial and Intermittent Streams in all Action Alternatives

Sub-watershed	Stream Type	# Culverts Replaced	Cu. Yd. Of Fill Stabilized
Hardy/Rebel	Intermittent	13	5,850
	Perennial	1	450
Quartz Creek	Intermittent	26	11,700
	Perennial	7	3,150
Total of Both	**All**	**47**	**21,150**

Cumulative Effects

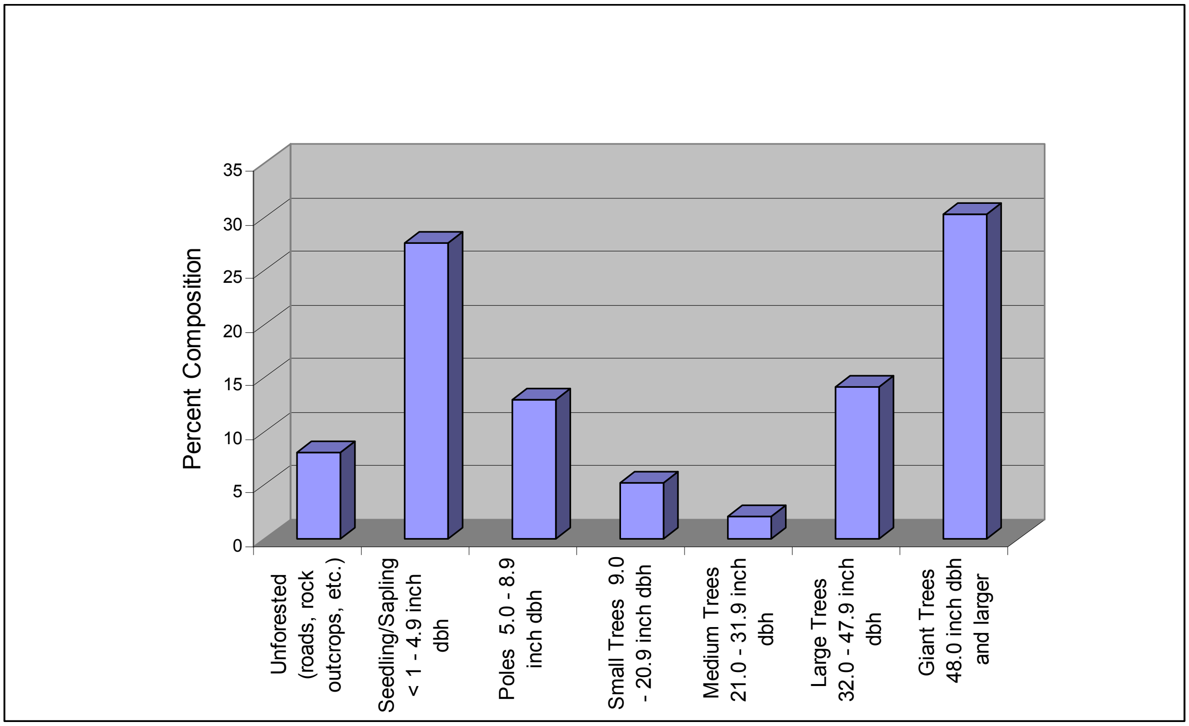
Analysis for cumulative effects is based on management activities that have or will occur within both the 6th field sub-watersheds. Management activities in the Quartz Creek and Hardy Creek/Rebel Creek sub-watersheds have influenced sediment delivery into channels in several ways. The effects and current conditions are discussed in the previous Affected Environment section. Sediment yields from erosion are expected to increase with all proposed action alternatives in each sub-watershed by less than 1%. No other future management is planned within the Hartz Project area that would contribute incrementally to the cumulative effects from past and currently proposed activities.

Effects to Aquatic Habitat: The amount and nature of sediment that is contributed to streams is an important component of the quality of aquatic habitat, and the health of the aquatic species that occupy these habitats. Additional discussion of the project effects on sediment regimes and how they relate to aquatic habitat and fisheries are presented in the sections that pertain to Aquatic Habitat and Fisheries.

Affected Environment – Woody Debris Supply

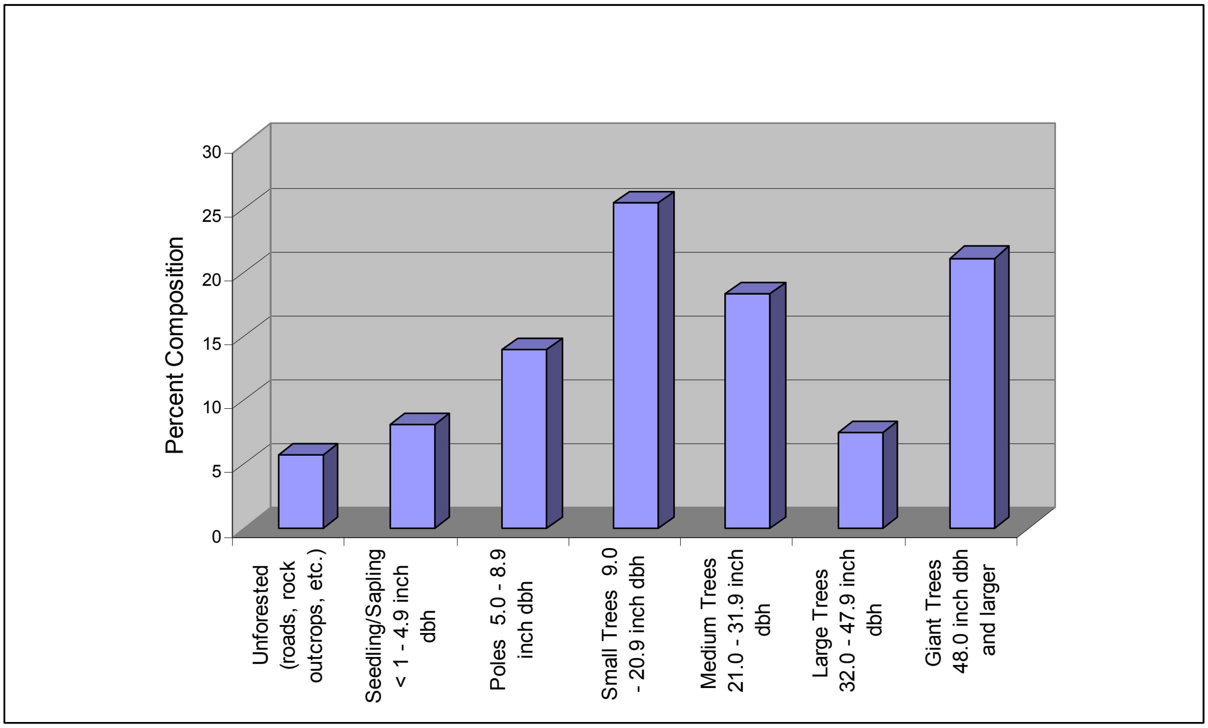
For the purpose of evaluating project effects on the supply of large woody material to aquatic habitat from riparian reserves, the existing composition of riparian reserves was examined in project area sub-watersheds. Approximately 40% of federally managed land now classified as riparian reserve has been affected by past management in the Quartz Creek Sub-watershed, and 46% in the Hardy/Rebel Creek Sub-watershed. Current riparian reserve stand composition by size class is described in the graphs in Tables 28 and 29.

Table 28: Riparian Reserve Composition Along All Stream Classes (NFS land), in the Quartz Creek 6th Field Sub-watershed.



Large woody material considered of sufficient size to be stable in-stream and positively influence aquatic habitat quality, are those greater than 24 inches in diameter at breast height (dbh). The graph in Table 28 reflects a higher than expected sapling and pole composition (1 – 8.9 inches dbh). Trees of sufficient size (greater than 24 inches dbh) are low in numbers due to the past harvest of areas now considered riparian reserve. Previously managed, even-aged riparian reserve stands are generally composed of trees less than 21 inches in diameter in Quartz Creek sub-watershed. Average tree diameters for riparian areas within the proposed units are between 10 and 15 inches dbh.

Table 29: Riparian Reserve Composition Along All Stream Classes in the Hardy Creek 6th Field Sub-watershed.



In Hardy Creek/Rebel Creek sub-watershed, unmanaged wilderness portions of the sub-watershed influence the composition described in the graph in Table 29. However, past management is evident in the abundance of trees smaller than 21” dbh. Even-aged riparian reserve stands measuring less than 21” dbh comprise about 47% of Hardy Creek/Rebel Creek sub-watershed. Average tree diameters for riparian areas within the proposed units are between 10 and 12 inches dbh.

Environmental Consequences – Woody Debris Supply

Effects of Alternative 1 (No Action)

Direct and Indirect Effects

There are no riparian reserves treated with the no action alternative. Non-treatment of riparian reserve plantations would be expected to delay tree size contribution from thinned acres as described in Table 31.

Trees currently ranging from 10.8 to 14.9 inches dbh would be expected to grow at a predictable rate (expressed in terms of diameter in Table 31) should the no action alternative be implemented. Even-aged riparian reserve trees are currently at the limit of tree vigor due to stand density. The effects of the no action alternative on aquatic habitat are a continued suppression of diameter development of even-aged riparian reserve trees. The rate of riparian reserve diameter development compared to the thinning alternatives may be expected to take an additional 40 years and is dependant upon natural thinning processes. The delay in the availability of significantly sized wood to channels adjacent to proposed units would be expected to delay the recovery of in-stream habitat dependent upon in-stream wood.

Tree mortality would be expected to increase and contribute to accelerate recruitment of a portion of riparian stands into stream channels. The aquatic benefit of small diameter trees is limited due to their reduced ability to maintain stable positions where they can store sediments and contribute to habitat development. The longevity of recruited in-stream small trees is short-lived, as small diameter stems break down through abrasion and decomposition rapidly compared to larger trees greater than 24 inches dbh. As compared to action alternatives, the no action alternative would provide a greater volume of in-stream wood in the short-term, but the wood would be of limited value to aquatic habitat quality and its presence would be of short duration. There would be no adverse effect to aquatic habitat or organisms with implementation of the no action alternative.

Effects of Alternatives 2-4

Direct and Indirect Effects

There are 148 to 155 acres of riparian reserves proposed for thinning in both Quartz Creek and Hardy/Rebel Creek sub-watersheds, depending upon the action alternative. Table 30 summarizes the percentage of riparian reserve area affected by harvest in the two project area sub-watersheds. Unit 25, which proposes thinning of 6.6 acres in riparian reserves, is not included in Alternative 3.

Table 30: Percent Riparian Reserve Acres Prescribed for Thinning

6th Field Sub-watershed	Acres of Riparian Reserves. (Federal)	Alternative 2 and 4		Alternative 3	
		Riparian Reserve Acres Thinned	Riparian Reserves Thinned Percent of Sub-watershed	Riparian Reserve Acres Thinned	Riparian Reserve Thinned Percent of Sub-watershed
Quartz Creek	2,754	100.8	3.7%	100.8	3.7%
Hardy/Rebel Creek	8,083	53.9	0.7%	47.3	0.6%

The effects of thinning riparian stands were evaluated in terms of acres of thinning and the size of trees (dbh) available to aquatic habitat in the future.

All action alternatives treat a nearly equivalent area of riparian reserves. Due to the small area of actual riparian reserve treatment in each sub-watershed (3.7% of federal land in Quartz Creek sub-watershed and 0.7% in Hardy/Rebel Creek sub-watershed), the benefit would be small in both sub-watersheds. A reduction in large wood supply would occur over the short-term adjacent to thinned riparian reserves (i.e. number of stems available to the channel over the next 40 years), but that would not adversely influence aquatic resources.

One of the expected benefits of thinning in riparian reserves is the influence on stand structure and the development of larger diameter trees, as described above. The even-age character of managed stands ranging in age from 31 to 58 years old is expected to respond favorably in terms of growth rate with thinning. Treated riparian reserve stands are expected to provide a greater degree of diversity of size in the long-term within each watershed as compared to no thinning of reserves in the no action alternative.

Table 31 summarizes existing and future stand average stem diameters associated with units where thinning occurs in riparian reserves. Trees currently ranging from 10.8 to 14.9 inches dbh are expected to have accelerated rates of height and diameter growth in response to thinning. In about 40 years, trees adjacent to streams thinned in this project would begin to approach the size considered important as in-stream sediment storage elements and to function in habitat development. The future rate of wood recruitment to channels would depend largely upon natural disturbance events such as wind-throw and snow-down, mass failure or debris torrent, flood, and fire.

Table 31: Hartz Project Riparian Reserve Thinning Effect on Tree Diameter

Unit	Existing Condition - Average Diameter at Breast Height (DBH)	DBH Following Heavy Thinning	DBH in 40 years	
			Action Alternatives 2, 3* and 4	Alternative 1, No Action
4	13.3”	16.3”	21.6”	17.7”
5	12.4”	13.8”	19.0”	17.0”
6	10.9”	12.3**	18.3”	16.8”
8	12.1”	14.9	21.1”	17.0”
9	14.5”	16.6”	23.1”	19.5”
12	10.8”	14.3”	20.0”	14.9”
15	11.9”	14.5”	21.6”	17.7”
22	11.9”	14.6	21.9”	19.9”
23	10.8”	14.2	19.6”	15.7”
25*	11.1”	12.2”	18.5”	16.2”

*Unit 25 riparian reserve thinning treatment does not occur in Alternative 3.

** Diameter (dbh) following a moderate thinning.

The quantity of important large woody material 24 inches dbh or greater available to project area channels is expected to increase through time, in part accelerated by proposed riparian reserve treatments. In-stream wood supply, identified as deficit during surveys of fish-bearing channels in the project area, would be expected to begin increasing in density. The composition of the thinned riparian reserves would be less uniform with respect to diameter as larger trees develop in response to thinning. The current deficits in large tree diameters in the two sub-watersheds would be reduced. Retaining the existing hardwood elements within the reserves would maintain stand diversity and complexity.

Large wood in streams is an important component of the quality of aquatic habitat, and the health of the aquatic species that occupy these habitats. Additional discussion of the project effects on the size and supply of large wood and how they relate to aquatic habitat and fisheries are presented below in the sections that pertain to Aquatic Habitat and Fisheries.

Cumulative Effects

Analysis for cumulative effects is based on management activities that have or will occur within both sixth field sub-watersheds. Past timber management and natural disturbances within the Quartz Creek and Hardy/Rebel Creek sub-watersheds, has resulted in the current riparian area conditions including the smaller diameter trees located within the Hartz proposed harvest units. The proposed commercial thinning would result in reduced densities, increasing the rate of growth and future of availability of large woody material for streams within the Hartz Project area. Pre-commercially thinning will also contribute to the reduction of stand densities in some of the many younger stands. No other future management is planned within the Hartz Project area that would contribute incrementally to the cumulative effects from past and currently proposed activities.`

Affected Environment – Aquatic Habitat

Existing Habitat Conditions for the Quartz Creek Sub-watershed and McKenzie River

Quartz Creek

The low gradient lower reaches of Quartz Creek are believed to have provided spawning and rearing habitat for spring chinook salmon historically, although no salmon reproduction has been documented in recent history. Based on existing salmon production in similar sized tributaries of the McKenzie River such as Gate Creek, it is likely some production occurred there when habitat conditions were nearer natural conditions. Quartz Creek is not expected to have contributed significantly to the overall McKenzie River salmon population, but habitat loss in this watershed contributes cumulatively to loss of historic salmon habitat.

Mainstem McKenzie River

A major influence on the mainstem McKenzie River channel condition in the vicinity of Quartz Creek confluence is the presence of flood control dams upstream. Cougar dam (1963) and Blue River dam (1968) have altered the flow regime and sediment supply to the mainstem McKenzie, and have cut off sediment supply from over half of the drainage area (Minear 1994). Minear also noted a reduction of large woody debris in the 1986 channel as compared to historic aerial photos from 1949, indicating a reduction in pool-forming agents and channel roughness elements. Increases in development along the McKenzie River, timber harvest, and roads have resulted in a 44% reduction in mature conifers in riparian areas, and a 45% increase in hardwoods, from levels in the 1940s.

Existing Habitat Conditions for the Hardy Creek Sub-watershed and South Fork McKenzie River

Hardy and Buoy Creek

Processes important to formation of aquatic habitat in Hardy Creek and the South Fork McKenzie River are active in this watershed, although modified by past management. The same earthflow that formed Hidden Lake continues to provide large woody material and sediment at an accelerated rate compared to typical western Cascade tributaries. Much of past timber removal in Hardy Creek watershed occurred on the face of the earthflow, which historically served as a large woody debris “conveyor belt” as Hardy Creek continues to cut the toe of the earthflow. Portions of the in-stream wood and sediment recruited into Hardy Creek migrate to the South Fork McKenzie River and serve as important elements in aquatic habitat in the South Fork McKenzie watershed. Hardy Creek’s current moderate-to-low levels of in-stream wood are not expected to reflect historic densities due to past timber harvest near channels and the presence of roads. Two species of fish have been documented in Hardy Creek (rainbow trout and cutthroat trout) and it is suspected that spring chinook juveniles rear and sub-adult and adult bull trout forage in Hardy Creek’s lower reach, near its confluence with the South Fork McKenzie River.

Buoy Creek, a fish bearing tributary to Hardy Creek, flows out of Hidden Lake for approximately 2 miles down the steep, east-facing flank of Indian Ridge. Hidden Lake is believed to provide the cutthroat trout source that continuously populates Buoy Creek. Cutthroat trout are found throughout Buoy Creek, regardless of steep channel gradient (15-18% gradients usually prohibit cutthroat trout movement and colonization from downstream). Moderate levels of in-stream wood are present in Buoy Creek, provided by a diverse stand age along its margins. Channels flowing across the ancient earthflow, such as Buoy Creek and east flowing tributaries to Hardy Creek, are continually downcutting and are generally deeply entrenched. Mass wastes along their margins are not uncommon and are a natural occurrence. Buoy Creek, east flowing tributaries across the ancient earthflow, and Hardy Creek are important natural sediment producers for channels below, including the South Fork McKenzie River. Currently, the addition of sediment in Buoy and Hardy Creeks (and the low level of in-stream wood recruitment to serve as sediment storage and a source of channel stability) has caused channel widening, aggradations, and loss of pool habitat, which is directly related to channel instability and poor quality fish habitat.

South Fork McKenzie River

Using a historic aerial photo series from 1939-1990, the South Fork Watershed Analysis team (1994) examined the reach between the current high pool reservoir-level to French Pete confluence (about 0.3 mile downstream of Hardy Creek confluence). Significant change occurred through this period, associated with removal of in-stream wood through timber salvage in South Fork McKenzie River channel conditions. The watershed analysis team found a trend of island and bar decline, side channel abandonment and in-stream wood decline. Salvage of in-stream wood was common into the 1980’s throughout the McKenzie basin, especially following flood events and accumulation and concentration of new woody material. In a 1988 stream survey of South Fork McKenzie River by Oregon State University, the South Fork reach downstream and upstream of the project area was examined. The survey occurred from the current high pool reservoir to Augusta Creek confluence, located about 4 miles upstream of Hardy Creek. This reach measured 6.7 miles long and averaged 62 feet in width. The survey found 4.3 pools/mile (12-17 pools/mile are desired in this channel type). Historic conditions available from a 1937-38 Bureau of Fisheries survey found 38.4 pools/mile in this reach. Large woody debris densities from the 1998 OSU survey found 12.0 pieces/mile ($\geq$ 24 inch diameter). Approximately 80 pieces/mile of large woody debris is desired.

Historical Management of Riparian Reserves

Historically, management activities have occurred within riparian areas adjacent to streams within the analysis area. Table 32 summarizes the acres that have been impacted by management activities such as timber harvest and road construction, and the percent of the Riparian Reserve area on National Forest System land that has been affected.

Table 32: Past Impacts to Riparian Reserves on National Forest by Sub-watershed

6th Field Sub-watershed Name (number)	Acres of Riparian Area*	Riparian Reserve Area Affected by Past Management		Percent of Riparian Reserve Area Affected
Quartz Creek (170900040501)	2,754 acres	Timber Management	1,060 acres	38.5%
		Road Construction	25.1 acres	0.9%
Totals	**2,754 acres**	**1,085 acres**		**39.4 %**
Hardy Creek/Rebel Creek (170900040304)	8,083 acres	Timber Management	3,642 acres	45.1%
		Road Construction	83.3 acres	1.0%
Totals	**8,083 acres**	**3,725 acres**		**46.1%**

*All stream classes including wetlands, lakes and reservoir

The majority of lower Quartz Creek watershed is privately owned industrial forestland, generally managed on a shorter rotation period than compared to National Forest System lands. Riparian area protections on private land are determined by Oregon Forest Practices basal area computation for residual trees along the lower 8.3 miles of Quartz Creek and lower watershed tributaries. Much of lower Quartz Creek riparian area is considered to be near early seral condition based upon visual appearance of the watershed, visible from Rd 2618. For the purposes of evaluating past, future and cumulative effects in the entire Quartz Creek 6th field watershed, harvest of trees adjacent to streams is expected to occur at a rate of about 2% of private riparian area per year (a 45-50 year rotation schedule). For a description of private land contribution to ARP used in evaluating watershed condition and peak and base flows, see the previous discussion under Stream Flows/Disturbance History.

Environmental Consequences – Aquatic Habitat

Effects of Alternatives 1 (No Action)

The no-action alternative, in combination with past, present, or foreseeable future events, is not expected to contribute adverse affects to aquatic resources through any incremental change in habitat conditions. Habitat conditions in the McKenzie River and South Fork McKenzie River necessary for ESA listed species (bull trout rearing and foraging, and spring chinook reproduction and rearing) would be expected to be maintained within and downstream of the Hartz Project area.

Effects of Alternatives 2-4

Direct and Indirect Effects

The method of timber removal, road construction and reconstruction, culvert replacement, timber haul and project mitigations were evaluated to provide the extent of potential effects to aquatic resources and are summarized in the Fisheries Biological Assessment (Appendix B), in previous sections for Aquatic and Riparian Habitat, and below.

Thinning of riparian reserve trees is not expected to adversely affect stream temperatures through reduction in canopy cover. No-cut riparian buffers would maintain shade over streams necessary to maintain stream temperatures within the range required by native aquatic animals in the project area. Affects on temperature for more distantly located listed species and their habitat is negligible with action alternatives. Aquatic habitat temperature would be maintained at the site-specific scale and larger scale (6th field).

The rate of sediment supply increase over current estimated levels is expected to be less than 1% in Alternatives 2 and 4, and less than 0.5% in Alternative 3. The net effect of road resurfacing activity is to simultaneously reduce fine sediment originating from roads when replacement of undersized and aged culverts is performed. An estimated increase in suspended sediment of 0.19 to 1.9 mg/l is anticipated during the first fall storm in Quartz Creek following culvert replacements, but it would not cause adverse effects to native aquatic species (Newcombe and MacDonald, 1991).

Risk of short-term fine sediment increase would be mitigated by following dry season operation restrictions, limiting equipment proximity to channels; requiring full suspension over perennial channels, and using existing skid trails in riparian reserves. Temporary road building within the riparian reserve would not occur. Removal of any temporary roads in the first season following timber harvest is expected to maintain water quality conditions that existed prior to timber harvest activities.

Sediment delivery volumes described in the previous Quantitative Sediment Analysis sections are mitigated by project prescriptions and use of best management practices (BMPs). BMPs and mitigation measures intended to trap fine sediments during culvert replacement are expected to minimize impacts to aquatic habitat and resources, with a minor increase in sources of suspended sediment. Concurrent to culvert replacement would be resurfacing of haul route roads. Short-term increases in fine sediment would occur on the site-specific scale from replacement of culverts and with ground disturbing activity associated with timber harvest. A less than 1% increase in fine sediment supply over background levels of sediment supply is expected to maintain habitat conditions within the needs of aquatic fauna. With the low overall volume of sediment produced in project-related activities, aquatic habitat quality would be maintained.

Mitigation methods to divert water, trap sediments and avoid mobilization of sediments are expected to minimize adverse impact to animals in the immediate vicinity of project activities where culvert replacements and reconstruction activities occur near aquatic organisms, such as the Lytle Creek culvert replacement on Rd 2618. Another mitigation measure is the requirement for dry season installation.

Cutthroat and rainbow trout are located in the immediate vicinity of Lytle Creek. Short-term adverse effects would not be of sufficient magnitude or duration to harm cutthroat or rainbow trout due to the short period required to replace the culvert and season of installation. Summer season installation would avoid the incubation period and highest organism susceptibility to fine sediment. With improved capacity of the Lytle Creek culvert, one of the long-term benefits from the replacement would be that it would function at reduced risk of catastrophic fill failure during flood disturbance.

Suspended sediments are not expected to adversely impact habitat important to spring chinook and bull trout due to low project scale and intensity, mitigation methods, and roads preparation for hauling.

A variety of activities that would be funded with KV collections are included in each of the action alternatives. These activities include mitigations that are part of the existing alternatives as well as additional restoration and improvement activities. All of these activities have been previously addressed in programmatic consultation documents for listed fish species. The activities would also normally be categorically excluded from documentation in an environmental analysis. Project Design Criteria directed by National Marine Fisheries Service and U.S. Fish and Wildlife Service would be incorporated into project design for these activities. Based on these existing restrictions, extraordinary circumstances are not anticipated and the quality of aquatic habitat would not be affected by these activities at either the project or the 6th field sub-watershed scales.

Fuels Treatments: The use of low severity fire in post-harvest treatment of Hartz project units is expected to present negligible risk to aquatic animals or habitat. Most fire treatments consist of hand- or machine piling of slash along roads and spring burning. Site conditions and springtime application (when fuel moisture is sufficient to maintain duff and soil stability) would protect aquatic resources in the project area. Potential to increase nutrient levels phosphorous and nitrate to channels increases with use of fire, however the level of nutrient delivery would not exceed the range of conditions provided during historic fire disturbance. Aquatic species have adapted to a more frequent fire disturbance regime than is currently provided in a managed forest landscape. Removal of duff through burning and exposure of soil to mobilization with precipitation is of very low risk. The potential to adversely affect aquatic biota or habitat is negligible; due to the distance fire is maintained from the channel and low intensity of fire used in unit treatment (springtime use of fire in post-timber harvest stands).

Project effects are expected to be of short duration during the season of implementation. No adverse affects on the aquatic resources are expected within the Hartz Project area, or in Quartz Creek or Hardy/Rebel Creek 6th field sub-watersheds, from implementation of any action alternative.

Cumulative Effects

The scale of cumulative effects on aquatic habitat and aquatic fauna is the 6th field sub-watershed. The rationale for conducting analysis at this scale is to address potential project effects on habitat of importance to various life history stages of ESA listed species (proposed Critical Habitat for spring chinook salmon including spawning, rearing and migratory habitat; and rearing and foraging habitat for bull trout). The 6th field scale is also suitable to evaluate potential project effects on Management Indicator Species (rainbow trout, cutthroat trout, spring chinook).

Considered cumulatively, management activities are not expected to cause adverse incremental changes to aquatic resources in any of the following areas of measurement:

The timing or magnitude of peak flow events:

Planning sub-drainage ARP levels remain above the Willamette Forest Plan recommended levels with action alternatives. The flow regime necessary to sustain native aquatic resources would remain within the range of conditions necessary for native aquatic resources.

Stream temperature and instability of stream banks:

Thinning of stream adjacent vegetation would maintain a no-harvest buffer, sufficient to maintain stream temperature and stream bank stability in action alternatives. Negligible change in stream temperature and maintenance of stream bank stability is expected maintain conditions essential to aquatic resources.

The supply of sediment to channels:

Action alternatives would result in a slight increase in sediment input in project area sub-watersheds as described in the water quality analysis. A less than 1% increase (Alternative 2 and 4) or less than 0.5% increase (Alternative 3) in sediment supply would not be expected to adversely increment this indicator. The expected sediment increase (the first fall storm following culvert replacements) is of short duration and within the tolerance of native organisms to sustain or avoid the sediment increase. The range of conditions necessary for aquatic resources in the Hartz Project area and sub-watersheds is maintained by action alternatives.

Sediment storage and structure in channels:

A temporary decrease in available large wood recruitment supply from thinned riparian reserve units is expected with action alternatives. The size of wood available within the next 40 years is considered too small to be of significant value, and therefore the temporary decrease is insignificant in effect. The composition of potential wood is expected to be significant in 40+ years, and trees available to channels from thinned riparian reserves would fill a deficiency currently present in riparian reserve stands and in-stream. The magnitude of action alternative effects is considered small, due to the small area of riparian reserve thinning in each sub-watershed. An improving condition for aquatic resources is anticipated in the long-term as a result of action alternatives.

Conclusion:

In combination with present, past or foreseeable future management events, none of the action alternatives is expected to contribute to adverse effects to aquatic resources through incremental change in habitat conditions. Habitat conditions necessary for ESA listed species (bull trout rearing and foraging, and spring chinook reproduction and rearing) in the McKenzie River and

South Fork McKenzie River would be expected to be maintained within and downstream of the Hartz Project area.

Affected Environment – Fisheries

Listed Species and Management Indicator Species

Listed species inhabiting the project area are spring chinook salmon (Oncorhynchus tshawytcha) and bull trout (Salvelinus confluentus). Both species are listed as threatened and are protected under the Endangered Species Act. Listed species distribution, habitat requirements and existing habitat conditions are described in detail in Appendix B; Fisheries Biological Assessment. In addition to ESA-listed fish species inhabiting the project area, native aquatic species in the project area are described below.

Species commonly angled for are considered Management Indicator Species. One of the listed species (spring chinook salmon) is also considered a Management Indicator Species. In the McKenzie River, South Fork McKenzie River and tributaries in the project area, the Management Indicator Species are spring chinook salmon, rainbow trout, and cutthroat trout.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires the identification of habitat essential to conserve and enhance the federal fishery resources that are fished commercially. The Pacific Fishery Management Council (PFMC) designated Essential Fish Habitat (EFH) for chinook, coho, and Puget Sound pink salmon in their Amendment 14 to the Pacific Coast Salmon Plan, issued September 27, 2000. The interim final rule implementing the EFH provision of the MSA (62 FR 66531) requires federal agencies to consult with the NOAA Fisheries Service for any action that may adversely affect EFH.
The Hartz project is located in the middle McKenzie River sub-basin, adjacent to the McKenzie River channel listed as EFH for spring chinook salmon and upstream of the South Fork McKenzie River below Cougar Dam, which is listed as EFH for spring chinook salmon. The South Fork McKenzie River above Cougar Dam is not listed as EFH for spring chinook salmon.

Native Fish Distribution and Habitat Requirements

Mountain whitefish (*Prosopium wouldiamsoni*) are present in the mainstem McKenzie River and South Fork McKenzie River, utilizing the larger channels for most of their life history. Whitefish, a member of the *Salmonidae* family, spawn as temperatures decline in fall, when water temperatures are between 4.5 and 10 degrees Celsius. Adhesive eggs are broadcast over clean gravels of riffles and runs. Emerging whitefish fry drift downstream until suitable rearing habitat is encountered, primarily shallow backwaters and margins of low velocity less than 10 inches deep.

Native **rainbow trout** (*Oncorhynchus mykiss*) with distribution similar to whitefish, are river dwelling in the mainstem McKenzie River, South Fork McKenzie River and larger tributaries. The extent of their range following completion of the Cougar Dam is known to include the South Fork McKenzie River above Cougar Reservoir. Currently, ODFW stocks a fall spawning strain of rainbow in the McKenzie River from Forest Glen downstream (adjacent to the town of Blue River). Rainbow trout are no longer stocked in the South Fork McKenzie River. Native rainbow trout are spring spawning and require cold-water temperatures and clean substrates low in fine sediment. Native rainbow trout spawn in the spring between February and June, depending upon water temperature and elevation. Many rainbow trout prefer tributaries as spawning habitat and juveniles would remain a year or more in the natal stream before descending to the larger river to reach adulthood. In the project area, Quartz Creek and Hardy Creek are large tributaries preferred as spawning and rearing habitat by rainbow trout.

Native **coastal cutthroat trout** (*Oncorhynchus clarki clarki*) are the most widely distributed fish in the project area, present in the McKenzie River, South Fork and in numerous perennial streams in and near the project area. Several life history forms of coastal cutthroat exist, but the river/stream (fluvial) type that inhabits rivers and streams and remains resident is the only type known in the McKenzie River sub-basin. Like all native salmonids in the McKenzie River sub-basin, the coastal cutthroat trout require cold-water temperatures and clean substrates low in fine sediment as spawning habitat. Native cutthroat trout spawn in the late winter or early spring with fry emerging in spring or summer. Residents of small tributaries, sometimes ranging into the headwaters, may spend their entire life in a short segment of stream. Other cutthroat residents would live their adult life in a larger channel such as the McKenzie, South Fork McKenzie, or Quartz Creek and only enter tributaries to reproduce or seek refuge during flood disturbance.

Environmental Consequences – Fisheries

Effects of All Alternatives

Endangered Species Act (ESA) Listed Species and Proposed Critical Habitat

The ESA effects determination and rationale is described in detail in Appendix B, Fisheries Biological Assessment. The project is located in close proximity to Proposed Critical Habitat for spring chinook salmon in the South Fork McKenzie River, and Quartz Creek watersheds, and assessment of project effects on population, habitat and non-habitat indicators were evaluated to determine project effects on listed species. Though some project activities would have localized and minor negative effects at the project level scale, the effects to habitat occupied by spring chinook salmon (including Proposed Critical Habitat for spring chinook) and bull trout are considered to be either insignificant or discountable, primarily due to project design to minimize negative effects to all aquatic species and their habitat. As effects were found to be either insignificant or discountable, the effects determination is described as **Not Likely to Adversely Affect** listed species, bull trout and spring chinook salmon.

Management Indicator Species

Although some project activities would have localized and minor negative effects at the project scale, the effects to habitat occupied by native species considered Management Indicator Species (species commonly fished such as spring chinook salmon, rainbow trout, and cutthroat trout) are insignificant and are not expected to have an adverse effect on MIS species. With mitigation measures and design measures included, the Hartz Project can be expected to maintain MIS species and habitat in the short-term and have a beneficial influence on MIS habitat in the long-term as thinned riparian reserve stands begin contributing to in-stream habitat.

Magnuson-Stevens Fishery Conservation and Management Act

The proposed action is not likely to adversely affect aquatic systems, recreational fisheries, or designated Essential Fish Habitat. The effects that are likely to occur are based on sound aquatic conservation and restoration principles for the benefit of recreational fisheries, as directed by Executive Order #12962. Since the project is not likely to adversely affect EFH, no further consultation under the Magnuson-Stevens Fishery Conservation and Management Act is required.

Stand Health and Vigor

Affected Environment

The Hartz Young Stand Management Project area has many overstocked stands, most of which are managed stands, planted after regeneration harvests occurred in the 1950s through 1980s. These stands were planted at levels intended to be reduced over time by pre-commercial and commercial thinning, with final regeneration harvests occurring when the stands reached certain ages or stand density levels.

Riparian reserves located within the Hartz Project area were clearcut and planted under the same circumstances and with the same objectives as the rest of the managed stands. Current management objectives for riparian reserves, however, include creating late-successional characteristics over time with no regeneration harvests expected to occur. According to a study in the Oregon coast range by Tappeiner and colleagues (Tappeiner et. al. 1997), current tree densities within riparian reserves, as well as within the rest of the stands, are much higher than old-growth forests may have initially developed from.

Stands exams were completed in the Hartz Project area in 2003 and 2004. The data indicates that the maximum Stand Density Index is at the level at which thinning should occur in order to maintain overall stand growth and vigor. For maximizing overall stand growth the maximum SDI should be between 35% and 60%. Stands are managed below 25% to maximize mean tree growth. Stands proposed for harvest treatment average 50%, the level at which maximum stand production occurs and individual tree vigor begins to decline (Long, 1985).

There are about 200 to 250 overstory trees per acre in most of the stands with average diameters of about 11 to 14 inches dbh. Douglas-fir is the primary tree species for most, although some stands also have a few western hemlock and other shade tolerant species. Understory regeneration consists of some Douglas-fir, but mainly of shade tolerant species.

Most of the stands have canopy closures above 80%. Scattered openings exist within most stands as in root rot pockets or as special habitat openings, such as rock outcrops. The root rot pockets include armillaria root disease (*Armillaria ostoyae*) and or laminated root rot (*Phellinus weirii*), both of which are common on the McKenzie River Ranger District and are often associated with insects such as bark beetles.

Environmental Consequences

The current condition of the stands, including SDI, and stand development, was modeled using the Westside Cascades variant of the Forest Vegetation Simulator (FVS) (Wykoff, et al. 1982). The information was used for the effects analysis discussion for each alternative that follows:

Effects of Alternative 1(No Action)

Direct and Indirect Effects

Under Alternative 1, stands would continue to grow at increasingly high densities. When stands exceed maximum SDI of 60%, self-thinning through individual tree mortality would occur. The scattered mortality of individual trees leaves openings that would be quickly replaced through growth of residual trees. The canopy covers, therefore, are expected to remain high at 80% or above resulting in little to no understory development. In the absence of thinning, the suppression of most understory regeneration and shrub communities can be expected (Bailey and Tappeiner, no date).

With no thinning, trees in the stands may become more susceptible to disease and insects as they become weaker from competing for limited resources. Any insect and disease areas that already exist may spread quicker and further with increased tree stress and weakness.

Effects of Alternatives 2-4

Direct and Indirect effects

Moderate Commercial Thinning:

Moderate thinning of units, including the riparian reserves, would maintain or improve overall stand growth and vigor by reducing competition for limiting resources such as light, water, and soil nutrients (see Silviculture Prescriptions and Riparian Reserve Management, pages 41 through 44). Reduced stand densities and competition allows the residual trees to maintain a higher growth rate than would occur with no thinning. Table 33 compares no treatment of units 9 and 23, with a moderate commercial thinning that leaves about 90 trees per acre. Average growth over time is shown for remaining trees 7 inches dbh and greater, assuming no future treatments. The initial average dbh is greater after thinning because of the removal of smaller trees:

Table 33: Growth Comparison of No Thinning vs. Moderate Thinning in Units 9 and 23.

No Thinning				Moderate Thinning			
Year	Avg. dbh (Inches)	Avg. Growth (In/Decade)	Avg. Ht (Feet)	Year	Avg. dbh (Inches)	Avg. Growth (In/Decade)	Avg. Ht (Feet)
Unit 9				Unit 9			
2004	14.5	1.61	92	2004	14.5 / *16.3	1.61	92
2014	15.9	1.22	106	2014	18.1	1.48	115
2024	17.2	1.09	117	2024	19.7	1.35	127
2034	18.4	0.97	125	2034	21.1	1.21	138
2044	19.5	0.87	132	2044	22.4	1.14	147
Unit 23				Unit 23			
2004	10.8	2.07	72	2004	10.8 /*13.4	2.07	72
2014	12.3	1.39	82	2014	15.2	1.59	94
2024	13.6	1.13	92	2024	16.8	1.37	104
2034	14.7	0.92	100	2034	18.3	1.29	113
2044	15.7	0.87	107	2044	19.6	1.13	121

*Average dbh after thinning.

Over time, the average growth rates (inches/decade) would continue to decline for both units in both projections. However, the moderate thinning maintains a higher rate than no thinning. The average diameters and heights would increase over time for both the no thinning and the moderate thinning, however the moderate thinning would develop larger trees faster than not thinning the stand.

Reduced stand densities and greater diameter growth of residual trees would increase their stability making them more resistant to windthrow as they mature. The residual trees should also be less susceptible to some root diseases such as armillaria spp. and associated insects. Resistant and tolerant tree species that may be planted within identified laminated root rot pockets should have a higher chance of survival than would the Douglas-fir.

Moderate thinning would create openings in the canopy allowing for the release of some existing understory trees and shrubs. The canopy closures would be opened up to 40 to 50%, also providing opportunity for the establishment new vegetation and shade tolerant tree seedlings. These openings would therefore, enhance structural diversity throughout the stands as would the future creation of snags and large down wood.

The overstory would remain primarily Douglas-fir and as it responds to the openings with increase crown growth, eventually suppressing the understory vegetation. Increasing canopy closure and Stand Density Index would require that stands be commercial-thinned again in approximately 15 to 20 years. The future thinning would maintain growth of residual trees as well as to further the growth and development of the conifer regeneration and other understory vegetation.

Heavy Commercial Thinning:

Heavy thinning provides many of the same effects as moderate thinning, except that the average growth would be slightly accelerated as shown in the following table.

Table 34: Growth Comparison of Moderate Thinning vs. Heavy Thinning in Units 9 and 23

Moderate Thinning				Heavy Thinning			
Year	Avg. dbh (Inches)	Avg. Growth (In./Decade)	Avg. Ht. (Feet)	Year	Avg. dbh (Inches)	Avg. Growth (In./Decade)	Avg. Ht. (Feet)
Unit 9				Unit 9			
2004	14.5 / *16.3	1.61	92	2004	14.5 /*16.6	1.61	92
2014	18.1	1.48	115	2014	18.5	1.54	115
2024	19.7	1.35	127	2024	20.1	1.43	128
2034	21.1	1.21	138	2034	21.7	1.30	139
2044	22.4	1.14	147	2044	23.1	1.22	149
Unit 23				Unit 23			
2004	10.8 /*13.4	2.07	72	2004	10.8 /*14.2	2.07	72
2014	15.2	1.59	94	2014	16.0	1.59	95
2024	16.8	1.37	104	2024	17.6	1.41	105
2034	18.3	1.29	113	2034	19.1	1.27	114
2044	19.6	1.13	121	2044	20.6	1.31	122

*Average dbh after thinning.

Evidence from studies such as in the Young Stand Diversity Study, have shown similar results with thinning treatments. Heavy thinning would increase diameter growth where residual stand densities are lower, compared to most conventional thinning. With continuing growth trends, development of large diameter trees would occur faster heavily thinned stands (Beggs, 2004).

As with the moderate thinning, residual trees would have increased stability over time making them more resistant to windthrow. However, the heavier thinning could possibly make the residual trees more susceptible to windthrow initially (Garmen, et al. 2003).

The overall spacing would be wider with the heavier thinning than the moderate thinning, creating larger openings within the stands. The wider openings would provide more opportunity for the release of existing understory vegetation. The canopy closures would be opened up to 30% to 40%, which would provide more sunlight for the establishment of a few new shade intolerant tree species as well as shade tolerant species. More natural regeneration would be expected than with the moderate thinning. Greater thinning intensities (with greater amounts of wood removed) create more microsites for seedling establishment over a longer time period according to a study conducted in stands in western Oregon (Bailey and Tappeiner, no date). The overstory would remain primarily Douglas-fir with canopy closures increasing over time as they respond with the growth and expansion of their crowns. The heavier thinning treatment would generally allow for a longer time period before another commercial thinning treatment is needed. Canopy closure and SDI levels would probably increase to a point where another thinning is needed in approximately 40 or more years.

Regeneration Harvest:

Clearcutting, with each alternative, removes of most of the standing trees. Mortality of some of the residuals is expected during broadcast burning.

The structural diversity would be improved over time as the established regeneration grows into a new stand of young trees. The planted trees would be a variety of species and not exclusively Douglas-fir. Various species of shrubs, herbs, and other plants would come in after harvest and exist until the trees have grown tall enough to suppress their growth. Snags and large down wood would be created following harvest and exist in scattered areas throughout the stands. GTRs would also add to structural diversity within the stands. Riparian reserves would be commercially thinned to a minimum 40%- 50% canopy closure providing larger, healthier trees over time as well as contribute to overall stand diversity.

Effects of All Action Alternatives

All action alternatives for this project include a variety of harvesting strategies over the landscape. They each provide a mix of heavy thinning, moderate thinning, and with Alternatives 2 and 4, regeneration harvest. All the action alternatives help develop healthier, more diverse forests with larger, more vigorous trees.

Alternative 2 provides the most overall variety of densities within the project area due to the more equal distribution of all types of harvesting treatments. Alternative 3 has the most moderate thinning, allowing for more opportunities for future harvests and future treatment options within the stands. Alternative 4, having the greatest amount of heavy thinning and most regeneration harvest, may require less future commercial thinning entries for maintaining growth.

Cumulative Effects

Analysis for cumulative effects is based on management activities that have or will occur within identified stands in the Hartz Project area. The project area was determined to be sufficient for analysis because effects to stand health and vigor are the result of activities or disturbances occurring only within the stands.

Past timber management and natural disturbances within the Hartz Project area has resulted in the current stand conditions including the high stocking levels in the identified stands. The proposed actions would result in reduced stand densities, improving overall stand health and vigor. Pre-commercially thinning will also contribute to the reduction of stand densities in some of the many younger stands. No other future management is planned within the Hartz Project area that would contribute incrementally to the cumulative effects from past and currently proposed activities.

Distribution and Amount of Early Seral Stands

Affected Environment

The Hartz project area consists of a variety of age classes resulting from past fire, fire suppression, and timber harvest. However, the project area is currently lacking early seral stands that are less than 10 years old. These very young stands are important for maintaining a diversity of habitat conditions over a landscape. Young, early seral stands provide habitat for various plant and wildlife species such as forage habitat for deer and elk.

Past timber harvest within the project area includes approximately 448 acres of regeneration harvest in the past 14 years with a total of 9,635 acres of managed stands (see Table 1, Chapter 1). Currently, there are 108 acres of stands that are less than 10 years old and all are within the Hardy Creek/Rebel Creek subwatershed. The current seral stage distribution based on diameter at breast height (dbh) and age are shown in Table 35:

Table 35: Seral Stages Distribution

Seral Stage	Percent of Project Area	Acres	Approximate dbh (Inches)	Approximate Age (Years)
Early Seral	17	3,428	< 5	0-25
Mid Seral	31	6,176	5-21	26-100
Late Seral	49	9,869	>21	>101
Non-Forest	3	521	N/A	N/A
Total	100	19,994		

Early seral stands are single layered stands dominated by seedlings that are in stand initiation stage of stand development (Oliver and Larson, 1996). Average diameters usually are less than 5 inches dbh, and the trees less than 25 years old. Although 19% of the project area is considered early seral, most are greater than 15 years old.

The private land located in the Quartz Creek watershed north of the project area, currently has early, mid, and possibly some late seral stands. Approximately half of these lands may be in early seral condition, including stands that are less than 10 years old, if the stands are being managed for timber on a 40 or 50-year rotation.

Environmental Consequences

Effects of Alternative 1(No Action)

Direct and Indirect Effects

Under Alternative 1, current seral stand conditions in the project area would continue to develop under existing processes and rates of development. In the short term, overall diversity on the landscape would remain as it is. However, as the stands grow, the amount and distribution of seral stands would change. There would be an increase in the amount of mid seral forests, while the amount of early seral stands would decrease. Most early seral stands would be considered mid seral in about 10 years. As a result, the overall landscape diversity would be further reduced, to consist mainly of mid and late seral forests.

Effects of Alternative 2

Direct and Indirect Effects

Alternative 2 would create 84 acres of early seral stands. The 84 acres would be distributed between the two watersheds, with 26 acres located in the Quartz Creek sub-watershed near the private land boundary. The other 58 acres of early seral stands would be located within the Hardy Creek sub-watershed. Added to the current 3,428 acres, it would not increase the overall percentage for the project area, but it would create more stands that are less than 10 years old. The existing 108 acres of young stands and the 84 acres of new young stands would provide additional landscape and habitat diversity for 5 to 10 years while remaining early seral for about 20 to 25 years. The majority of the existing early seral stands will continue to grow over time and would be considered mid seral in about 10 years. As a result, overall landscape diversity would be reduced, and consist mainly mid and late seral forests.

Cumulative Effects

Analysis for cumulative effects is based on management actions that have or will occur within the Hartz Project area. The project area was determined to be sufficient for analysis because habitat diversity based on seral stage distribution can be measured at any scale. The Hartz Project area was chosen as the landscape to measure habitat diversity because that is the area where management activities are proposed and would result in measurable changes. Activities occurring on adjacent private lands are not included for measurement since seral stage information is unknown; however, distribution of proposed harvest in relation to private land was analyzed.

Cumulative effects to the landscape would include past disturbances that have helped create the current seral stage distribution shown in Table 35. Alternative 2 would increase the amount early seral stands to 3,512 acres, and stands less than 10 years old from 108 to 192 acres. The future prescribed burning of a 17-acre unit would increase the acres of stands less than 10 years old to 209 acres. Current and future timber harvesting on private land is expected to continue, maintaining about half of private lands in the early seral stage.

The cumulative effect on the distribution and amount of early seral stands within the Hartz project area would be of a relatively small increase of early seral stands created (less than 1%). The increased habitat diversity would be greater in the Hardy Creek sub-watershed where fewer stands less than 10 years old exist. The 26 acres in the Quartz Creek sub-watershed are near the private land boundary where young stands do exist and there is less need for early seral habitat. The effects would be short term, with continued growth of the stands and their eventual change to mid seral forest. No other future management is planned within the Hartz Project area that would add incrementally to the cumulative effects of the past timber harvesting, and the currently proposed activities.

Effects of Alternative 3

Direct and Indirect Effects

Alternative 3 would not create any early seral stands. The current 3,428 acres, including 108 acres of stands less than 10 years old, would remain for the project area. The overall landscape diversity would remain as it is. As the stands grow however, the amounts and distribution of current seral stands would change. There would be an increase in the amount of mid seral forests, while the amount of early seral stands would decrease. Most early seral stands would be considered mid seral in about 10 years. As a result, the overall landscape diversity would be further reduced consisting of mainly mid and late seral forests.

Cumulative Effects

With Alternative 3, there are no current or future management actions planned within the Hartz Project area that would contribute incrementally to the cumulative effects from past timber harvest and the resulting seral stage distribution.

Effects of Alternative 4

Direct and Indirect Effects

Alternative 4 would create 143 acres of early seral stands less than 10 years old. Added to the current 3,428 acres it would total 3,571 acres, which would slightly increase the percentage for the landscape to about 18%. The 143 acres would be distributed between the two watersheds with 85 acres located in the Quartz Creek sub-watershed near the private land boundary, and the other 58 acres located within the Hardy Creek sub-watershed. The existing 108 acres of young stands and the 143 acres of new young stands would provide additional landscape and habitat diversity for 5 to 10 years, but remain in the early seral stage for a total of another 20 to 25 years. The majority of the existing early seral stands will continue to grow over time, and would be considered mid seral in about 10 years. As a result, the overall landscape diversity would be reduced, and would consist of mainly mid and late seral forests.

Cumulative Effects

Alternative 4 would increase the amount early seral stands to 3,571 acres, and stands less than 10 years old from 108 to 251 acres. The future prescribed burning of a 17-acre unit would increase the acres of stands less than 10 years old to 268 acres. The overall percentage for the landscape would be increased to about 18%. Current and future timber harvesting on private land is expected to continue, maintaining about half of private lands in early seral stages.

The cumulative effect on the distribution and amount of early seral stands within the Hartz Project area would be a relatively small increase of early seral stands resulting in improved habitat diversity. The increased diversity would be greater in the Hardy Creek sub-watershed where fewer stands less than 10 years old exist. The 85 acres that would be in the Quartz Creek sub-watershed are all near the private land boundary where young stands do exist and there is less need for early seral habitat. The effects would be short term, with continued growth of the stands and their eventual change to mid seral forest. No other future management is planned within the Hartz Project area that would contribute incrementally to the cumulative effects from past timber harvest and currently proposed activities.

Threatened Northern Spotted Owl

Affected Environment

The northern spotted owl is considered a management indicator species, or MIS, for old growth habitat (USDA 1990, p. IV-160). Past surveys for spotted owls have documented seven northern spotted owl activity centers within 1.2 miles of the Hartz Project. All of the owl activity centers have established 100-acre late successional reserves surrounding them. Though portions of the planning area do fall within Critical Habitat for the Northern Spotted Owl, as well as the Fall Creek Late Successional Reserve, none of the proposed harvest units are within these designations.

Loss and fragmentation of suitable spotted owl and other interior forest species habitat in this planning area have had detrimental effects on existing spotted owls and other interior forest-dependent species. Fragmented habitat increases flight distance and energy consumption for foraging, and increases habitat suitability for predatory and competitive owls such as the Great Horned and Barred owls. This may increase spotted owl mortality, especially for juveniles.

The U.S. Fish and Wildlife Service has determined that reduction of suitable spotted owl habitat below 40% of the median home-range (1,182 acres) has a notably higher likelihood of leading to disruption of essential breeding, feeding, and sheltering behaviors (USDI, 1990). A 1.2-mile radius around the activity centers defines the median home range.

Stands being proposed for thinning in the Hartz Project consist of previously clearcut 35-45 year old plantations, and do not meet the characteristics of northern spotted owl suitable habitat. The late-successional habitat in the Hartz Planning area surrounding proposed thinning stands is suitable spotted owl habitat by varying degrees:

- Suitable habitat is defined as nesting, roosting, and foraging habitat.
- Dispersal habitat contains foraging and dispersal habitat characteristics.

Suitable spotted owl habitat has been defined in various documents: ISC Report, USFWS Critical Habitat Determination, Memorandum Decision and Injunction for Judge Dwyer's Decision, and the FSEIS. General guidelines for suitable spotted owl habitat are Douglas-fir, Western hemlock, Western red cedar, or Ponderosa pine older than 200 years and having a moderate to high canopy closure of 60-80%. An understory of multi-layered conifers and hardwoods open enough to still allow owls to fly within and beneath it, moderate to high snag densities, and large logs are also found in typical spotted owl habitat. However, all of the above characteristics do not need to be present for spotted owls to make use of an area, and for habitat to be determined suitable.

Dispersal habitat typically would not have the large, old-growth nest trees, multi-layered canopy, or many large snags and logs. The minimum canopy closure for dispersal habitat is 40%.

Past logging on both federal and private land in the Quartz and Hardy Creek drainages has removed many acres of spotted owl habitat. Remaining suitable habitat in both drainages, but particularly in the Quartz Creek drainage, is now highly fragmented, lowering the overall quality of habitat on the landscape. Hundreds of acres of these previously logged stands have re-grown and are now providing low quality dispersal habitat conditions. Stands that have not been commercially thinned are relatively densely stocked, making flight and dispersal for spotted owls difficult.

Environmental Consequences

Effects of Alternative 1(No Action)

Direct and Indirect Effects

Under this alternative, no changes to spotted owl breeding or dispersal habitat would occur. Forest stands in the area would continue to grow following natural successional pathways. Trees would thin out naturally over a span of several decades, and may reach low quality spotted owl foraging habitat suitability in approximately 50 or more years. Due to the previous clearcuts and relatively tight spacing in plantations, trees would grow slower in diameter than if thinning were to occur. Self-thinning would take place over time mostly due to tree competition, some windthrow, and possibly root rot over time. Habitat conditions for the spotted owl prey base would not be optimal due to a lack of snags. The lack of medium and large down wood would also not provide optimum prey base conditions. Down wood would be provided as tree mortality occurs.

Effects of Alternative 2-4

Direct and Indirect Effects

The Hartz Project would not modify existing suitable spotted owl habitat, which consists of nesting, roosting, and foraging habitat. Dispersal habitat would be thinned in Alternatives 2, 3, and 4 as shown in the table below. Dispersal habitat would be downgraded or removed. The following definitions apply to these terms:

- Downgraded: Dispersal habitat that is moderately thinned and still retains a minimum of 40% average canopy closure.
- Removed: Dispersal habitat that is thinned below 40% canopy closure with a heavy thinning, or regeneration harvest that maintains 15% of the original stand acres.

Table 36: Spotted Owl Dispersal Habitat Removed or Downgraded by Alternative

	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4
Acres removed - 15% of Stand Acres Remaining (regeneration harvest)	0	84	0	143
Acres Removed - <40% canopy closure (heavy thinning)	0	432	307	513
Acres Downgraded - >40% canopy – remains dispersal habitat (moderate thinning)	0	190	341	50

The amount of spotted owl dispersal habitat would be reduced in the short-term in the McKenzie River/Quartz Creek and South Fork McKenzie Watersheds, with the implementation of alternatives 2 - 4. However, in the long-term, the heavily and moderately thinned units would provide improved spotted owl dispersal habitat and benefits to their prey base, up until the time when they may be thinned again. Thinning of dispersal habitat is judged to pose a relatively low risk to spotted owls compared to thinning or removal of suitable habitat. The overall effects and risk of this project on individual owl pairs is judged to be low. This project would provide positive benefits to spotted owls after ten or more years, and especially after several decades. Effects are in compliance with Standards and Guidelines from the Willamette National Forest Plan and U.S. Fish and Wildlife Service guidance. All sites at risk from noise disturbance would be protected with seasonal restrictions.

Spotted owl dispersal habitat is generally analyzed at the quarter township level. Adequate dispersal habitat is believed to be provided if at least 50% of the quarter township meets the minimum stand diameters of 11inches dbh and canopy closure of 40%. The results of the 11-40 analyses are displayed in a table in Appendix C. Of the seven quarter-townships that the Hartz Project area falls within, four are currently below the 50% level for dispersal habitat. Thinning of Hartz stands would further reduce dispersal habitat levels within two quarter-townships for several years until canopy closure grows back in. This timeframe is estimated to be approximately 7 to 8 years for moderately thinned stands remaining at 40-50% canopy closure, and approximately 10 years for heavily thinned stands that would remain at 30-40% canopy closure.

Alternatives 2-4 would not affect suitable nesting, roosting, or foraging habitat. None of the proposed thinning units are located in Critical Habitat or within Late Successional Reserves.

Formal and informal consultation with the U.S. Fish & Wildlife Service for effects to the northern spotted owl was initiated in 2004 for FY2005/2006 Habitat Modification Projects in the Willamette Province. A Biological Opinion was received on April 4, 2005 [FWS *reference*: 1-7-05-F-0228]. This Biological Opinion concludes the finding of no jeopardy and no adverse modification of critical habitat. The Hartz project may affect, but is not likely to adversely affect the northern spotted owl. Seasonal restrictions would be required to comply with the Biological Opinion.

Effects of Alternative 2

Direct and Indirect Effects

No occupied breeding habitat would be altered with this alternative. With this alternative, 622 acres of dispersal habitat would be thinned. Heavy thinning would occur on 432 acres and moderate thinning on 190 acres. Moderately thinned stands would remain low quality dispersal habitat with residual canopy covers of 40% to 50%. The quality of habitat should improve with an increase in canopy cover in approximately seven to eight years. The heavy thinning would result in canopy covers that are too open for suitable dispersal habitat and recovery would be expected to occur in approximately 10 to 15 years. In the long-term, this type of forest thinning would increase plant species diversity and potential use of these forest stands that are not currently considered to be suitable for nesting, roosting, and foraging. Heavily thinned stands would show slightly more vertical layering and slightly increased levels of understory vegetation compared to moderately thinned stands.

Planned snag and log creation would improve future spotted owl habitat and prey base conditions. Four dimensional snag creation methods include a variety of treatment heights, diameters, both scattered and clumped distribution, and use of multiple snag creation methods. These thinned stands would reach low quality foraging habitat conditions in approximately 40 or more years.

Two additional units totaling 84 acres would be harvested with a regeneration prescription, removing the current dispersal habitat. These areas are expected to grow back into dispersal habitat in approximately 40 years.

Effects of Alternative 3

Direct and Indirect Effects

No occupied breeding habitat would be altered with this alternative. With this alternative, 648 acres of dispersal habitat would be thinned. Heavy thinning would occur on 307 acres and moderate thinning on 341 acres. Moderately thinned stands would remain low quality dispersal habitat with residual canopy covers of 40% to 50%. The quality of habitat should improve with an increase in canopy cover in approximately seven to eight years. The heavy thinning would result in a canopy covers that would be too open for suitable dispersal habitat, and recovery would be expected to occur in approximately 10 to 15 years. In the long-term, this type of forest thinning would increase plant species diversity and potential use of these forest stands that are not currently considered to be suitable for nesting, roosting, and foraging. Heavily thinned stands would show slightly more vertical layering and slightly increased levels of understory vegetation compared to moderately thinned stands.

Planned snag and log creation would improve future spotted owl habitat and prey base conditions. Four dimensional snag creation methods include a variety of treatment heights, diameters, both scattered and clumped distribution, and use of multiple snag creation methods. These thinned stands would reach low quality foraging habitat conditions in approximately 40 or more years.

Effects of Alternative 4

Direct and Indirect Effects

No occupied breeding habitat would be altered with this alternative. With this alternative, 706 acres of dispersal habitat would be thinned. This alternative heavily thins more acres than other alternatives, resulting in increased possible short-term negative effects to the northern spotted owl. However, in the long-term, heavy thinning on more acres may benefit future growth of spotted owl habitat because they would show more vertical layering and slightly increased levels of understory vegetation compared to moderately thinned stands. Heavy thinning would occur on 513 acres and moderate thinning on 50 acres. Moderately thinned stands would remain low quality dispersal habitat with residual canopy covers of 40% to 50%. The quality of habitat should improve with an increase in canopy cover over a short period of time. Canopy recovery in the heavily thinned stands would be expected to take approximately 10 to15 years.

Planned snag and log creation would improve future spotted owl habitat and prey base conditions. Four dimensional snag creation methods include a variety of treatment heights, diameters, both scattered and clumped distribution, and use of multiple snag creation methods. These thinned stands would reach low quality foraging habitat conditions in approximately 40 years.

Three additional units totaling 143 acres would be harvested with a regeneration prescription, removing the current dispersal habitat. These areas are expected to grow back into dispersal habitat in approximately 40 years.

Cumulative Effects

Past management activities within the Hardy Creek and Quartz Creek watersheds have resulted in the removal or fragmentation of many acres of suitable spotted owl habitat. Most of these previously managed stands are currently providing low quality dispersal habitat. Many are too young and of too small a diameter to be considered dispersal habitat at this time, but would grow into dispersal habitat over time. Pre-commercial thinning allows the younger stands to achieve dispersal habitat for spotted owl sooner than those stands not thinned. Cumulative effects from future pre-commercial thinning, along with the c proposed commercial thinning, would result in an increase in the amount and quality of dispersal habitat on the landscape in the future. In addition to proposed commercial thinning in alternatives 2, 3, and 4, the 538 acres proposed for pre-commercial thinning, is expected to be dispersal habitat in approximately 10-15 years.

Current and future logging on adjacent private lands to the north is expected to occur on short rotations providing dispersal habitat for short durations, but not suitable spotted owl habitat.

The adjacent Fall Creek Late Successional Reserve to the west would continue to provide improved habitat conditions over time as stands of all age classes grow, as provided by the Northwest Forest Plan.

Threatened, Endangered, and Sensitive Species

Affected Environment – Wildlife

The Endangered Species Act (ESA), administered by the U.S. Fish and Wildlife Service (USFWS), mandates protection of threatened and endangered species. Listed species are typically habitat-specific with narrow geographic and environmental distributions. Proposed, threatened, endangered, and sensitive (PETS) species have specific requirements under the ESA and Willamette National Forest Plan to maintain viability. Protection includes managing habitat to minimize impacts, as well as prohibition of noise disturbance during the breeding season. Consultation is required with USFWS on activities that may affect these species or their habitat.

Table 37 lists the PETS wildlife species on the Willamette National Forest (USDA Forest Service, 2002) and whether there is potential habitat in the planning area. Additional detailed information about these species is in Appendix C Biological Evaluation for Wildlife.

Table 37: Potential for Occurrence of PETS Species in the Hartz Project Area

Species	Habitat Present in Hartz Project Area?	Federal Status
Amphibians and Reptiles		
Oregon Slender Salamander	Yes	USFS Sensitive
Cascade Torrent Salamander	Yes	USFS Sensitive
Foothill Yellow-legged Frog	Yes	USFS Sensitive
Oregon Spotted Frog	No	USFS Sensitive
Northwestern Pond Turtle	No	USFS Sensitive
Birds		
Least Bittern	No	USFS Sensitive
Bufflehead	Yes	USFS Sensitive
Harlequin Duck	Yes	USFS Sensitive
Northern Bald Eagle	Yes	USFS Threatened
American Peregrine Falcon	Yes	USFS Sensitive
Yellow Rail	No	USFS Sensitive
Black Swift	Yes	USFS Sensitive
Tri-colored Blackbird	No	USFS Sensitive
Northern Spotted Owl	Yes	USFS Threatened
Mammals		
Baird’s Shrew	Yes	USFS Sensitive
Pacific Shrew	Yes	USFS Sensitive
California Wolverine	Yes	USFS Sensitive
Pacific Fisher	Yes	USFS Sensitive
Pacific Fringe-tailed Bat	Yes	USFS Sensitive
Lynx	No	USFS Threatened
Mollusks		
Crater Lake Tightcoil	Yes	USFS Sensitive
Invertebrates		
Mardon skipper	Yes	USFS Sensitive

Northern Bald Eagle

The South Fork of the McKenzie River south of Cougar Reservoir may be used occasionally by foraging bald eagles, but is not expected to provide high quality nesting habitat. Similarly, the lower reaches of the Quartz Creek drainage may also provide some foraging opportunities but eagles are not expected to regularly use this area. The Hartz Project area does not provide high quality habitat for bald eagles, and no effects on the northern bald eagle are anticipated with the implementation of any action alternatives.

Canada Lynx

The USFWS posted a Clarification of Findings and Final Rule in the Federal Register on July 3, 2003, for Endangered and Threatened Wildlife and Plants: Notice of Remanded Determination of Status for the Contiguous Unites States Distinct Population Segment of the Canada Lynx. Numerous comments and recommendations were received by the USFWS during a 30-day comment period ending April 16, 2003. The text below is taken from the USFWS Clarification of Findings:

> In addition to appropriate vegetation type, delineation of the range of the lynx within the contiguous United States must consider snow conditions. Lynx are at a competitive advantage over other carnivores (e.g., bobcats (Lynx rufus) or coyotes (Canis latrans) in areas that have cold winters with deep snow because of the lynx's morphological adaptations for hunting and surviving in such environments.
>
> It is well established that lynx are highly mobile and are frequently found in marginal forest types or completely unsuitable habitats that cannot sustain lynx. The fact that individual lynx have been found in such areas does not mean that those areas can support a lynx population or should be considered or managed as "lynx habitat" (J. Claar et al., in lit. 2001). To be considered lynx habitat, an area must have the potential to sustain a lynx population over a period of time, which includes supporting the appropriate vegetation composition and structure to support adequate snowshoe hare densities and deep snow where lynx are at a competitive advantage.
>
> We do not consider compilations of anecdotal reports of lynx in Oregon reliable for the reasons described by McKelvey and Aubry (Rocky Mountain Research Station, in litt. 2001). Habitats in Oregon that are potentially suitable for lynx are naturally isolated from occupied habitats in Washington and Idaho. There are no records of lynx reproduction in Oregon. Based on the limited verified records of lynx, lack of evidence of lynx reproduction, frequency of occurrences in atypical habitat, and the correlations of such occurrences with cyclic highs, we believe that lynx occur in Oregon as dispersers that have never maintained resident populations.

Even though the Hartz Project area has a consistent winter presence of bobcats and coyotes, no lynx have been documented to occur in the planning area. The planning area does not typically receive deep snow with cold winters, and adequate densities and distribution of snowshoe hare have not been documented. Therefore, it has been determined that the Hartz planning area is not considered lynx habitat.

Harlequin ducks

Harlequin ducks, which are listed as a sensitive species, have been seen in Quartz Creek as well as the South Fork McKenzie River. It is suspected they use other tributaries with fast-moving water as well. Habitat includes large downed wood for resting and loafing.

Since no action alternative is located near Quartz Creek or South Fork McKenzie River, there are no effects on Harlequin ducks. Seasonal restrictions would be implemented for noise disturbance activities (See Design Measures for Wildlife in Chapter 2).

Peregrine Falcon

There are numerous cliff bands in the Hartz Project Area which are suitable peregrine falcon nesting habitat, most of which were surveyed to protocol in the spring and summer of 2004. No active peregrine falcon eyries are known from the area. With either seasonal restrictions or surveys during the year of operation, no effects are expected to peregrine (see Design Measures for Wildlife in Chapter 2).

Affected Environment
Botanical Species and Special Habitats

The Forest Service Manual directs us to ensure the viability of sensitive botanical species as well preclude trends toward endangerment that would result in the need for Federal listing (Forest Service, 1991). A prefield review was conducted to determine which sensitive species have historically been documented in the Hartz Young Stand Management Project area. Two extant populations of *Ophioglossum pusillium*, adders tongue, occur within the project area but are located one half mile from proposed units and would not be affected by proposed project activities. The prefield review did not reveal any lichens, bryophytes, of fungi species of concern.

The prefield review also determined locations of several special habitats, potential habitat for sensitive plant or animal species, within the project area. These special habitats include springs, ponds, rock outcrops, moist rock garden, wetlands, and talus slope. See Table 38 for locations of special habitats.

Table 38 Special Habitats in the Hartz Project Area

Unit	Habitat
1	Seep/Spring
8	Pond, seasonal
8	Pond
8	Shrub wetland
9	Pond, seasonal
9	Pond
11	Rock outcrop
12	Cliff/moist rock garden
22	Pond
22	Seep/spring
22	Willow wetland
23	Cedar swamp/ wetland
23	Talus
25	Rock outcrop/ cliffs

Intuitive-controlled field surveys followed up the prefield review in 2004, to determine the presence of sensitive botanical species within those special habitats areas. Surveys were conducted for lichens, bryophytes, vascular plants, and the fungi *Bridgeoporus nobilissimus*. The sensitive vascular plant *Lewisia columbiana* var. *columbiana* was located in a moist rock garden in the northern portion of Unit 12. *Castilleja rupicola,* a sensitive vascular plant, was located in the southern portion of Unit 25 on rock outcrops, though much of this population is located outside the unit. The sensitive lichen *Peltigera pacifica* occurs along the southeast boundary of Unit 1. *Pseudocyphellaria rainierensis*, another sensitive lichen, occurs in multiple locations along the eastern and southern boundaries of Unit 12. The rare lichen, *Leptogium subaridum*, is located in Unit 25. This lichen has limited distribution in British Columbia and Washington State, with a suspected wider distribution in the Rocky Mountains. The single site of *L. subaridum* in this project area is suspected to be the first occurrence of this species in the northwestern portion of Oregon.

Surveys were not conducted for fungi because single pre-disturbance surveys for these species have been deemed impractical (USDA, 1998; USDA, 2000; USDA, 2004). All fungi except *Bridgeoporus nobilissimus*, which is a perennial conk, were formerly Category B Survey and Manage Species (rare but pre-disturbance surveys impractical). According to the 2004, ROD To Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines "If pre-project surveys were not practical under Survey and Manage Standards and Guidelines, then field surveys are not likely to occur for special status (sensitive) species either." (Pg 6, USDA, 2004).

In general, the fungi species on the Willamette National Forest sensitive species list that have come from the Survey and Manage and Protection Buffer species list, are limited in distribution and their habitats are poorly understood (i.e. there are very general habitat characteristics listed in the literature). Therefore, the majority of fungi are listed as having potential habitat within the project area.

A summary of the survey evaluation process that was conducted for botanical PETS (Proposed, threatened, endangered, and sensitive) species is located in Appendix D – Biological Evaluation, Botany.

Environmental Consequences
Botanical Species and Special Habitats

The fungi impacts are described in terms of fungus functional group (mycorhizal, saprophytic on litter, saprophytic on wood, and parasitic). Since the parasitic *Cordyceps* is dependent on a mycorrhizal fungus for its survival, effects for parasitic fungi would be lumped with mycorrhizal.

Effects of Alternative 1(No Action)

Direct and Indirect Effects

This alternative would have no direct or indirect impact on sensitive plants, lichens, bryophytes, or fungi. There would be no ground disturbance or temporary increase in fuels from logging slash.

Effects of Alternative 2-4

Direct and Indirect Effects

The action alternatives would have no direct or indirect impact on sensitive plants, lichens, or bryophytes. Known occurrences would be protected with a no disturbance buffer to maintain the viability of the populations. The buffer would maintain the microclimate for those species requiring cover or moisture retention and protect the species from being physically damaged during project implementation. This buffer applies to all harvest activities, ground disturbing activities, and broadcast burning. Special habitats would also be buffered from harvest and ground disturbing activities. These buffers would maintain the microclimate, hydrology, and prevent damage to the areas during project implementation. For further discussion on sensitive plants, lichens and bryophytes see the Botany BE in Appendix D.

Fuel loading would be temporarily increased around the sensitive plant population in unit 12 because fuels treatments are not proposed for that location. This may lead to a temporary increase in the risk of a wildfire causing damage to some of the plants in the population. After approximately three years biological processes would break down the fuel, greatly reducing the risk of fire.

Ground disturbance and tree harvesting associated with the action alternatives may impact, but would not cause a trend toward listing for all fungus groups. Late Successional Reserves and a Botanical Special Interest Area are located within the project area and account for 25% of the Hartz Young Stand Management Project area (5,842 acres). These areas are potential habitat for fungi species and are not proposed for any treatments in this project.

The impacts of the proposed action alternatives may include short-term adverse effects on mycorrhizal or saprophytic fungi. The direct effects would be disruption of the mycelial network or substrate (wood and liter) where machinery used to harvest and build the road would churn up the soil. There may also be some localized direct effects to mycelia or wood/litter substrate from pile burning. Concentrated burning can result in localized higher fire intensities and changes in fungal species diversity (Baar, 1999). The proposed tree harvest may indirectly affect mycorrhizal fungi with the removal of trees that may be their host (Kranabetter, 1998). However, many potential host trees would remain in thinned units with the prescribed retention of approximately 45 to 80 trees per acre. Silvicultural prescriptions also maintain tree species diversity. Units that would be regeneration harvested would retain 15% of the acres in Green Tree Retention areas that would contain potential habitat for fungi. The remaining acres would be replanted with Douglas fir, western hemlock, sugar pine, and western white pine, providing potential habitat for fungi in the future.

Cumulative Effects

The analysis area for cumulative effects is the Hartz Young Stand Management project area. Activities outside the analysis area would have no effect on the sensitive botanical species located within.

There would be no direct or indirect effects to known populations of sensitive botanical species or special habitats with any of the alternatives proposed. Therefore, there would be no cumulative effects to sensitive botanical species or special habitats.

Impacts to the fungi species from proposed actions are described above. No other future management is planned within the Hartz Project area that would affect the fungi or contribute incrementally to past and currently proposed activities.

Migratory Land Bird and Management Indicator Species

Affected Environment – Migratory Landbirds

Migratory landbirds and their required protection are outlined in the January 11, 2001 Executive Order "Responsibilities of Federal Agencies to Protect Migratory Birds." A Memorandum of Understanding was signed between the USFS and USFWS to complement the January 2001 Executive Order. Agreed-to measures include identification of habitats needed by priority species. Habitats vary broadly for this large group of species. The Hartz Project Area contains populations of migratory landbirds typical of the western Cascades.

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). These species are associated with old-growth, riparian, rocky cliffs, or grass habitats. Snags in the area may be providing important habitat for Vaux's swifts, Williamson's sapsuckers, and American kestrels. Old growth stands occupy portions of this landscape, which may be supporting Cooper's hawks, olive-sided flycatchers, western wood-pewee, and mountain bluebirds. Riparian habitat associated with streams in the area may be providing habitat for riparian-associated species such as Williamson's flycatchers, tree swallows, and red-eyed vireos.

Past harvest in the Hartz Project area has changed the seral stage composition of the landscape, altering habitat conditions for landbirds. Large snag habitat used by some landbird species, i.e. hairy woodpeckers and brown creepers, has been lost due to past timber sales, as well as roadside salvage. Any future logging of young or older forest stands would continue to impact local populations of landbirds because different species thrive in various types of forested habitats.

Environmental Consequences – Migratory Landbirds

Effects of Alternative 1(No Action)

Direct and Indirect Effects

Alternative 1 does not propose management activities at this time and therefore would not alter habitat conditions for migratory landbirds. Existing vegetation conditions would continue to follow natural successional pathways, and bird populations would respond accordingly. While no snag habitat used by certain species of migratory land birds would be lost due to roadside hazard tree removal, no additional snag habitat would be created within forest stands where it is currently at extremely low densities, or non-existent.

Effects of Alternative 2-4

Direct and Indirect Effects

Felling of trees associated with this project may unintentionally affect individual migratory birds, but is not expected to have a measurable negative effect on bird populations because of the limited extent of habitat removal.

Thinning and removal of young stands may negatively impact certain species such as Hutton's vireo, golden-crowned kinglet, hermit thrush, and Swainson's thrush. There will be areas of no harvest, such as riparian buffers, within some of the proposed stands providing structural variability and potentially less impact.

Species that use early seral-stages, such as the winter wren, American robin, and grouse, may benefit from thinning and regeneration harvest. Species which would increase in number, as a result of thinning would include Dark-eyed junco, Warbling vireo, American robin, Hairy woodpecker, Townsend's solitaire, Evening grosbeak, Western tanager, and Hammond's flycatcher (Hayes, 2003).

Some snag habitat used by migratory birds such as western bluebirds or swallows, would be lost due to roadside hazard tree removal under Alternatives 2-4. However, snag creation activities in units following logging would mitigate this loss in the long-term. It would take approximately ten or more years before these created snags become functional.

Effects of Alternative 2

Direct and Indirect Effects

Alternative 2 would impact migratory landbirds by thinning 622 acres of young forest stand habitat. In addition, 84 acres would have a regeneration harvest, leaving 15% green tree retention.

Alternative 2 includes low intensity broadcast burning during spring in portions of the two units (2 and 25) following a regeneration harvest. This may impact some bird species if they are nesting in the remaining green trees. In some cases, this may cause nest failure, especially for those birds which nest relatively low to the ground such as hummingbirds, flycatchers, warblers, sparrows, and thrushes. Most neotropical migrants generally fledge in June or July, although this can be later when second nest attempts are made. Juveniles of some species may not be able to fly long distances until late summer; however, many species are independent much earlier and would be able to escape a fire and smoke situation that could harm them.

Effects of Alternative 3

Direct and Indirect Effects

Alternative 3 would impact migratory landbirds by thinning 648 acres of young forest stand habitat. This alternative does not include any regeneration units nor the associated low intensity broadcast burning which may impact certain species of landbirds. This alternative would include more acres of moderate thinning than other alternatives. Those species that would decrease less as a result of moderate thinning, compared to heavy thinning, include Pacific-slope flycatchers, Hutton's vireos, and brown creepers (Hayes, 2003).

Effects of Alternative 4

Direct and Indirect Effects

Alternative 4 would impact migratory landbirds by thinning 563 acres of young forest stand habitat. In addition, 143 acres would have a regeneration harvest, leaving 15% green tree retention. This alternative includes the most acres of heavily thinned and regeneration units, therefore, impacts to landbirds are expected to be the greatest in the short-term. Those species, which would increase more as a result of heavy thinning, compared to moderate thinning, include Pacific-slope flycatchers, Hutton's vireos, and brown creepers (Hayes, 2003). It is expected that habitat for these species would again improve once canopies close back in.

Alternative 4 would include a low intensity broadcast burn in portions of three units 2, 4, and 25. The effects would be the same as those discussed under Alternative 2 for these three units.

Effects of Alternative 2-4

Cumulative Effects

Past management activities within the Hardy Creek and Quartz Creek Watersheds have resulted in changes to the seral stage composition across the landscape altering habitat conditions for landbirds. Different species occupy different seral stage habitats and therefore the effects to each species depend on the type of change that occurred.

Cumulative effects from a proposed 17-acre burn project on Indian Ridge along with the currently proposed regeneration harvest would be an increase in the amount of early seral stands. The prescribed burn would impact some migratory landbirds by killing young trees and shrubs, setting the seral stage back to early. While this would remove nesting habitat structure for certain species of landbirds, regeneration of huckleberry fields would provide a valuable food source to many of these birds in late summer.

Cumulative effects from future pre-commercial thinning along with the proposed commercial thinning would be an increase in the acres of openings created across the landscape. Approximately 538 acres of pre-commercial thinning will increase the total acres of thinned stands to 1,160 in Alternative 2; 1,186 in Alternative 3; and 1,101 acres in Alternative 4. This may impact some landbirds by reducing suitable, dense nesting habitat in very young trees. The more open nature of the remaining young trees may make nests more available to landbird nest predators, i.e. Stellar's jays or ravens.

Affected Environment – Management Indicator Species

Management Indicator Species (MIS) were addressed in the Willamette Forest Plan (USDA Forest Service, 1990). They include the spotted owl, pileated woodpecker, marten, elk, deer, cavity excavators, bald eagle, peregrine falcon, and fish. All of the management indicator species may occur in the Hartz project area.

Through Region-wide coordination, each Forest identified the minimum habitat distribution and habitat characteristics needed to satisfy the life history needs of MIS. Management recommendations to ensure their viability were incorporated into all WNF Plan Action Alternatives. Current conditions for the spotted owl and bald eagle are discussed in the Wildlife BE in Appendix C. Habitat for elk and deer is discussed in the Elk Emphasis Area Management section in this chapter. Late successional forest, which provides habitat for pileated woodpeckers, marten, and cavity excavators, was discussed under the Vegetation section earlier in this chapter. One long-term and two short-term management areas designated under the Willamette National Forest Plan were retained on the landscape to provide additional habitat specifically for marten. Management indicator fish species found in this area were described previously in the fish discussion.

The DecAID Tool

The NWFP, as amended, requires retention of snags at levels sufficient to support cavity-nesting birds at 40 percent potential population levels. Biological potential models have been invalidated (Johnson and O'Neil, 2001). The DecAID advisory tool (Mellen et al. 2003) was developed to help federal land managers evaluate effects of management activities on wildlife species that use dead wood habitats. DecAID displays data about wildlife use based on snag density and diameter. Data in DecAID suggests that snag retention levels for some cavity excavators may need to be higher than the levels previously calculated from biological potential population models. DecAID does not model biological potential or population viability. Furthermore, no direct relationship exists between species habitat, tolerances, snag densities, and sizes used in DecAID and the measurements of population levels.

The usefulness of DecAID as it may apply to a young stand management project such as Hartz, is to evaluate watersheds and set dead wood management goals that may be used to guide future activities. Current Forest Plan Standards and Guidelines pertaining to dead wood shaped the Silvicultural Prescription for this project by incorporating protection measures for existing snags and down wood, providing for snag and down wood creation at a low to moderate level, as well as providing for additional future recruitment of these habitat components within harvest units. Diameters and value to wildlife would be greater at a future point in time.

Retention levels of dead wood, which may be interpreted as recommendations from the use of DecAID, are not intended to be a prescription that is met on every acre across the landscape. Instead, the levels can be viewed as recommendations targeting ranges of conditions that should exist within selected habitat types at appropriate scales across a landscape. These conditions encourage biodiversity and support the viability of species dependent on dead wood.

The Hartz Project considered snag and down wood levels within the 6^{th} field subwatersheds South Fork McKenzie/Hardy Creek/Rebel Creek and Quartz Creek when evaluating levels and distribution of current and future wood decay management.

Environmental Consequences – Management Indicator Species

Effects of Alternative 1 (No Action)

Direct and Indirect Effects

Under Alternative 1, no change to habitat of management indicator species would occur; forest stands would continue to develop following natural successional pathways. Alternative 1 would meet all applicable Standards and Guidelines from the Willamette Forest Plan.

Effects of Alternative 2-4

Direct, and Indirect Effects

Hartz Alternatives 2-4 meet all applicable Standards and Guidelines from the Willamette Forest Plan. All alternatives of the Hartz Project would meet Northwest Forest Plan Standards and Guidelines, and therefore maintain persistent populations of spotted owls, pileated woodpeckers, and marten (USDA USDI FSEIS 1994, Appendix J2). Under Alternatives 2-4, changes in the amount or characteristics of required habitat for these species would be minimal. Changes that would improve habitat include the increased levels of snags and down wood. Between 4 and 11 trees per acre would be left in all units for future snag and down wood creation up to five years after harvest.

Impacts of alternatives of the Hartz Project for the spotted owl, bald eagle, peregrine falcon, and fish can be found in the Biological Evaluations in the Appendix. This project may affect, but is not likely to adversely affect, the northern spotted owl due to modification or removal of dispersal habitat in Alternatives 2-4. The spotted owl is discussed further in the previous section. This project has no effects on bald eagles or peregrine falcons.

Impacts of the Hartz Project on elk and deer are discussed in the elk section.

While pileated woodpecker and marten may be displaced by harvest and burning activities in this area, populations throughout their range have not been identified as being in decline, as indicated by their absence from the Regional Forester's Sensitive Species List (2001).

Cumulative Effects

No other future management is planned within the Hartz Project area that would add incrementally to the cumulative effects of the past and currently proposed activities as described above.

Road Density and Elk Habitat

Affected Environment

The Hartz planning area has three designated Elk Emphasis Areas: Upper Quartz, Hardy and Starr (see map in Appendix A). All three of the areas are Moderate Emphasis Areas. These areas are managed for elk habitat under guidance from the Willamette Forest Plan with the assumption that providing high quality elk habitat would adequately address the needs for black-tailed deer.

A Model to Evaluate Elk Habitat in Western Oregon (Wisdom, 1986) is used to estimate habitat effectiveness (HE), which is defined as the proportion of achievement relative to an optimum condition. The management intent is to maintain effectiveness value in the range of 0.4-1.0 with the optimum value being 1.0. HE incorporates and qualifies four key habitat attributes; size and spacing of forage (HEs), quality of forage (HEf), cover areas (HEc), and open road density through elk habitat (HEr). Each habitat variable is calculated individually and allows for a comparison by variable or as a whole (HEI).

Summary of Existing Elk Model Variables for the Hartz Project Analysis Area

Size and Spacing of Forage: The size and spacing habitat effectiveness rating (HEs) for forage and cover in these three elk emphasis areas indicates that the existing distribution of cover and forage is very good and that management goals for size and spacing are currently being met Upper Quartz (0.59), Hardy (0.57) and Starr (0.62).

Forage: The forage quality habitat effectiveness ratings (HEf) for the Upper Quartz area is currently below standards (0.23). The forage quality levels are currently being met in Hardy (0.55) and Starr (0.46).

Cover: All three big game emphasis areas currently meet the cover effectiveness-rating (HEc) requirement in Upper Quartz (0.58), Hardy (0.58) and Starr (0.49).

Road Density: The open road density habitat effectiveness ratings (HEr) indicate that road densities are below the Forest Plan recommendations for the Upper Quartz (0.35) and Hardy (0.38) emphasis areas. The Starr emphasis area is above standards at (0.43).

Habitat Effectiveness Index (HEI): The overall ratings of (HEI) indicate that the Upper Quartz (0.41) is below the minimum Forest standards. The Hardy emphasis area (0.51) is currently above the minimum Forest Plan standards. The Starr (0.49) area is below the minimum effective ratings.

Affected Environment – Road Density

Past road building activities have resulted in the current somewhat extensive road network on the landscape. Typical road building techniques were employed such as the use of contours, benches and ridge tops. Roads have been used for accessing timber harvest areas, firefighting, recreating and as travel routes. Open roads for the project area total about 83 miles, with 40.09 miles located in Upper Quartz Elk Emphasis Area, 23.03 miles in Hardy, and 20.26 miles in Starr.

In order to have road density levels that are closer to Willamette Forest Plan recommendations, the action alternatives propose to close roads following timber harvest. These reductions of open roads are intended to increase security for elk by reducing harassment caused by motor vehicles (Witmer and deCalesta, 1985). Tables 5, 8 and 11 in Chapter 2, display the proposed road closures, road numbers, and road miles, for each alternative. No road closures are proposed for the Starr area since it currently exceeds the standards for by 1.19 miles.

Environmental Consequences – Road Density

Table 39 below displays, by alternative, the existing miles of open road for each elk emphasis area and lists the open road miles lacking or exceeding the target standards following the proposed road closures.

Table 39: Open Road Density

Emphasis Area	Existing Open Road Miles	Target Open Road Miles	Alt 1 Open Road Miles	Alt 2 Open Road Miles	Alt 3 Open Road Miles	Alt 4 Open Road Miles
Upper Quartz	40.09	32.4	40.09	38.48	38.48	38.48
(+) or (-) Target	N/A	N/A	-7.69	-6.08	-6.08	-6.08

Emphasis Area	Existing Open Road Miles	Target Open Road Miles	Alt 1 Open Road Miles	Alt 2 Open Road Miles	Alt 3 Open Road Miles	Alt 4 Open Road Miles
Hardy	23.03	20.6	23.03	18.83	22.53	18.83
(+) or (-) Target	N/A	N/A	-2.43	+1.77	-1.93	+1.77
Starr	20.26	21.45	20.26	20.26	20.26	20.26
(+) or (-) Target	N/A	N/A	+1.19	+1.19	+1.19	+1.19

Effects of Alternative 1(No Action)

Direct and Indirect Effects

Under Alternative 1 (No Action), current road densities would remain unchanged. No new road construction or road closures would occur. The miles of open road would remain below the recommended Forest Plan standards by having 7.69 miles more open road than desired in the Upper Quartz area and 2.43 miles in the Hardy area. The Starr area would remain above the standards by 1.19 miles. Road densities may be reduced naturally over time due to vegetation growth that would "brush in" roads and restrict or discourage vehicle travel.

Effects of Alternative 2-4

Direct and Indirect Effects

Alternatives 2 and 4 propose to close 5.81 miles of open roads leaving 38.48 miles in Upper Quartz Creek, 18.83 miles in Hardy, and 20.26 miles remaining open in Starr. An additional 6.08 miles would need to be closed in the Upper Quartz area to meet Forest Plan standards of 32.4 miles of open road. The Hardy area would exceed standards by having 1.77 less miles and the Starr area would exceed the standards by 1.19 miles.

Alternative 3 proposes to close 2.11 miles of open roads leaving 38.48 miles in Upper Quartz Creek, 22.53 miles in Hardy, and 20.26 miles remaining open in Starr. An additional 6.08 miles would need to be closed in the Upper Quartz area, and 1.93 miles in the Hardy area to meet Forest Plan standards. The Starr area would exceed the standards by 1.19 miles. See Appendix E for the specific elk model values and HE ratings for each alternative.

Cumulative Effects

The analysis for cumulative effects is based on management activities that have or will occur within the three moderate Elk Emphasis Areas. This scope of analysis was chosen because of the determined target levels of open roads that are described for the Elk Emphasis Areas in the Willamette Forest Plan.

Past road management activities have resulted in the current road network in the project area including 83 miles of open roads. The open roads have resulted in less security for elk from harassment by motor vehicles. The overall impact of the Hartz project on open road density is that it would bring two of the moderate elk emphasis areas, Upper Quartz and Hardy, closer to meeting the Forest Plan Standards and the intentions to improve elk habitat conditions. No future management is planned within the Hardy Creek and Quartz Creek Watersheds that would contribute to the cumulative effects from past and currently proposed activities.

Affected Environment – Forage, Hiding, Thermal and Optimal Thermal Habitat

Past harvest activities have certainly shaped the landscape in terms of juxtaposition and types of elk habitat. Since 1950, over 9,000 acres have been managed for timber. Harvest treatments were primarily regeneration, including clearcuts and shelterwoods. These harvested units once provided a wealth of quality forage for elk but have since grown into hiding and thermal cover.

Environmental Consequences – Forage, Hiding, Thermal and Optimal Thermal Habitat

Effects of Alternative 1(No Action)

Direct and Indirect Effects

Current trends of elk habitat development would continue to occur naturally over time with Alternative 1. Existing elk foraging habitat is expected to continue growing into hiding cover and then to thermal cover. Thermal cover would continue to grow toward optimal thermal cover. There would be no change to the current elk effectiveness ratings (see Appendix E).

Effects of Alternative 2-4

Direct and Indirect Effects

The proposed timber harvests would change the function of this elk habitat from hiding or thermal cover to foraging habitat (see Table 40).

Table 40: Approximate Change in Elk Habitat Abundance by Elk Emphasis Area

Upper Quartz Emphasis Area

Alternative	Optimal Thermal	Thermal	Hiding	Forage
1	0	0	0	0
2	0	-468	-58	+526
3	0	-468	-58	+526
4	0	-468	-58	+526

Hardy Emphasis Area

Alternative	Optimal Thermal	Thermal	Hiding	Forage
1	0	0	0	0
2	0	-180	0	+180
3	0	-122	0	+122
4	0	-180	0	+180

Starr Emphasis Area

Alternative	Optimal Thermal	Thermal	Hiding	Forage
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

+ indicates gain in habitat acreage
- indicates loss of habitat acreage
0 indicates no change to habitat available

Thinning would reduce the quality of hiding and thermal cover in the short-term (8-10 years), but would promote higher quality thermal cover in the future (10-20 years). The thinned stands are expected to function as foraging habitat for the first decade after treatment. Thinning the stands should result in a higher quality habitat by increasing the structural diversity. Although the elk model does not reflect a positive change in foraging habitat, (see Appendix E) the treated units would open up the forest canopy to allow a greater amount of sunlight to reach the forest floor. This solar input would stimulate plant growth and provide a greater understory forage production (Hooven, 1973).

The regeneration harvesting would change thermal cover in to foraging habitat. The foraging habitat is then expected to be most beneficial for the first 10-15 years. These forage acres would be expected to grow into hiding cover and then thermal cover and eventually optimal thermal cover given enough time.

The overall habitat quality would be maintained or slightly increased in the three emphasis areas under all three alternatives.

Cumulative Effects

Analysis for cumulative effects is based on management activities that have or will occur within the three moderate Elk Emphasis Areas. The Elk Emphasis Areas were used for scope of analysis because of the determined ratings for elk habitat that is described for the Elk Emphasis Areas in the Willamette National Forest.

Past management activities initially resulted in an abundance of forage habitat with the many acres of regeneration harvesting that occurred. The more recent lack of harvest has allowed the forests to grow into hiding and thermal cover. The overall impact of the proposed Hartz project is that valuable elk forage would be produced. No future management is planned within the Hardy Creek and Quartz Creek Watersheds that would contribute to the cumulative effects from past and currently proposed activities. It is expected that the resilient elk would continue to roam the landscape adapting well to changes in their habitat. The opportunist nature of elk and their persistence at survival make it likely that they would continue to thrive on this planning area landscape in the foreseeable future and beyond.

Fire and Fuels

Affected Environment – Fire and Fuels

Fire History

Considering the 19,994 acre project area in this fire and fuels analysis, the last natural fire disturbance of any consequence took place 100 years ago or more. Fire history records indicate that just 27 fires were reported and suppressed in the project area over the last quarter century (1979 to 2004). Seventeen of the fires were lightning-caused and ten were human-caused. With modern fire detection and aggressive suppression techniques, the total fire area was limited to just 6.3 acres in the project area.

Timber Harvest

Timber harvest has since replaced fire disturbance, but on a smaller scale. Clearcut harvesting was common in the Hartz Young Stand Management Project Area 30 to 40 years ago and was occurring as long as 50 years ago. A healthy second growth forest now occupies the old clearcuts. The understory is generally bracken fern, sword fern, dwarf Oregon grape, and vine maple. The Hartz Project Area is made up of 10,415 acres of mature forest, (81 years and older) and 9,619 acres of young second-growth stands 0 to 80 years old, mostly Douglas-fir with small amounts of western hemlock. Approximately 5,537 acres of the Hartz area was harvested and planted within the past 30 years, and many of those acres will be pre-commercially thinned by the year 2005.

The stands proposed for thinning were clearcut in the 1950's thru to the 1970's, more specifically, 383 acres in the 1950's, 303 acres in the 1960's and 20 acres in 1970. Most were broadcast burned, planted, and some have been pre-commercially thinned. Down woody debris is generally light to moderate and there are usually only a few small snags.

Fuel Models

There are three major Fire Behavior Prediction System fuel models (FM) represented within this project planning area. Fuel Model 5 best describes 3,325 acres of light brush, and plantations of between 2 and 10-foot tall regeneration with snowbrush (ceanothus). Fuel Model 8 constitutes 10,085 acres where stands were heavily harvested before fuels treatment, as well as those stands more typical to this fuel model, a healthy mature stand that has a very light fuel loading. About 6,169 acres are a Fuel Model 10 represented by the mixed conifer stand with a heavy down woody component (see Fuel Model map Appendix A).

Environmental Consequences – Fire and Fuels

Effects of Alternative 1(No Action)

Direct and Indirect Effects

Under Alternative 1, no fuels would be generated and forested stands in the area would continue on a path of natural succession. Stands that were previously managed and are currently in an overstocked condition would develop relatively slowly into diversified forests. Slow growing and weakened trees would die and contribute to the fuel buildup on the forest floor. Over time, the increasing fuel loads could be associated with greater fire intensity and severity, and increased rates of spread. Fire occurrence would continue on the landscape only under uncontrolled, wildfire conditions.

Effects of Alternatives 2-4

Direct and Indirect Effects

The proposed moderate and heavy commercial thinning in the Hartz Young Stand Management Project Area 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. Stands that are heavy thinned may be less susceptible than the moderate thinned stands since they would have less residual trees and more openings. The proposed regeneration harvest would eliminate most of the canopy and ladder fuels, therefore, the potential for crown fire spreading through these stands would be very low.

Increased fuel loads affect wildfire behavior by increasing the rate of fire spread. This would increase the risk of a fire becoming a large fire should a wildfire ignite in, or enter, a unit. Light and moderate levels of logging slash would be created with levels dependent on, for the most part, whether the stand is moderate thinned, heavy thinned, or regeneration harvested. Fuel loads would be reduced in units that use ground based logging systems by having the tops yarded during logging. The thinned units, which are located on slopes too steep for ground based logging, (where helicopter or cable systems are used) would not treat fuels other than hand piling and burning along the roads. Some of the thinned units left untreated for fuels would be above the Willamette National Forest Plan recommended levels (USDAFS, 1990); however, the project area will still meet the Forest Plan standards and guides for fuel loads.

Since the commercial thinning would occur over a period of years the total fuel load would not be on the ground at once; therefore, untreated fuel would be in varied stages of height and decomposition.

Moderate to heavy precipitation in the western Cascade Mountains accelerates the decomposition processes and, over time, reduces the risk of large fire growth associated with untreated fuel buildup. With no fuel treatments after 3 years the 0-3 inch fuel would reduce as the needles drop off and snow crushes the fuel closer to the ground, accelerating decomposition. Flame length as a result would drop to 4 feet or less, an acceptable level for fire crews to build hand line under normal summer weather conditions.

Fuel loads following regeneration harvests will be the highest initially and will remain as such until the broadcast burn is implemented. The intention of the broadcast burn is to remove the fine fuels that normally carry ground fire through the unit. Some of the larger fuels may remain, but fuel loads will be below the recommended levels.

The following table (Table 41) displays the acres of harvest and fuels treatments for each of the action alternatives. More than one type of fuels treatment can be applied to any given area; therefore, the total acres of treated and un-treated fuels can vary and not equal the total amount of stand acres.

Table 41: Fuels Treatment for the Action Alternatives

Fuels Treatment	Alt. 2 Acres	Alt. 3 Acres	Alt. 4 Acres
Moderate Commercial Thinning	190	341	50
Heavy Commercial Thinning	432	307	513
Regeneration Harvest	84	0	143
Acres of Treated Fuels	321	239	380
Acres of Un-Treated Fuels	458	482	399
Acres Above Recommended Fuel Loads	384	384	325

Alternative 2

Direct and Indirect Effects

Alternative 2 can be considered the moderate fuel treatment alternative compared to the other alternatives. Overall un-treated fuels are second highest with 458 acres, of those 384 acres would be above recommended fuels loads. The amount of activity-created fuels in some areas does not exceed per acre fuels recommendations either due to small tree size or lower numbers of cut trees per acre. Unit 9 has 31 acres of un-treated fuels that remain above recommended levels by 0.7 tons per acre after 3 years. The fuels will decrease over time as decomposition continues. This alternative has the second highest amount of heavy thinning, which would provide more acres of open stands and canopies, reducing the chance of crown fire spread.

Alternative 3

Direct and Indirect Effects

Alternative 3 has the lowest acreage of fuels treatments compared to the other alternatives. There are 384 acres of un-treated fuels that would be above recommended fuel loads. The acres of heavy and moderate thinning for this alternative are about equal, and the moderate thinned acres are higher than the other two alternatives.

Alternative 4

Direct and Indirect Effects

Alternative 4 has the highest acreage of fuel treatments compared to the other alternatives. No fuels treatment would occur on 399 acres, which is the lowest of all the alternatives. Out of those 399 acres, there are 325 acres that would be above recommended fuel loads. Unit 9 has 31 acres of un-treated fuels that remain above recommended levels by 0.7 tons per acre after 3 years. The fuels will decrease over time as decomposition continues. Alternative 4 has the highest amount of heavy thinning and regeneration harvests, providing the most acres of open stands of all the alternatives.

Effects of Alternatives 2-4

Cumulative Effects

Past management of the Hartz Young Stand Management Project Area has resulted in fuel loads that are mostly low (fuel model 8). The proposed action results in an increase of fuel loads generated by logging slash, which will decrease over time. The biomass fuel loads would be decreased with the proposed action through reduced stand density. Future management activities that may contribute to higher fuel loads would include pre-commercial thinning. Typically, the thinning slash is pulled back from roads and allowed to decompose on site minimizing the overall risk of human ignition. Other future activities may include salvage logging within forested areas or hazard tree removal along roadsides. The removal of dead and dying trees would reduce the potential for a large fire developing.

Affected Environment – 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 National Forest lands in Oregon.

The Oregon Smoke Management Plan establishes designated areas that are principal population centers and Class I airsheds, including wildernesses and other sensitive airsheds. One purpose of the Smoke Management Plan is to protect air quality in these high priority areas. For the 19,994-acre Hartz Young Stand Management Project Area, the closest designated areas are the Willamette Valley, about 50 miles to the west, and Bend, 45 miles to the east. The closest Class I airshed is the Three Sisters Wilderness, east of the planning area.

Environmental Consequences – Air Quality

Effects of Alternative 1(No Action)

Direct and Indirect Effects

There are no impacts to air quality in the No Action Alternative, however, the stands will continue to store more biomass as they grow and postpone the release of smoke to the driest time of year when the impact to people is greater. If a large fire were to occur, it would occur during summer conditions, consuming more fuel and create greater amounts of smoke. Smoke could blanket the nearby Class I airshed of the Three Sisters Wilderness with a significant negative effect on air quality and visibility, or intrude on at least one of the designated areas. The most likely time for a large wildfire to occur is between July 1 and September 15, coinciding with outdoor recreation activities and high public use of the wilderness.

Effects of Alternative 2-4

Direct and Indirect Effects

Air quality in the designated areas could be affected by forest-land fuel treatments, such as broadcast application of fire to reduce fuels and burning hand piles or landing piles.

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

Table 42: PM-10 and PM-2.5 Emissions by Action Alternatives

	Alternative 2		Alternative 3		Alternative 4	
	Handpile Burning	Broadcast Burning	Handpile Burning	Broadcast Burning	Handpile Burning	Broadcast Burning
PM 10	13.0 Tons	14.0 Tons	12.5 Tons	0.0 Tons	13.9 Tons	26.7 Tons
Total PM 10	27.0 Tons		12.5 Tons		40.6 Tons	
PM 2.5	12.0 Tons	12.8 Tons	11.6 Tons	0.0 Tons	12.8 Tons	24.3 Tons
Total PM 2.5	24.8 Tons		11.6 Tons		37.1 Tons	

Prescribed broadcast burning would occur in the spring when snow has melted off and fuels are dry enough to burn and last through July 1st. Burning resumes September 15 and after dry, east wind events has ended. Generally, both hand pile and landing pile burning would occur in the fall when the seasonal rains control and extinguish the burning.

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

The Oregon Smoke Management Plan and the Oregon Visibility State Implementation Plan (SIP) also have a number of requirements designed to meet Clean Air Act standards, reduce the amount of smoke produced, and reduce smoke impact on designated areas and wilderness areas. They have also required or encouraged a variety of measures to reduce smoke emissions. All burning operations will comply with the SIP, and planned through the Oregon Smoke Management System.

Cumulative Effects

Future activities that may contribute to an increase in emissions would include the 17-acre prescribed burn on Indian Ridge. This prescribed burn will not consume activity created fuel from timber harvest, because no harvest is planned at this time, and will produce fewer emissions than the smallest of the proposed broadcast burn units of the Hartz Project. To protect air quality in Class I airsheds (wilderness) and designated areas burning will occur in the fall outside of the highest public use period between July 1 and September 15 in the Three Sisters Wilderness.

Noxious Weeds

Affected Environment

Noxious weeds on the McKenzie River Ranger District are predominately located along roads, power lines, and recreation sites. They are primarily introduced or spread by vehicle traffic, road maintenance, recreational users, and ground disturbing activities including timber harvest.

The Willamette National Forest divides noxious weeds into three categories: established infestation, new invader, and potential invader. Established infestation species are abundant and widespread on the Forest. These species are managed for containment with a goal of preventing spread to uninfested areas. New invader species are not well established or widespread on the Forest and are treated aggressively, with the goal of treatment being elimination of the species. Potential invader species are not known to be on the Forest, but are present in neighboring Forests or counties. See Table 43 for a list of the established, new invader and potential invader species.

Table 43: Weed Classification for Willamette National Forest

Potential Invaders	New Invaders	Established Infestations
Leafy spurge	Spotted knapweed	Canada thistle
Yellow starthistle	Diffuse knapweed	Bull thistle
Distaff thistle	Yellow toadflax	Scotch broom
Squarrose knapweed	Dalmatian toadflax	Tansy ragwort
Gorse	Giant knotweed	St. Johns-wort
Orange hawkweed	Meadow knapweed	Foxglove
	Climbing nightshade	Ox-eye daisy
	Field bindweed	
	Evergreen blackberry	
	Himalayan blackberry	
	False brome	
	Reed canarygrass	
	Sweetclover	
	Houndstongue	
	English ivy	
	Butterfly bush	
	Yellow hawkweed	
	Purple loosestrife	
	Everlasting peavine	
	Vinca	
	Evening primrose	
	Bladder campioin	

Roadways, proposed quarries, and proposed units within the Hartz Young Stand Management Project area were surveyed in the summer of 2004 for noxious weeds. Species abundance and distribution varies from isolated plants to large, well-established populations. Weed species found in the project are located along roads and in forest openings in proposed units. No weed species were found in the proposed rock quarry. Forest roads and State Highway 126 are conduits for continual weed dispersal and expansion in this area. Routine road maintenance and construction activities contribute to the spread of weeds through ground disturbance, seed spread by the use of mowers, road equipment, and contaminated rock and fill material. Most seed species become established as a result of a soil disturbance activity, either natural or artificial. Once species are established they are able to persist and reproduce with little competition from native vegetation.

The most abundant species present in the project area are Scotch broom, ox-eye daisy, and St. John's wort. New invader species present in the project area include sweetclover, Himalayan blackberry, evergreen blackberry, spotted knapweed, false brome, and everlasting peavine. No potential invader species were observed in the project area.

The new invader weed false brome is of particular concern. This species, unlike most of the weeds, is shade tolerant and can grow in forested areas. False brome spreads quickly and competes very aggressively with native vegetation. If left untreated, this species can dominate an area leaving no native vegetation. False brome is not palatable to wildlife and is presumed to suppress the growth of conifer seedlings. Treatment of the false brome and other new invader species prior to the start of the project activities, as well as washing equipment after working at those sites is crucial to reducing the risk of spreading these weeds throughout the project area.

Environmental Consequences

Effects of Alternative 1(No Action)

Direct and Indirect Effects

Under Alternative 1, the risk of noxious weeds spread along open roads would continue since there would not be a reduction in open road miles. Roadways support the heaviest populations of noxious weeds and pose a threat for invasion by not decreasing vehicle access and requiring continual maintenance. A limited amount of treatment of noxious weeds would continue to occur within the project area, with new invader species receiving the highest priority for treatment.

Effects of Alternative 2-4

Direct and Indirect Effects

There is a risk that ground based harvest equipment could spread existing weed seed into un-infested areas within units, particularly those proposed for regeneration harvest. See table 17 for a comparison of alternatives by activity. The risk of weed spread is low to moderate since only 18% to 20% of the units would be harvested with ground-based methods. Contract provisions that require off-road equipment and road maintenance equipment be cleaned before entering National Forest lands and requirements for seeding disturbed areas would also reduce the risk that weeds might spread and find favorable growing sites. The risk of noxious weed establishment and spread would be greatly reduced through prevention, monitoring, and treatment according to design measures and mitigation measures for noxious weed control (see Chapter 2).

Regeneration harvest opens areas to high light conditions that are optimal for noxious weed establishment. Weed populations that may become established would start declining as the canopy of the trees close; approximately 20 years after the units are planted with conifers. Risk for weed establishment or spread in regeneration harvest units is highest in Alternative 4. No regeneration harvest is proposed in Alt. 3.

The construction of 2,050 feet of temporary road proposed in all the action alternatives increases the risk of weed introduction because of the associated ground disturbance and the potential use of weed-contaminated material if fill or rock is used in construction. Surveys of proposed rock quarries would reduce the risk of weed-contaminated rock. Road closures, however, reduce open road density thereby reducing the risk of weed spread by motorized vehicles and road maintenance equipment. The three action alternatives have approximately the same risk for the introduction and spread of noxious weeds. Alternatives 2 and 4 have more acres of ground based logging and regeneration harvest, but also have more miles of road closure. Alternative 3 has less acres of ground based logging, regeneration harvest, and less miles of road closure.

Cumulative Effects

The analysis area for considering cumulative effects for noxious weeds is the Hardy Creek and Quartz Creek 6th field watersheds. This analysis area was selected for its known distribution of noxious weeds and because it contains likely travel routes for the proposed project. Past management within the Hartz Project area has provided opportunities for establishment and spread of noxious weeds. This management includes road building, road maintenance, and timber harvest. Risk of further establishment and spread from the current proposed action exists; however, design and mitigation measures will help minimize the potential.

Road maintenance currently occurring in the analysis area would provide opportunities for the establishment and spread and noxious weeds. Design measures and mitigation measures are being implemented to minimize this risk.

In addition to activities proposed in the Hartz Project, the reasonably foreseeable management activities that would pose a risk for the introduction and spread of noxious weeds in the watersheds are road maintenance. However, design measures and mitigation measures would be implemented to minimize the potential.

Soil Productivity and Slope Stability

Affected Environment

The Hartz project area is located in the Western Cascades physiographic province. The area is divided into two relatively different geomorphic terrains. The west side of Indian Ridge, within Indian and Quartz Creeks, includes terrain with the following:

- Steep, stable, shallow-soiled side slopes of eroded Tertiary volcanic strata composed mainly of tuffs and breccias.
- Glacially formed benches in volcanic strata.
- A Relatively gently sloping sequence of stable stream terraces that likely evolved during Pleistocene glaciation and subsequent outwash.

Neither debris chute-type slope instability nor slump-type rotational failures have been active agents in the down slope movement of soil in this part of the analysis area.

The side east of Indian Ridge within Hardy Creek, includes terrain with the following:

- Debris chute, and large-scale, slump type, earth flow terrain.
- Glacially formed benches and steep, ice-eroded side slopes on volcanic strata.

The earth flow terrain east of Indian Ridge has stabilized and generally has not shown any movement for many hundreds to thousands of years, except for a few localized areas. The debris chute activity is confined to several localized sites throughout the basin.

The units proposed for harvest the in Hartz Young Stand Management project, were originally logged with primarily cable yarding, though suspension may have been limited. Often ground-based systems were utilized, especially on the flatter ground. The units were harvested prior to the establishment of Regional guidelines of acceptable amounts of compaction, which is 20% of the activity area. Compaction may have once exceeded the Regional guidelines when the units were originally logged, however, with the establishment of regeneration and brush, little evidence now remains of that previous yarding activity. Some compaction has been ameliorated with the subsequent bioturbation, or the effects of vegetation, and freeze/thaw. Transects in a few of the flatter areas indicate primary skid roads and landings now occupy 8% to 11% of the flatter terrain.

More information regarding current conditions and the Soil Scientist review of the project area can be found in Appendix G.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

Intermediate and suppressed trees would slowly be removed from the stand through mortality and decay. Overstocked stands would rapidly see density increase, growth slow, and mortality rise. Understory plant diversity would diminish as well as soil biota because of the lack of sunlight. In areas compacted or disturbed in the initial entries, the soil building process would continue to return the soil to near pre-harvest conditions.

Alternatives 2-4

Direct and Indirect Effects

For all action alternatives, soil disturbance, compaction, nutrient loss, and slope stability effects resulting from project activities would be well within applicable Regional and Forest standards. Significant adverse impacts are not anticipated based on the extensive incorporation of Best Management Practices (BMPs) that are designed to protect soil resources (Design Measures and Mitigation, Chapter 2). The harvested units would still have mortality occurring from blow down, snow down, and bug kill; as would the forested areas not included in the Hartz project area. The growth of the understory from created openings would increase plant diversity as well as soil biota. The soil building process would continue to return the soil to near pre-harvest conditions for both past and current harvest treatments. Detailed discussion of these measures and effectiveness can be found in Appendix G.

Cumulative Effects

Past logging of the proposed units may have resulted in compaction that exceeds Regional guidelines of 20% of the activity area. The effects have since diminished with growth of brush and regeneration of trees. The proposed action would have no adverse impacts to soil productivity and slope stability that exceed the standards set by Regional Guidelines and contribute incrementally to the cumulative effects of the past timber sales. There are no reasonably foreseeable future management activities planned within the Hartz project area that would contribute incrementally to the cumulative effects from past management activities.

Roads and Access

Affected Environment

Past management activities in and near the Hartz Project Area have provided the current network of Forest Roads, mainly from timber sales. The current system of roads provides sustainable access to the area for administration, protection, public recreation, and forest product utilization, consistent with the Willamette Forest Plan. This section incorporates by reference the Willamette National Forest Road Analysis Report (USDAFS, 2003), which provides detailed information regarding the Forest roads, describing maintenance levels, maintenance costs, and management direction.

The Hartz project area includes a total of 112 miles of Forest system roads, contained within the Hardy Creek/Rebel Creek and Quartz Creek sub-watersheds. However, the analysis also includes Forest Road 19, which extends outside of the project area, because of the potential impacts log haul would have on recreation and traffic safety. Considerations for road maintenance extend outside the Hartz Project area. Road closures and road density analysis are confined to the project area.

Forest road 19, known as Aufderheide Scenic Drive, is a two-lane paved road that provides the primary access to the project area from State Highway 126. Road 19 is also part of in the West Cascades National Scenic Byway. Other important Key Forest roads that provide access to the area include Forest roads 1980 and 1985, tributary to Forest road 19; and Forest road 2618, tributary to State Highway 126 by way of Quartz Creek. These Key Roads and numerous secondary roads are predominately surfaced with crushed rock.

Approximately 29 miles of Forest roads are currently closed with gates, berms, or other structures in the project area. One unclassified road exists adjacent to Hardy Creek and would provide access unit 22. This road was built as temporary access for logging in a previous timber sale, and was not constructed, maintained, or intended for long-term use.

The current road system allows the Forest Service administrative access to conduct a wide variety of forest management and fire protection activities in the area. Specifically, the Forest roads provide access to facilities at Indian Ridge Lookout for both recreation and fire detection purposes, Indian Ridge Communications Site, and they provide the public access to Hidden Lake Day Use Area and several dispersed campsites in the project area. In addition, current roads provide the means to transport timber products from the national forest. These roads also allow public use of firewood and special forest products, and provide land-owners of adjacent properties access to manage their lands under special agreements.

The road system receives annual maintenance in accordance with established road management objectives. However, over the last decade, a limitation on road maintenance funds on the Forest has resulted in a backlog of maintenance work to reduce brush, clean out drainages, and repair road surfaces on many of the Key and secondary roads in the project area.

Environmental Consequences

Effects of Alternative 1(No Action)

Direct and Indirect Effects

In the no action alternative, current levels of road maintenance would continue on the existing network of roads. The existing budgetary trend would continue, making it uncertain that funding would be available to fully support road maintenance, which could lead to some roads becoming unsuitable for passenger vehicles, making it difficult to travel for public and agency administrative traffic. There is currently a backlog of road maintenance and some local roads are becoming impassible due to fallen trees or the growth of brush. Culverts that may potentially plug and cause washouts could go undetected on roads not maintained and impassible to administrative traffic. Current rates of the spread of noxious weeds could continue on roads not maintained.

Effects of Alternative 2-4

Direct and Indirect Effects

Road maintenance as identified in Chapter 2 would occur under all action alternatives. Road maintenance would protect the road infrastructure, improve safety of the road, improve drainage, and reduce the spread of noxious weeds. Roads that undergo improvements could increase sediment production and transport over the short term. Newly graded or surfaced roads, improved drainage structures, and upgraded culverts could increase sediment production until surfaces stabilize. Brushing roads increases sight distance to improve visibility for safe driving. Removing ditch slough to predetermined disposal locations would reduce the likelihood of spreading noxious weeds. Blading, ditch maintenance, culvert replacement, surface rocking, and installing dips or waterbars corrects or improves water drainage. With the approval of designated water sources for filling water tankers, compaction and dust abatement operations would not directly affect stream flows or fish and fish habitat.

Action alternatives may cause a temporary increase in sedimentation while the work is being done, but in the long term, would decrease the volume and velocity of water that carries sediments into creeks. Maintenance activities could cause some short-term delays or detours for road users while roadwork is being performed.

After the road closures and decommissioning, the open road density would be reduced from approximately 83 miles to 77 miles in Alternatives 2 and 4, and from approximately 83 miles to 81 miles in alternative 3.

Cumulative Effects

The effect of past management actions have created a road system within the Hartz Project area that requires consistent road maintenance levels to provide adequate resource protection. The incremental short-term cumulative effect as a result of proposed action includes road maintenance that increases protection of the existing road infrastructure, improves the safety of the road, decreases sedimentation, and reduces the spread of noxious weeds.

Proposed road closures with gates or earth berms would provide longer term incremental effects of decreasing access (public, administrative and commercial), decreasing the current effective open road density, improving drainage structures to decrease sediment, and reducing road maintenance costs. However, there would be fewer roads for public and administrative vehicle access for recreation, reforestation, fire and noxious weed control. There are no additional foreseeable future management actions that would have cumulative effects on the roaded condition of the project analysis area.

Recreation and Scenic Quality

Affected Environment

The scale of analysis for recreation resources includes the Hartz Project area and the Aufderheide National Scenic Byway on Forest road 19, along the South Fork McKenzie River. The project area lies south of Cougar Reservoir and west of Aufderheide Scenic Byway, which is one segment of the West Cascades National Scenic Byway.

Recreation opportunities existing in the Hartz Young Stand Management Project area in developed and dispersed areas. These areas offer a wide range of recreational experience for the visitor and include camping, climbing, photography, fishing, hiking, bicycling, swimming, hunting, nature watching, day-use visits, and sight-seeing while driving Forest roads. The availability of recreation opportunities varies by location. Most of the opportunities are in the Hardy drainage and is accessible by Forest Road 1980, and Forest Road 19. The Hidden Lake Special Interest Area (SIA), Red Diamond and Hard Rock Campground, Indian Ridge Trail and Lookout are all within the project area.

ROS

The Forest Service uses a land classification system to inventory and describe a range of recreation opportunities called the Recreational Opportunity Spectrum (ROS) (Forest Plan FEIS, page III-93). This system seeks to identify recreation settings of varying characteristics that range from large, remote, undeveloped areas to small, easily accessed highly developed sites.

VQO

The Forest Plan has also established Visual Quality Objectives (VQOs) to describe degrees of acceptable alteration of the natural landscape when considering timber stand management (Forest Plan FEIS, page III-112). The following table displays both ROS and VQO for Willamette Forest Plan Management Areas where stand treatments occur.

Table 44. ROS Class and VQO Where Stand Treatment Occurs

1990 Willamette Forest Plan Management Areas	ROS and VQO	Treatment Acres	
		Alt 2 and 4	Alt 3
11a - Scenic-Modification Middleground	ROS - Roaded Modified, VQO of Modification.	75	20
14a – General Forest	ROS - Roaded Modified, VQO - Maximum Modification.	463	467
15– Riparian Reserve	ROS - Roaded Natural VQO - Partial Retention.	168	161

Driving for pleasure (sightseeing) is considered a major use in the area, on both aggregate surfaced and paved roads. The use of Forest road system varies from very light use on most dead end roads, to moderate use on secondary and connector and Key Forest roads. Secondary and connector roads receive increased use during the hunting season.

Forest Road 19 is approximately 59 miles in length from State Highway 126 to Westfir, Oregon, 5 miles of which is in the Hartz Project area. Forest Road 19 receives seasonally heavy traffic from motorcycles, RV's, logging trucks, passenger cars and pickups, as well as bicycles. The traffic use decreases in the winter months due to the snow levels, and remains closed at Box Canyon at the southern district boundary for three to four months.

Hidden Lake is the most popular day use area in the project area. Hidden Lake is located off Forest Road 1980, and became a day use area in April 1998. Uses is restricted to overnight camping to outside of ¼ mile from the lake, and consists of swimming, rafting, hiking and fishing. Hidden Lake falls is within Management Area MA-5a – Special Interest Areas (SIA). Hidden Lake became a SIA with the 1990 Willamette Forest Plan. The desired condition for Hidden Lake SIA is to continue to provide unique features in a mostly undisturbed environment.

Terwilliger Hot Springs Day Use area is along Cougar Reservoir, approximately 5 miles from the Hartz project area on Forest Road 19. This day use area is along a likely haul route for implementation of the proposed action. During the summer months there could be as many as 100-300 visitors crossing Forest Road 19 from the Terwilliger Hot Springs parking lot to the Rider Creek trailhead that leads into the hot springs.

Few dispersed campsites are located within the project area. The number and location of sites may vary somewhat as road closures limit access to some areas, and as new roads open others. The more popular sites are often found on open roads and landings, and many people return to favorite sites year after year. Red Diamond and Hard Rock campgrounds are developed sites located in the project area along the South Fork McKenzie River.

Indian Ridge Lookout stands on Indian Ridge at an elevation of 5,405 feet. It is also within Hidden Lake Special Interest Area. The 16 ft. x 16 ft. cabin sits atop a 30-foot tower, and was built in 1958. The lookout is open from July until the end of September depending on the snow conditions, and is a popular destination for sightseeing. Indian Ridge is included in the Cabin Rental program and rented through the National Recreation Reservation Service, is consistently reserved every day during a season.

Approximately ½ mile of the Indian Ridge trail (#3315) is located within the Hartz project area. It originates approximately ¼ mile below the Lookout on Forest Road 1980. The total trail length is approximately 2.1 miles long. This trail is managed for non-motorized uses such as hikers and pack and saddle. Some spots along the trail offer breath-taking views of surrounding mountains. The trail traverses bear grass meadows and second growth Douglas-fir.

Scenic Quality

The scenic viewshed of the project area has been heavily modified with timber management over the past four decades. Timber management, mostly with clearcutting and shelterwood timber harvest, is evident on the landscape from the patchwork appearance. This past management activity has created variable size openings and a range of stand ages in the second growth stands, considered desirable to some for hunting and sightseeing.

Clearcutting has occurred in the Hartz Project Area in both Quartz and Hardy subwatersheds as recent as 1993. The project area includes Visual Management allocations MA 11a – Scenic, Modification Middleground, and MA 11c – Scenic, Partial Retention Middleground, within the Hardy subwatershed. The project area also includes MA 5a along the South Fork McKenzie River, as a designated Wild and Scenic Study River, and an Oregon State Scenic Waterway.

The action alternatives include harvest units 22 and 25 within Management Area 11a, which is located on the mid-slopes above the South Fork McKenzie River. The viewshed for this management area is fully roaded and has a variety of stand ages from previously harvest units mostly completed before 1993. All clearcuts were planted immediately after harvest, and are all are currently fully stocked with trees. Approximately 33 acres is still in a disturbed condition for this analysis, meaning the average height of the reforested stand is less than 4.5 feet tall. This acreage was planted in 2000 (Southside Elk Timber Sale). Less than 1% of the entire MA 11a viewshed can be considered in “disturbed”. The viewshed is considered “recovered” and within Forest Plan Standards and Guidelines (MA-11a-08, and MA-11a-09). The Visual Quality Objective (VQO) of “Modification” for this allocation is also met.

South Fork McKenzie Wild and Scenic Study River

The South Fork of the McKenzie River has been determined to meet the criteria for inclusion in the National Wild and Scenic River System (NWSRS). It is designated as the South Fork McKenzie River Wild and Scenic Study River. A portion of segment 2 of the South Fork McKenzie along Forest Road 19 falls within the Hartz project area. One of the river’s criteria for inclusion into the NWSRS in Segment 2 meets criteria for Outstanding Remarkable Value because of the variety of recreational opportunities. The highly visual backdrop of the landscape within the corridor’s mature and old growth forest, combined with the beauty of the South Fork McKenzie River to meet the scenery value.

Oregon State Scenic Waterway

The Oregon Scenic Waterway program is administered by the Oregon State Parks and Recreation Department. The South Fork McKenzie River was added to the State Scenic Waterway Program in 1988. According to the Eligibility Determination for South Fork McKenzie River, goals of the program include the protection of the free-flowing character of the river for fish, wildlife, and recreation and to protect and enhance scenic aesthetic, natural recreation, scientific, and fish and wildlife values along the scenic waterway (U.S. Forest Service, 1992)

Environmental Consequences

Effects of Alternative 1(No Action)

Direct and Indirect Effects:

Current uses of the National Forest in the project are and on Forest Road 19 would remain unchanged with the No Action alternative. The recreating public would continue to use the project area for all forms of recreation, especially recreational driving. The public would continue current use of dispersed sites, day use areas, developed sites, and trails. Scenic quality along the South Fork McKenzie River would remain unchanged.

However, with the No Action Alternative, current recreation experience would change over the long term (10-20 years) as young forest stands grow and views from the road system diminish. The in growth of trees would block vistas, and traveling on trails may become more difficult.

Effects of Alternative 2 - 4

Direct and Indirect Effects:

The direct effect of proposed timber harvest, log truck hauling, underburning, and fuel treatments would be localized road closures; disruptions to hunting, hiking, camping and driving in some areas. The logging activity and hauling could cause noise and dust disturbance. The duration of these effects would only last for during implementation. It is unlikely that all recreation use in the area would be affected at the same time.

Recreation use of Hidden lake could be affected by hauling on Forest Road 1980. Use could be diverted to other water-recreation areas for people interested in Hidden Lake Day Use. A possible indirect effect of log hauling and noise on Forest Road 1980 would be more overnight use at Red Diamond and Hard Rock Campgrounds during the years of operation, because campers would use these developed campgrounds rather than established dispersed campsites.

The direct effect of opening up some of the forested areas could provide better habitat for wildlife, which could possibly provide more wildlife viewing for the forest visitors. Forest travelers desire a view of a mosaic of natural forest settings in the course of their visit.

There would be no direct effects to the Indian Ridge trail, West Cascade National Scenic Byway or the South Fork McKenzie River Study. Recreational use of Indian Ridge Lookout would be affected by additional log hauling traffic on Forest road 1980. Alternatives 2 and 4 include regeneration harvest unit 25, which may be noticeable from the lookout. However, since the viewable opening of unit 25 includes a thinned riparian reserve in the middle of the unit, the clearings would be very small. The openings from unit 25 would comprise less than 1 % of the viewable landscape from the lookout, and the new created openings would not be a dominant feature on the landscape.

Under alternatives 2 and 4, thinning harvest units proposed in units 2, 23, and the regeneration harvest in unit 25 are within the viewshed of the South Fork McKenzie River but they could not be seen from viewpoints along the river, or on Aufderheide Scenic Byway.

There would be no direct or indirect effect on the South Fork McKenzie Wild and Scenic Study River that would diminish the Outstandingly Remarkable Values that have allowed its eligibility for inclusion into the Wild and Scenic Rivers system. There would also be no direct or indirect on the river's special attributes qualifying it as an Oregon State Scenic Waterway.

Cumulative Effects

Past activities have cumulatively created a network of roads in the Hartz Project area that now benefit the recreating public that seeks a roaded experience in the National Forest. Development of the current road system provides access to the Hidden Lake Day Use Area and Indian Ridge Lookout for recreation. Past clearcutting has created a diversity of forest setting and a variety of vistas to observe from the roads, trails, and in a dispersed recreation manner.

The timber harvest and road closure activities in the Hartz Project would have a very small incremental effect on the recreational experience within the project area for activities dependent on driving forest roads or accessing areas within the project area. Road closures amount to less than 5% of the total open road in the project area.

The proposed action would have no incremental cumulative effect on public access to Hidden Lake and Indian Ridge Lookout, and does not diminish the experience for visitors using these areas.

The proposed action would have a small incremental effect on visual quality by removal of 15 acres with in MA-11a from regeneration unit 25. The 15-acre opening constitutes less than 1% of the viewshed for this Management Area, which includes the South Fork McKenzie River Wild and Scenic Study River, and Oregon State Scenic Waterway. The regeneration harvest proposed within MA-11a also does not exceed Willamette Forest Plan Standards and Guidelines.

The proposed action would not have incremental cumulative effects on the South Fork McKenzie River that would decrease or diminish the Outstandingly Remarkable Values that have allowed its eligibility for inclusion into the Wild and Scenic Rivers system; or on the river's special attributes qualifying it as an Oregon State Scenic Waterway.

Roadless and Unroaded Areas

Affected Environment

The Hartz Young Stand Management Project Area does not include any Inventoried Roadless Areas (IRAs). However, the project area does include contiguous unroaded areas 1,000 acres or more in size. Because the Hartz Project area has been extensively roaded in the past, the unroaded areas do not exist in large blocks. The areas are between existing roads and are somewhat linear features, and no location in the project area is more than one mile from an existing road or previously managed stand.

Thinning treatments are proposed within areas considered unroaded areas. Units 9 and 12 area in previously managed stands that were clearcut in the 1950s, and then planted with seedlings. Existing roads provide access to both units. The unroaded areas in and around units 9 and 12 do not have the potential for future designation as Wilderness because they are surrounded by roads, and are approximately 6 miles from the Chucksney Mountain IRA to the southeast.

Environmental Consequences

Effects of Alternative 2 - 4

Direct and Indirect Effects:

Units 9 and 12 would be thinned to various densities in all action alternatives. Since yarding would be done with a combination of helicopter and skyline systems from existing roads, no permanent or temporary roads would be constructed to affect the roaded condition. The action alternatives do not increase the current managed acres within any unroaded areas.

The effects of the action alternative on water quality, soils, and air are discussed elsewhere in this chapter (Aquatic and Riparian Habitat and Soils). Thinning managed stands within the unroaded areas would not adversely affect roadless characteristics derived from these resources. Thinning managed stands in the unroaded areas would also not affect the ability for this area to function as a source of public drinking water to communities downstream.

Because of past management activities in the area around units 9 and 12, there is not a diversity of plant and animal species that would be found in natural, unmanaged stands where disturbance from roading and accompanying activities have not occurred. Therefore, none of the action alternatives are expected to lead to an incremental decrease in overall diversity of plant and animal species. The effects on plant and animal species are discussed elsewhere in this chapter.

Units 9 and 12 are currently dispersal habitat for the northern spotted owl. Thinning in these units with all alternatives would result in the short-term reduction of dispersal habitat in the unroaded areas (see Threatened Northern Spotted Owl above). Effects of the proposed thinning on the habitat for other Threatened, Endangered, or Sensitive species are discussed elsewhere in this chapter. The areas where management activities are proposed are not large enough to function as biological strongholds or refuges for species that depend on large undisturbed areas.

Past management actions have created a heavily roaded landscape in the Hartz Project area, with a patchwork of second growth conifer plantations. As stated elsewhere in this chapter, the proposed action and the other action alternatives would not adversely affect the scenic quality of the landscape.

There are limited opportunities for recreation activities that depend on remoteness and wilderness-like experiences in this area, as discussed elsewhere in this chapter (see Recreation and Scenic Quality). Except for noise and traffic occurring during project implementation, the proposed action and other action alternatives would have no long-term affect on the sense of remoteness or solitude within unroaded areas that does currently exists within the project area.

As discussed later in this chapter, there are no known cultural sites within any of the stands where timber harvest operations would occur, including managed stands within unroaded areas. There would be no effect on traditional cultural properties or sites with implementation of the proposed action and other action alternatives.

Cumulative Effects:

The thinning of units 9 and 12 within the unroaded areas would not result in a loss or reduction of any roadless characteristics identified within the Hartz Project area. Considering the cumulative effect of past actions in the project area, and the reasonably foreseeable future action of precommercial thinning, no incremental change is expected to the existing unroaded condition of the Hartz Project area.

Social/Economics

Affected Environment

The economy of the local communities from the Springfield urban-growth boundary to McKenzie Bridge depends on a mixture of tourism, recreation, timber industry, and Forest Service jobs for stability. Local businesses that rely on tourism and recreation include Hoodoo Ski Bowl, and the many inns, lodges, restaurants, stores, gas stations, and the outfitters and guides. Timber industry jobs include a variety of woods and mill jobs. Forest Service jobs in the vicinity are located at McKenzie Bridge, Blue River, Sisters, Detroit, and sweet Home Ranger Stations. Tourism and recreational activities connected with National Forest lands have been on the increase in recent years for the upper McKenzie River. Employment in tourism and recreation-related services has also increased accordingly.

The current level of timber harvesting on the Willamette National Forest has dropped substantially from the levels of the late-1980s. This decrease has contributed to a decline the number of local jobs associated with wood products industry in the area.

Viability of Harvest

The Hartz planning area has 545 acres of 30 to 40 year old stands that were initially included in the Hartz Young Stand Management Project. Stand Exams were conducted on all the units proposed for harvest in 2003, and 2004. Many of the units were found to have high densities at or above 40% maximum SDI. The stands were located in areas where the steep ground made helicopter the only feasible logging system used for harvesting. The stands were therefore eliminated from the project and further analysis.

Environmental Consequences

Effects of Alternative 1(No Action)

Direct and Indirect Effects

This alternative would not harvest any timber and therefore, would not support direct, indirect, and induced employment, or increased income to local economies. Current trends in timber harvesting from National Forest lands would continue into the future. Current employment in the wood products sector of the local economy would not be effected.

Effects of Alternatives 2-4

Direct and Indirect Effects

In general, the primary effect on timber harvest-related employment would occur from commercial harvest associated with the alternatives over the next two to four years. All action alternatives were found to be financially viable, and would provide opportunities for timber harvest-related employment. However, the proposed action is expected to contribute very small incremental effects on the socio-economic environment.

Table 45: Estimated Present Net Value of Alternatives

	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Volume (MMBF)	11.6	9.4	13.5
Discounted Revenues*	$4,815,790	$3,899,980	$5,607,000
Discounted Costs	$3,638,332	$2,913,273	$4,155,141
Net Present Value (NPV)	$858,044	$720,824	$1,063,033
NPV per Acre	$1,215	$1,112	$1,506

* Discounted Revenues based on February 2005, selling values.

Heritage Resources

Affected Environment

There are a number of cultural resources within the larger Hartz planning area. They include ancient prehistoric lithic sites (of varying sizes), historic period American Indian peeled tree locations (culturally modified trees), historic cabin sites and historic trails.

Prehistoric Settlement

The overall Hartz Planning Area contains a moderate density of prehistoric lithic (stone tool) archeological sites. The moderate site density relates to the likely position of the area within prehistoric hunter/gatherer settlement patterns in the upper McKenzie area. While much of the area exhibits very steep topography, there is abundant water, productive big game habitat, and before the era of fire suppression, abundant huckleberries on ridgetop locations. Thus, it was a fairly attractive hunting and foraging area, despite the rugged topography.

Recent archeological surveys conducted in concert with the District's timber sale program have increased the sample of known sites. The known, fully documented sites in the vicinity of the Hartz Planning Area are assumed to be eligible to the National Register of Historic Places because of their ability to yield information about prehistory. They are "lithic" sites, comprised of obsidian chipped stone tool making debris and discarded tools; basalt and other lithic raw materials are a minor fraction of the artifacts in some of the sites. Tool making debris found in the archeological sites within the area tends to be at low to moderate densities. Most of the archeological evidence appears to derive from the Middle Archaic period of about 6,000-2,000 years ago.

Historic Native American Land Use

Before the 1855 Dayton Treaty, west-side Indian bands (likely ancestors of the Molalla and Kalapuya) used the area. A band of Kalapuya Indians lived at the mouth of the McKenzie, near its confluence with the Willamette River. They may have visited or traveled through the area during the summer and fall. However, once they were relocated to the Grand Ronde or Siletz Reservations in the Coast Range (in the mid to late 1850s), they could not easily get to the area.

The 1851 Gibbs and Starling treaty sketch map depicts this part of Western Oregon as being within the tribal area of the Molalla Indians. A band of Molalla Indians lived in the Oakridge area until the 1870's, and it is well documented that members or survivors of that band actively hunted along Indian Ridge, in the approximate center of the Hartz planning area.

Euro-American Settlement

Homesteading did not take place within the Hartz Planning Area. Perhaps the most significant historic development was that of the Forest Service transportation system (roads and trails) and fire lookout system, since it enabled the implementation of the fixed-point fire suppression system as well as commercial logging.

Traces of early to mid-20th Century Euro-American activity are found in Forest Service trail blazes, old roads, trails, fire lookout sites, etc. Thus far, none of these have been formally evaluated as historically significant. In terms of recreational development, a special use permit in the past was issued for a structure known as Hardy Cabin, near the confluence of Hardy Creek and the South Fork McKenzie River; the permit was initially issued in 1913, and reissued in 1920 and 1931. No traces of the cabin (a small hunting and fishing lodge) remain above ground.

Archeological Methodology

This heritage assessment of the Hartz project area is based on a detailed records search. Those records included historic overviews, project-specific field survey reports, field notes, archeological site base maps, archeological survey base maps, and archeological site files kept at the McKenzie River Ranger District. Archeological field surveys were completed for areas proposed for ground-disturbance in the Action Alternatives. Existing, surfaced access routes were not surveyed, while un-surfaced access routes were surveyed if no acceptable prior survey pertains. No cultural resources were discovered during those surveys.

Environmental Consequences

Effects of Alternative 1(No Action)

Direct and Indirect Effects

Under Alternative 1, no effects to cultural resources are expected since no ground disturbance activity would occur.

Effects of Alternatives 2-4

Direct, Indirect, and Cumulative Effects

All action alternatives for the Hartz Project would cause ground disturbance on up to 706 acres of ground in harvest units and up to 2,050 feet of temporary road construction (Alternatives 2 and 4), with lesser amounts of potential disturbance in Alternative 3 (648 acres). These proposed activities could affect the condition of significant heritage resources. Since appropriate and approved surveys were undertaken and no cultural resources were documented, the foreseeable effects would be in the form of inadvertent damage to the integrity of heritage resources, which were not discovered during initial survey. Any such discoveries of previously unknown heritage sites would result in evaluation against National Register of Historic Places criteria for significance and design measures as described in Chapter 2 would be implemented.

Therefore, there are no incremental cumulative effects from implementation of the proposed action on heritage resources. There are no foreseeable future management activities within the Hartz project area involving ground disturbing activities. Any sites identified after the project would require surveys to be completed and design measures applied as necessary.

Compliance with Other Laws, Regulations and Policies

This section describes how the action alternatives comply with applicable State and Federal laws, regulations and policies.

Federal Laws:

The Preservation of Antiquities Act, June 1906 and the National Historic Preservation Act, October 1966 – Before project implementation, State Historic Preservation Office consultation is completed under the Programmatic Agreement among the United States Department of Agriculture, Forest Service, Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer regarding Cultural Resource Management on National Forests in the State of Oregon, dated June 2004. Field surveys where ground-disturbing activities would occur in the Hartz Young Stand Management Project area have been completed. The surveys did not identify any sites. Should sites be found during ground disturbing activities, contract provisions would provide protection and the McKenzie River District Archaeologist would be immediately notified. These measures resulted in a determination of **No Historic Properties Affected**. Because heritage resources would not be affected by proposed activities under any action alternative, there would be no effect to any historic property listed in or eligible to the National Register of Historic Places.

The Endangered Species Act (ESA), December 1973 – The ESA establishes a policy that all federal agencies would seek to conserve endangered and threatened species of fish, wildlife and plants. Biological Evaluations for plants and wildlife have been prepared, which describes possible effects of the proposed action on sensitive, and other species of concern that may be present in the project area. A Biological Assessment (BA) was prepared for the northern spotted owl, and for the threatened bull trout and spring chinook salmon. See "Consultation and Coordination – Coordination with Other Governments and Agencies", in this chapter.

Clean Air Act Amendments, 1977 – The alternatives are designed to meet the National Ambient Air quality standards through avoidance of practices that degrade air quality below health and visibility standards. This project is consistent with by the 1990 Clean Air Act and the 1977 Clean Air Act and its amendments (see Chapter 3, Fire and Fuels Section).

The Clean Water Act, 1987 –This act establishes a non-degradation policy for all federally proposed projects. Compliance with the Clean Water Act would be accomplished through planning, application and monitoring of Best Management Practices (BMPs).

There are no streams within the Quartz Creek sub-watershed listed by Oregon Department of Environmental Quality as water quality limited based on water temperature, or any other water quality limited factors. An un-named tributary of Rebel Creek, which is adjacent to the Hartz Project Area boundary, is listed by Oregon Department of Environmental Quality as 303(d), water quality limited based on water temperature during the summer season. (See Aquatic and Riparian Habitat, page 56)

Federal Mine Safety and Health Act of 1977, Public Law 91-173, as amended by Public Law 95-164. Development of rock pits would conform to the requirements of the act, which sets forth mandatory safety and health standards for each surface metal or nonmetal mine. The purpose for the standards is to protect life by preventing accidents and promoting health and safety.

Magnuson-Stevens Fishery Conservation and Management Act, 1976 (MSA) – The Hartz project area is in the middle of the McKenzie River sub-basin. The McKenzie River channel and the South Fork McKenzie River below Cougar Dam, is listed as Essential Fish Habitat (EFH) for spring chinook salmon. The project area is located in both the Quartz Creek drainage, up stream from the McKenzie River; and in the South Fork McKenzie River drainage, upstream from Cougar Dam and Reservoir. Neither Quartz Creek nor the South Fork McKenzie River, above Cougar Dam, is listed as EFH for spring chinook salmon.

Wild and Scenic Rivers Act, 1968 – Alternatives in this proposal are designed to maintain the Outstandingly Remarkable Values of the South Fork of the McKenzie River Wild and Scenic Study River. No actions occur within the Special Interest Area designated for this WSR Study River.

Inventoried Roadless Areas and Wilderness – There are no actions proposed within Inventoried Roadless Areas (IRAs) or Wilderness in the Hartz Young Stand Management project, and no actions would affect these designations where they occur adjacent to the project area.

Executive Order 13186: Neotropical Migratory Birds – 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 Hartz Project Area contains populations of migratory landbirds typical of the western Cascades. See page 96, Migratory Land Bird and Management Indicator Species for further discussion of effects on neotropical migratory birds.

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. Proposed harvest treatments would not occur within 100-year floodplains.

Executive Order 11990 requires government agencies to take actions that minimize the destruction, loss, or degradation of wetlands. Streamside riparian reserves, seeps, springs, and other wet habitats exist in the Hartz Project Area. These areas would be either avoided, or managed according to Riparian Reserve Management Guidelines in Chapter 2 to comply with amended Willamette Forest Plan Standards and Guidelines. Riparian reserves would also be protected with Mitigation Measures also detailed in Chapter 2. As a result, proposed harvest treatments would be consistent with Executive Orders 11988 and 11990.

Executive Order 12898: Environmental Justice – Executive Order 12898 requires that federal agencies adopt strategies to address environmental justice concerns within the context of agency operations. With implementation of the Proposed Action or any of the alternatives, there would be no disproportionately high and adverse human health or environmental effects on minority or low-income populations. The actions would occur in a remote area, and nearby communities would mainly be affected by economic impacts connected with contractors implementing harvest, road reconstruction, tree thinning, planting, fuels treatment activities. Racial and cultural minority groups could also be prevalent in the work forces that implement timber harvest, road reconstruction, tree thinning, planting, and fuels treatment activities. Contracts contain clauses that address worker safety.

The National Environmental Policy Act (NEPA), 1969 – NEPA establishes the format and content requirements of environmental analysis and documentation. Preparation of the Hartz Young Stand Management Project EA was done in full compliance with these requirements.

The National Forest Management Act (NFMA), 1976 – All proposed harvest units are planned on suitable land, and will be capable of restocking within 5 years of harvest by either natural or artificial means. All units were considered for potential uneven-aged management. Proposed commercial thinning would increase the rate of growth of remaining trees, and would favor species or age classes most valuable to wildlife. The resultant reduced stress on residual trees would make treated stands less susceptible to pest-caused damage. Mitigation has been identified to protect site productivity, soils, and water quality.

The burning of activity fuels would reduce long-lasting hazards from wildfire over the project area as a whole, while air quality would be maintained at a level that would meet or exceed applicable Federal, State, and local standards. All proposed activities would provide sufficient habitat to maintain viable populations of fish and wildlife, and critical habitat for threatened or endangered species would be protected. Proposed activities are designed to accelerate development of forest habitats that are currently deficient within the analysis area, enhancing the diversity of plant and animal communities in the long-term. See discussions under the applicable resource sections above, for further support that proposed activities would comply with the seven requirements associated with vegetative manipulation (36 CFR 219.27(b)), riparian areas (36 CFR 219.27(e)), and soil and water (36 CFR 219.27(f)).

Forest Plan Consistency – The Willamette National Forest produced a Forest Plan in accordance with the National Forest Management Act of 1990, as amended. Chapter 1 names and describes major amendments to the Willamette Forest Plan since 1990. This plan provides guidelines for all natural resource management activities and establishes management standards. Current Forest Plan direction identifies fuel standards by management area across the forest.

The vegetative manipulation (commercial and non-commercial thinning) associated with the Hartz Young Stand Management project is consistent with the Willamette National Forest Land and Resource Management Plan FEIS and Record of Decision (see Silviculture Report for details of the prescriptions).

Other Jurisdictions – There are a number of other agencies responsible for management of resources within the Hartz Project Area. The Oregon Department of Fish and Wildlife is responsible for management of fish and wildlife populations, whereas the Forest Service manages the habitat for these animals. The Oregon Department of Fish and Wildlife has been contacted regarding this analysis.

Proposed harvest treatments within riparian areas have been designed to comply with "Sufficiency Analysis for Stream Temperature – Evaluation of the adequacy of the Northwest

Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards" (USDA Forest Service and USDI BLM, 2004). This document was prepared in collaboration with Oregon Department of Environmental Quality and United States Environmental Protection Agency to provide documentation of Northwest Forest Plan compliance with the Clean Water Act with regard to state water quality standards for stream temperatures. As such, it redeems several of the Forest Service responsibilities identified in "Memorandum of Understanding between USDA Forest Service and Oregon Department of Environmental Quality To Meet State and Federal Water Quality Rules and Regulations" (USDA Forest Service and Oregon DEQ, May 2002). The Sufficiency Analysis provides current scientific guidance for management of riparian vegetation to provide effective stream shade, including appropriate methods of managing young stands for riparian objectives other than shade, such as production of large wood for future recruitment.

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 will comply with the State of Oregon's Smoke Management Implementation Plan and, for greater specificity, see the memorandum of understanding mentioned above.

Energy Requirements and Conservation Potential – Some form of energy would be necessary for proposed projects requiring use of mechanized equipment: Commercial thinning would involve small machines, while projects such as road reconstruction and maintenance could require heavy machinery for a small amount of time. Both possibilities would result in minor energy requirements. Alternatives that harvest trees could create supplies of firewood as a by-product, which would contribute to the local supply of energy for home space heating.

Prime Farmland, Rangeland, and Forestland – No prime farmland, rangeland, or forestland occurs within the analysis area.

Unavoidable Adverse Effects – Implementation of any of the alternatives, including the No Action alternative, would inevitably result in some adverse environmental effects. The severity of the effects would be minimized by adhering to the direction in the management prescriptions and Standards and Guidelines in Chapter IV of the Willamette Forest Plan and additional Mitigation Measures and Design Measures proposed in Chapter 2 of this document. These adverse environmental effects are discussed at length under each resource section.

Irreversible and Irretrievable Effects – "Irreversible" commitment of resources refers to a loss of future options with nonrenewable resources. An "Irretrievable" commitment of resources refers to loss of opportunity due to a particular choice of resource uses.

No new construction of permanent roads is planned. Temporary road would be constructed, but would be obliterated following operations. Log landings would produce irretrievable changes in the natural appearance of the landscape as well. Rock used to surface roads would be an irreversible commitment of mineral resources.

The soil and water protection measures identified in the Forest Plan Standards and Guidelines, Mitigation and Design Measures in Chapter 2, and Best Management Practices are designed to avoid or minimize the potential for irreversible losses from the proposed management practices.

Concerning threatened and endangered plant, wildlife, and fish species, a determination has been made that the proposed actions will not result in irreversible or irretrievable commitment of resources that foreclose formulation or implementation of reasonable or prudent alternatives.

With Alternative 1 (No Action): There would be an irretrievable loss of growth within the untreated, overstocked forest. Potentially, the ability to protect forest within the analysis area from catastrophic fire could be irretrievably lost as well. There would be an irreversible loss of timber value due to poor tree growth related to crowded conditions and insects and disease.

With all Action Alternatives (2, 3, and 4): Tree removal would result in an irretrievable loss of the value of removed trees for wildlife habitat, soil productivity, and other values. Log landings would produce irreversible changes in the natural appearance of the landscape. The visual effect of log landings would be somewhat reduced by mitigation measures and design measures to reduce soil compaction and erosion (seeding and waterbarring for example). Little irreversible loss of soil should occur due to extensive mitigation associated with timber harvest and prescribed fire (harvest only on slopes less than 35 percent, full log suspension, etc.).

Monitoring Plan

Noxious Weeds

As a mitigation measure to determine if the weed treatments were effective, post-sale noxious weed surveys will be completed by District personnel. The monitoring survey would occur 1 year after treatments with results reported to the district Botanist. Bermed and decommissioned roads would be monitored for noxious weeds for three years after the road treatment is completed. Follow up treatments would occur if necessary.

Logging Operations

During logging, operations would be monitored for adherence to contract specifications including thinning specifications, bole damage to residual trees, skid trail spacing and use of designated skid trails. Monitoring would be done by Timber Sale Administrators from the District.

Reforestation

Regeneration surveys will be conducted in the first and third year by District personnel after planting to assess natural and planted seedlings survival and growth. Replanting will occur if necessary.

Forest Plan Implementation Monitoring

Timber sales from this project would be likely candidates for Forest Plan Implementation monitoring. The Forest Supervisor's Staff performs annual project monitoring at each Ranger District, and compiles the results in the yearly Forest Monitoring Report.

Consultation and Coordination ____________________

Coordination with Other Governments and Agencies

Consultation with the State Historic Preservation Office (SHPO) for "No Effect" projects is facilitated by the June 2004 Programmatic Agreement among the Forest Service, the Advisory Council on Historic Preservation, and SHPO. Under the terms of that Agreement, concurrence authority for findings of No Effect has been delegated to the Forest Specialist. A concurrence of "No Historic Properties Effected" finding was received from Forest Archaeologist Cathy Lindberg (the designated Forest Specialist for the Willamette National Forest) on April 14, 2005. The concurrence form, documenting compliance with the National Historic Preservation Act, can be found in Appendix F.

The Hartz Project was introduced to the Confederated Tribes of the Grand Ronde at an annual Forest program of work meeting on February 26, 2004. The project was also introduced to the Confederated Tribes of the Siletz at a similar program of work meeting on March 17, 2004.

Formal and informal consultation with the U.S. Fish & Wildlife Service for effects to the northern spotted owl was initiated in 2004 for FY2005/2006 Habitat Modification Projects in the Willamette Province. A Biological Opinion was received on April 4, 2005 [FWS *reference*: 1-7-05-F-0228]. This Biological Opinion concludes the finding of no jeopardy and no adverse modification of critical habitat. This project may affect, but is not likely to adversely affect the northern spotted owl. Seasonal restrictions would be required to comply with the Biological Opinion.

Consultation with USDI Fish and Wildlife Service on the bull trout was initiated on March 4, 2005, and concluded on March 22, 2005. Consultation with NOAA Fisheries on spring chinook salmon was initiated on March 4, 2005, and was concluded on March 21, 2005. Both consulting agencies concurred with the Fisheries Biological Assessment and it's conclusion that the Hartz Project may effect but is not likely to adversely affect (NLAA) bull trout or spring chinook salmon.

Project Mailing List:

On December 18, 2003, project scoping letters were sent to the following Federal, State, and local agencies, elected officials, tribal organizations, and individuals known to have an interest in similar projects:

Federal, State, and Local Agencies:

Bill Castillo, Oregon Dept. of Fish and Wildlife
Jeff Ziller, Oregon Department of Fish and Wildlife
Jan Houck, Oregon Parks and Recreation Department
Laurie Power, Environmental Coordinator, Eugene Water and Electric Board
Mike McCann, Eugene water and Electric Board
Ron Rhew, USDI Fish and Wildlife Service
McKenzie Watershed Council

Tribal Organizations:

Cheryle Kennedy, Confederated Tribes of the Grande Ronde
Delores Pigsley, Confederated Tribes of the Siletz
Olney Patt, Jr., Confederated Tribes of Warm Springs Indian Reservation

Elected Officials:

County Commissioners, Lane County
US Senator Ron Wyden

US Senator Gordon Smith
US Representative Peter DeFazio

Individuals and Organizations:

Jim Baker, McKenzie Guardians
Jim Berl, Oregon Guides and Packers
Roger Borine, Oregon Hunters Assoc.
Ralph and Ellen Core
Terry Damon, Rosboro Lumber Co.
Ken & Louise Engelman, River Reflections
Mike Graney
Doug Heiken, Oregon Natural Resources Council
Jim and Nancy Holland
President, Obsidians
James Johnston, Cascadia Wildlands Project
Josh Laughlin, Cascadia Wildlands Project
Hugh Kern, Forest Issues Coord., Many Rivers Group, Sierra Club
Mike Kerrick
Bob Kintigh
Joan and Hector Leslie
Oregon Field Director, Rocky Mountain Elk Foundation
Lester McClure
Ross Mickey, Northwest Forestry Association
Trout Unlimited
Greg Pitts, Oregon Council, Federation of Flyfishers
Bryan Bird, Forest Conservation Council
John Muir Project
Peter Saraceno
Annette Simonson, Santiam Wilderness Committee
Manager, McKenzie River Chamber of Commerce
Dave Stone, Conservation Leader, Lane Co Audubon Society
Craig Patterson
Zane Smith
Andy Stahl, FSEEE
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List of Preparers

Rita Mustatia, Silviculturist and Project Leader

Eric Bergland, Archaeologist

David Bickford, Fisheries Biologist

Al Brown, NEPA Coordination and Planning

Tere Desilva, GIS and Mapping

Dan Fleming, Logging Systems Analyst

Susan Fritts, Botanist

Shane Kamrath, Wildlife Biologist

Steve Keable, Fire and Fuels Specialist

Tim Kee, Timber Stand Improvement and KV Coordination

Dave Kretzing, Hydrologist

Adrienne Launer, Transportation Planner

Jeri Ledgerwood, Recreation Specialist

Doug Shank, Soil Scientist

Ruby Seitz, Wildlife Biologist

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APPENDICES

Appendix A – Maps

Hartz Young Stand Management Project - Age Classes

Hartz Project Area - Fuel Model

Hartz Young Stand Management Project – Elk Emphasis Areas

Appendix B – Biological Assessment, Spring Chinook Salmon and Bull Trout

Appendix C – Biological Evaluation, Wildlife

Appendix D – Biological Evaluation, Botany

Appendix E – Elk Emphasis Area Analysis

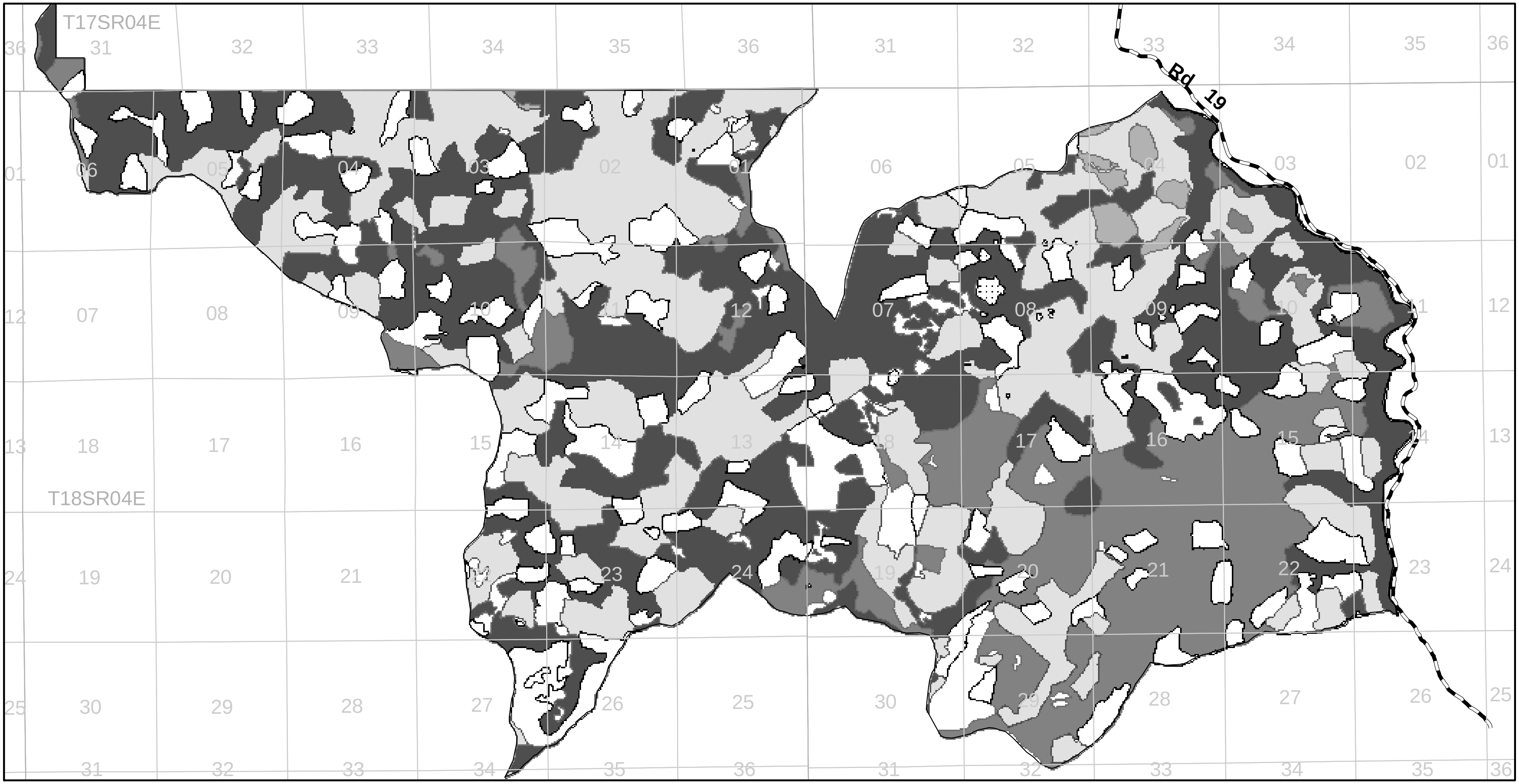
Appendix F – SHPO Concurrence Letter

Appendix G – Soils Specialist Report

Appendix H – Past Timber Sales

Appendix A – Maps

Hartz Young Stand Management Project - Age Classes



Ageclass

- 0-25 yrs (2004-1979)
- 26-50 yrs (1978-1954)
- 51-100 yrs (1953-1904)
- 101-150 yrs (1903-1854)
- 151+ yrs (1853-0)

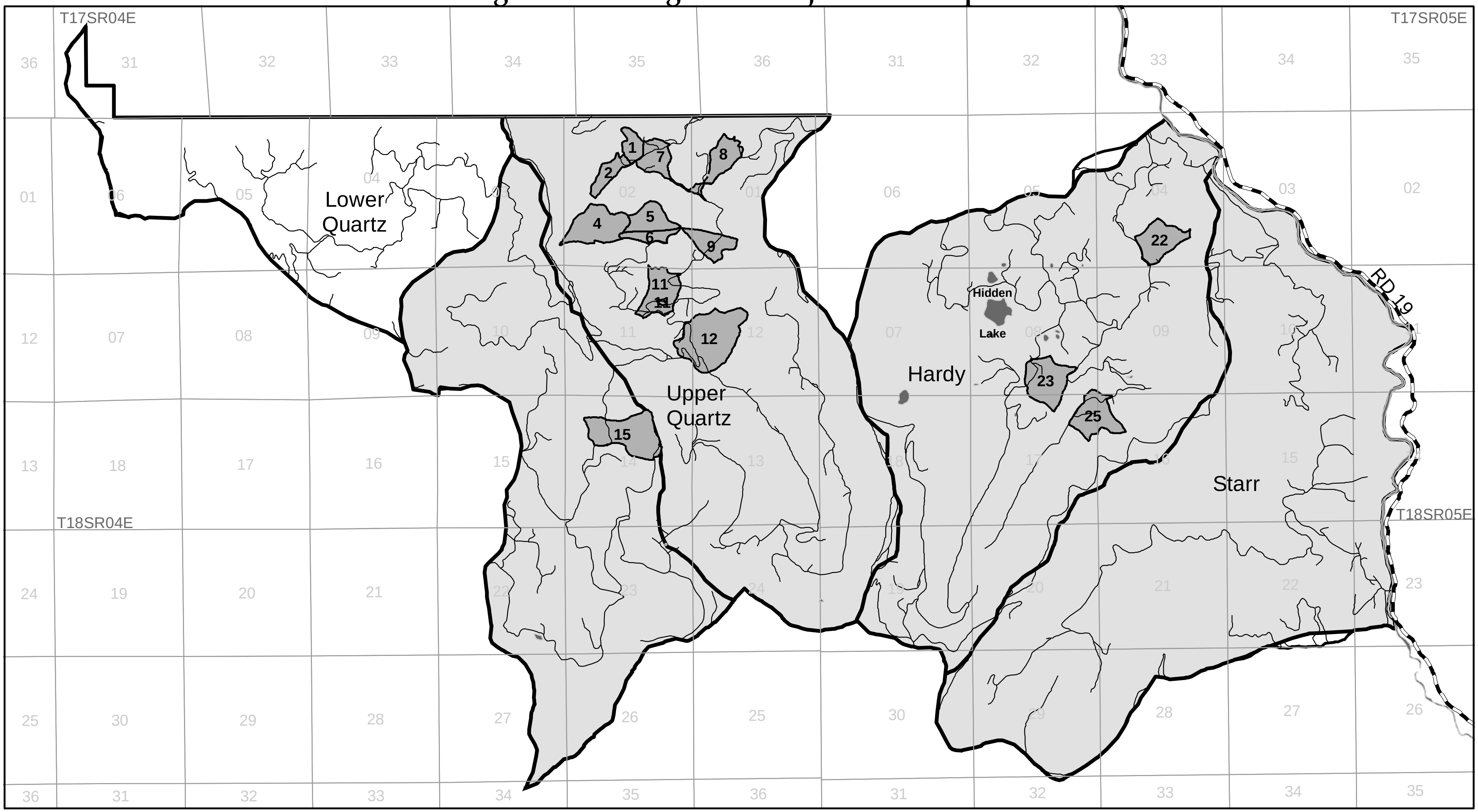
- Project Boundary
- Sections
- Lakes
- Road 19

N
W E
S

This product is reproduced from geospatial information prepared by the U.S. Department of Agriculture Forest Service. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Using GIS products other than those for which they were created may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification. For more information contact the Willamette National Forest.
01/13/2005

0 0.25 0.5 1 1.5 2 Miles

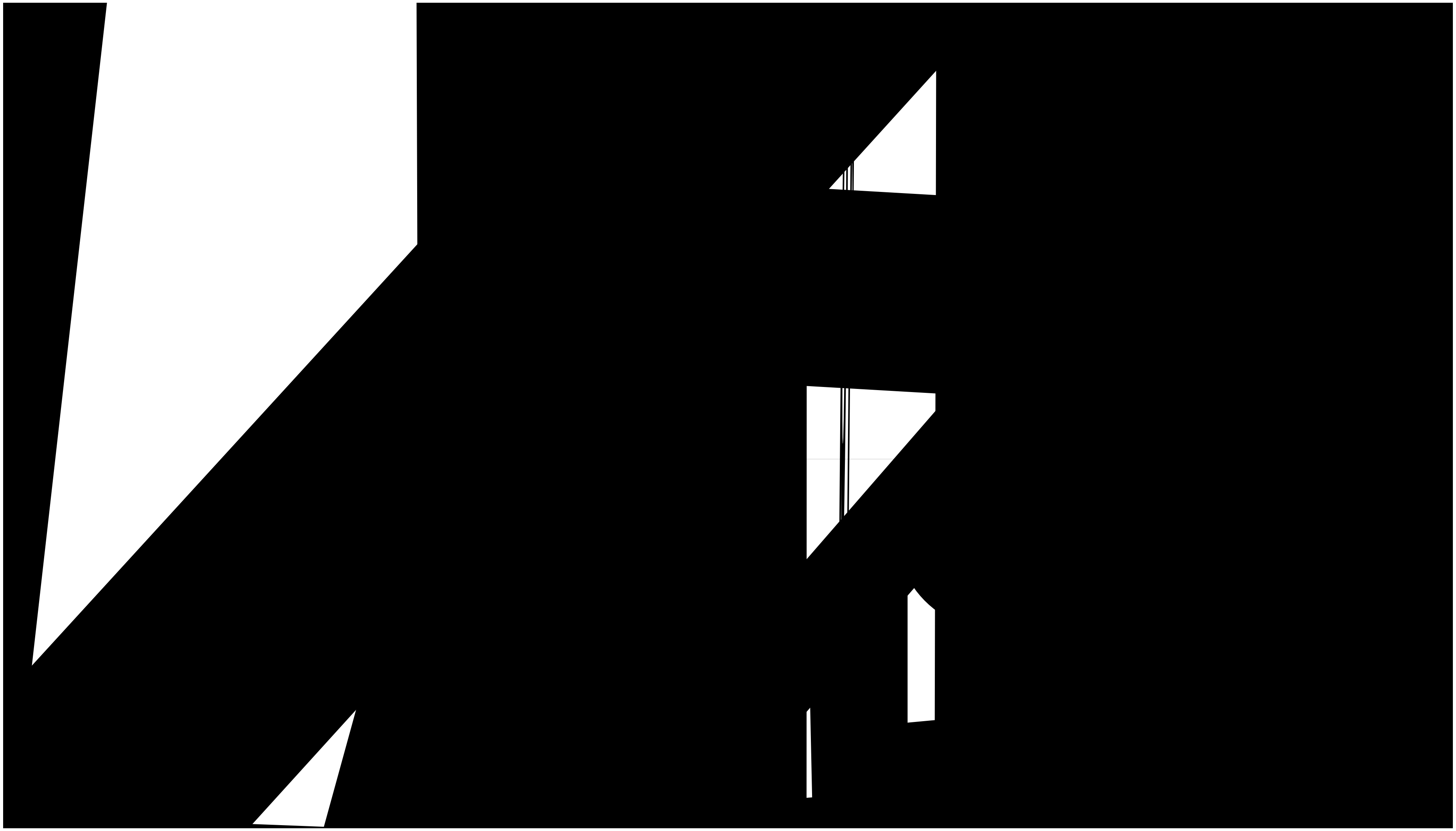
Hartz Young Stand Management Project - Elk Emphasis Areas



Low emphasis area
Mod emphasis area
Units
Lakes

N W E S

0 0.5 1 2 3 4 Miles



Appendix B –Biological Assessment, Spring Chinook Salmon and Bull Trout

Appendix B

Biological Assessment for Spring Chinook Salmon and Bull Trout

Hartz Young Stand Management Project

Willamette National Forest
McKenzie River Ranger District

1 March 2005

BIOLOGICAL ASSESSMENT

Project Name:

Hartz Young Stand Management Project

NEPA Document Name:

Hartz Young Stand Management Project Environmental Assessment, Draft

Watershed Analysis:

Quartz Creek and Minor Tributaries Watershed Analysis, Ecosystems Northwest for Willamette National Forest, 1998;

South Fork McKenzie River Watershed Analysis, Willamette National Forest, 1994.

Other ESA Consultation:

USFWS Wildlife Biological Opinion in progress

Administrative Unit:

Willamette National Forest, McKenzie River Ranger District

Prepared By:

Dave Bickford, Fishery Biologist, McKenzie River Ranger District, Willamette N.F.

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Dave Kretzing, District Hydrologist, McKenzie River Ranger District, Willamette N.F.

Reviewed By:

Wade Sims, ESA Consultation Biologist (Fisheries), Willamette and Siuslaw N.F.s

Date:

March 1, 2005

ESA Unit, Critical Habitat, and EFH Addressed in this BA:

LISTED SPECIES or HABITAT	ESA STATUS	ESA / EFH DETERMINATION
Upper Willamette Spring Chinook Salmon Ecologically Significant Unit (ESU)	Threatened	May Affect, Not Likely to Adversely Affect
Upper Willamette Spring Chinook Salmon Critical Habitat	Proposed	Will Not Adversely Affect
Columbia River Basin Bull Trout Distinct Population Segment (DPS)	Threatened	May Affect, Not Likely to Adversely Affect
Spring Chinook Salmon Essential Fish Habitat	N/A	No Adverse Affect

Project Location:

HUC	NAME	USGS HUC CODE	NW Forest Plan Key Watershed?
4th Field	McKenzie River	17090004	No
5th Field	McKenzie River/Quartz Creek	1709000405	No
6th Field	Quartz Creek	170900040501	No
5th Field	South Fork McKenzie River	1709000403	Yes

6th Field	South Fork McKenzie River/Hardy Creek/Rebel Creek	170900040304	Yes

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I. INTRODUCTION

The Hartz Young Stand Management Project (Hartz Project) is located in watersheds currently providing habitat for the Upper Willamette Spring Chinook Evolutionarily Significant Unit of chinook salmon (*Onchorhynchus tshawytcha*), and Bull Trout (*Salvelinus confluentus*) of the Columbia River Distinct Population Segment. Both species are listed as Threatened and are protected under the Endangered Species Act. This Biological Assessment (BA) evaluates the effects the project may have on these fish, their habitat or proposed critical habitat, and evaluates the effect of the project on Essential Fish Habitat (EFH) as designated by the Magnuson-Stevens Fishery Conservation and Management Act.

This BA was prepared in accordance with the following guidance and direction:

Analytical Process (AP) for Development of Biological Assessments for Consultation on Federal Actions Affecting Fish Proposed or Listed Under the Endangered Species Act Within the Northwest Forest Plan Area (Interagency Guidelines, November 2004),

Endangered Species Act of 1973 (as amended),

50 CFR § 402.12 (Interagency Cooperation, Biological Assessments),

Endangered Species Consultation Handbook (USFWS and NMFS, March 1998),

Streamlined Consultation Procedures for Section 7 of the Endangered Species Act (FS, NMFS, BLM,& USFWS, July 1999), and

Magnuson-Stevens Fishery Conservation and Management Act (§ 305(b)) and its implementing regulations (50CFR § 600).

The AP was prepared in conjunction with the recent efforts to clarify language in the 1994 Northwest Forest Plan Record of Decision regarding the Aquatic Conservation Strategy, and in response to concerns raised in previous litigation. NOAA Fisheries has worked with the U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM), and the Forest Service (FS) to revise the methods for making determinations of effect for land management activities impacting ESA-listed salmonid species in the Northwest Forest Plan geographical area. This new approach was used to assess the effects of the proposed action. In this regard, the elements of the proposed action were analyzed for potential effects on the Upper Willamette Spring Chinook Salmon and Bull Trout due to changes in the habitat pathways of water quality, habitat access, habitat elements, channel conditions and dynamics, flow/hydrology, and watershed conditions. In applying the revised analysis approach, the agencies consider eight factors, derived largely from the joint NOAA Fisheries and Fish and Wildlife Service ESA Section 7 Consultation Handbook, when evaluating the effects of an action on habitat indicators and subsequently the effects on ESA-listed fish. These factors are proximity, probability, magnitude (severity and intensity), nature, distribution, frequency, duration, and timing, where applicable.

This analysis considered the potential direct and indirect effect of the project’s elements on each habitat indicator and then utilized the relevant factors to determine if there was an effect and whether it was significant, insignificant, discountable, or beneficial. A summary for each habitat indicator was developed to ascertain whether effects from various elements combine to create adverse effects on any of the indicators. These effects are combined with the effects of other concurrent Federal action consultations and any interrelated or interdependent actions related to the proposed project to reach an overall effect determination for this project.

II. DESCRIPTION OF THE PROPOSED ACTION

A. Purpose and Need

Actions in the Hartz Young Stand Management Project (Hartz Project) area are designed to improve the health and diversity of previously harvested young stands that are currently in an overstocked condition. The need for action in these young stands was established from analysis of stand examinations performed in the field in 2004. Stand data shows that the maximum stand density index (SDI) levels are at about 50%, levels at which the limit of tree vigor is reached and overall stand health and tree vigor begin to decline. The purpose of this proposal is to apply silvicultural treatments to these young stands to maintain or improve tree growth and vigor, and to reduce the mortality that occurs in high-density stands when resources important to tree survival become limiting.

There is also a need for species and structural diversity within stands in the planning area. Timber harvest treatments designed to improve tree growth in the managed stands would also provide benefits to plant and wildlife habitat by promoting species and structural diversity by allowing the understory to develop in some areas.

The Willamette National Forest Land and Resource Management Plan, as amended, includes resource management goals to maintain or enhance forest conditions at the stand and landscape level; high quality water resources; aquatic habitat for fish, and terrestrial habitat diversity for wildlife and plants; scenic quality; and to provide timber products. The Forest Service is directed to meet these goals when planning projects at the site-specific level. Therefore, actions taken to meet the purpose and need shall be guided by the following objectives.

Reduce stand densities to improve forest health and diversity, primarily in previously managed young stands,

Increase the amount of large trees growing in riparian reserves capable of providing large wood to streams, especially within the Quartz Creek Watershed which is currently identified as deficit by the Quartz Creek and Minor Tributaries Watershed Analysis, and including the South Fork McKenzie River also identified as large wood deficit by the South Fork McKenzie River Watershed Analysis.

Reduce existing road density within the project area to improve aquatic and terrestrial habitat, habitat connectivity, reduce disturbance to elk and other wildlife species and reduce long-term road maintenance costs.

Provide a variety of habitat over the landscape including early-seral stands that are less than 10 years old.

Promote structural old-growth characteristics over time in stands located within Late Successional Reserves (LSRs).

Restore past vegetative conditions in non-forested areas.

Maintain scenic quality.

Generate economic benefits to the economy by providing timber products.

Figure A-1 (Project Location).pdf

Figure A-2 (Quartz Subwatershed).pdf

Figure A-3 (Hardy_Rebel Subwatershed).pdf

Figure A-4 (ESA Fish Distribution).jpg

Figure A-5 (Quartz_Units).pdf

Figure A-6 (Hardy_Units).jpg

B. Project Elements

Timber harvest activities are separated into six project elements which are described below and tracked through the analysis of effects section. All project elements are considered interrelated and interdependent to the Hartz Project. This project can be categorized into six primary project elements:

Timber Falling, Timber Yarding, Road Reconstruction (including culvert replacement and quarry development), Road Construction and Decommissioning, Timber Hauling, and Fuel Treatment. These elements are described below.

Timber Falling

The Hartz Project plans to commercially thin or regenerate 706 acres within young managed stands planted between 1946 and 1973 (trees aged 31 to 58 years old). Of 706 total project acres, 441 acres are proposed for thinning within the Quartz Creek sub-watershed, and 112 acres within the Hardy/Rebel Creek sub-watershed. Units proposed for regeneration total 85 acres within Quartz Creek and 58 acres within Hardy/Rebel Creek sub-watershed. A variable width no-cut riparian area buffer, depending upon whether full or partial suspension is possible, will be used to thin trees within the riparian reserve (Table B-1). Watershed analyses did not recommended riparian reserve widths different than interim widths described in the Northwest Forest Plan (NWFP). The Hartz Project will use riparian reserve widths as recommended in the NWFP, using site specific plant associations and site-potential tree height, as determined by certified silviculturalist: 300 feet on fish-bearing (Class II) streams, consisting of two site specific tree heights; 150 to 160 feet on permanently flowing nonfish-bearing (Class III) streams, consisting of one site specific tree height; and 150 feet on intermittent (Class IV) streams and small wetlands, consisting of one site specific tree height. Riparian reserve widths ranging from 150 to 160 feet along Class III streams is due to differing site plant associations.

Timber harvest activity has the potential to affect stream temperature through modification of canopy. In thinning riparian reserves to develop stem diameter, prescribed distances to channels was developed in part to minimize potential temperature impact to year-round waterways, using the guidance provided in Sufficiency Analysis for Stream Temperature (USDA Forest Service and USDI BLM, 2004). The following table summarizes riparian reserve thinning prescriptions, designed to minimize potential temperature impact to aquatic habitat (equipment proximity to channels and potential to generate sediment was also a consideration in developing riparian reserve management prescriptions described below).

Table B-1. Riparian Reserve Management for Hartz Project.

Stream Classification	All Silvicultural Treatments where full suspension can be maintained during harvest activities. (Includes treatment of activity fuels)	All Silvicultural Treatments where only partial suspension can be maintained during harvest activities. (Includes treatment of activity fuels)
Fish-bearing Streams (Class I Streams)	No Hartz units are located adjacent to listed species occupied habitat or to proposed spring chinook critical habitat.	No Hartz units are located adjacent to listed species occupied habitat or to proposed spring chinook critical habitat.
Fish-bearing Streams (Class II Streams)	60' No Harvest buffer and retain a minimum 50% canopy closure in the remainder of the 300’ riparian reserve.	75' No Harvest buffer and retain a minimum 50% canopy closure in the remainder of the 300’ riparian reserve.
Permanently flowing nonfish-bearing streams (Class III Streams)	30' No Harvest buffer and retain a minimum 50% canopy closure in the remainder of the 150’ to 160’ riparian reserve.	50' No Harvest buffer and retain a minimum 50% canopy closure in the remainder of the 150’ to 160’ riparian reserve.
Intermittent Streams (Class IV Streams)	Retain bank stability trees and a minimum 50% canopy closure in the remainder of the 150' riparian reserve.	30' No Harvest buffer and retain a minimum 50% canopy closure in the remainder of the 150’ riparian reserve.
Ponds and Wetlands less than 1 acre	30' No Harvest buffer and retain a minimum 50% canopy closure in the remainder of the 150’ riparian reserve.	50' No Harvest buffer and retain a minimum 50% canopy closure in the remainder of the 150’ riparian reserve.

Note: A minimum canopy closure of 40% will be permitted in riparian reserves harvested by helicopter to facilitate operational safety requirements. Class II Streams is a classification of the Willamette NF plan and is applied to any channel providing habitat to native fish species such as cutthroat, sculpin, rainbow. Class I Streams is applied to any channel providing habitat to at-risk species (spring chinook and bull trout), and to channels providing domestic water supply.

Full riparian reserves based upon stream classification would be used in stands proposed for thinning or regeneration. Thinning strategies within riparian reserves would be applied to all units with reserves, whether thinned or regenerated, using treatments described in Table B-1. For all action alternatives, treatment within riparian reserves has been designed to comply with "*Sufficiency Analysis for Stream Temperature - Evaluation of the adequacy of the Northwest Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards*" (USDA Forest Service and USDI BLM, 2004). 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 meets the expectations of several Forest Service responsibilities identified in "Memorandum of Understanding between USDA Forest Service and Oregon Department of Environmental Quality To Meet State and Federal Water Quality Rules and Regulations" (USDA Forest Service and Oregon DEQ, May 2002). The Sufficiency Analysis provides current scientific guidance for management of riparian vegetation to provide effective stream shade, including appropriate methods of managing young stands for riparian objectives other than shade, such as production of large wood for future recruitment.

Total riparian reserve acres thinned in Hartz Project will total 168 acres within the two 6th field sub-watersheds (Table B-2):

Table B-2. Hartz Project Riparian Reserve Acres Thinned by Unit and Channel Classification.

Quartz Creek 6th Field Sub-watershed					
Unit	Class II RR	Class III RR	Class IV RR	Wetland RR	Total
4	12.12	5.10	4.24		21.46
5		5.46	2.27		7.73
6*		11.86			11.86
8				2.63	2.63
9*		9.10			9.10
12		18.18	2.27		20.45
15		20.0	2.27	5.25	27.52
Total	**12.12**	**69.70**	**11.05**	**7.88**	**100.75**
* Class III riparian reserve width 160 feet; all other units with Class III riparian reserves are 150 feet.					
Hardy/Rebel Creek 6th Field Sub-watershed					
Unit	Class II RR	Class III RR	Class IV RR	Wetland RR	Total
22	24.24			10.5	34.74
23	13.64	7.28		5.25	26.17
25		3.64	3.03		6.67
Total	**37.88**	**10.92**	**3.03**	**15.75**	**67.58**
Project Total	**50.00**	**80.62**	**14.08**	**23.63**	**168.33**

Unit proximity to proposed spring chinook critical habitat ranges from 700 feet to about 1 mile within the Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in the Hardy/Rebel sub-watershed (Table B-3). No critical habitat has been designated or proposed for bull trout in the project area or downstream of the project area.

Table B-3. Hartz Project Length in Feet of Stream Channel Potentially Affected

Quartz Creek 6th Field Sub-watershed				
Unit	Intermittent	Downstream Distance to Nearest Perennial Stream	Perennial	Downstream Distance to Nearest Listed Fish Habitat
1		3,000 feet		6,000 feet
2		1,700 feet		1,700 feet
4	990	(w/in unit)	3,036	700 feet
5	495	(w/in unit)	990	3,200 feet
6		(w/in unit)	2,152	3,200 feet
7		5,500 feet		10,500 feet
8		5,000 feet		10,500 feet
9		(w/in unit)	1,650	5,600 feet
12	990	(w/in unit)	3,300	4,100 feet
15	495	(w/in unit)	3,630	3,600 feet
Total	**2,970 feet**		**14,758 feet**	
Hardy/Rebel Creek 6th Field Sub-watershed				
Unit	Intermittent	Downstream Distance to Nearest Perennial Stream	Perennial	Downstream Distance to Nearest Listed Fish Habitat
22		(w/in unit)	4,092	3,650 feet
23		(w/in unit)	1,650	11,200 feet
25	660	(w/in unit)	660	12,700 feet
Total	**660 feet**		**6,402 feet**	
Project Total	**3,630 feet**		**21,160 feet**	

Project proximity to habitat currently occupied by spring chinook and bull trout is the same in the Hardy/Rebel Creek sub-watershed (3,650 feet to 2.4 miles downstream). Project proximity to habitat currently occupied by spring chinook and bull trout is over 8 miles downstream in the Quartz Creek sub-watershed. Neither species are currently found in Quartz Creek, rather they are known to frequent the mainstem McKenzie River, located about 8 stream miles downstream of Hartz Project units, and are suspected to occasionally enter lower Quartz Creek as rearing or foraging habitat. Proposed critical habitat for spring chinook salmon includes Quartz Creek to the confluence of Indian Creek; the lower 8.3 miles of Quartz Creek. Project area unit description in Table B-4a describes unit size, aspect, tree height, tree density, for topographic and vegetative influences on potential stream shade.

Table B-4a. Hartz Project Unit Description

Unit	Acres	Alternative 4 Treatment	Unit Elev.	Slope Range	Aspect	Mean Tree Age (doug fir; yrs)	Mean Tree Diameter (doug fir; inches)
Quartz Creek Sub-watershed							
1	20	Heavy Thin	3600	25..40	N	56	14.8
2	26	Regeneration	3600	35..40	W	36	14.9
4	59	Regeneration	2650	55..64	SE	37	14.8
5	39	Heavy Thin	3200	50..55	SW	35	12.0
6	19	Moderate Thin	3100	45..65	NW	31	10.0
7	31	Moderate Thin	3950	20..40	N	49	14.1
8	38	Heavy Thin	4000	9..35	NW	48	12.4
9	36	Heavy Thin	3850	48..53	NW	52	13.7
11	53	Heavy Thin	3550	25..32	W	58	14.4
12	115	Heavy Thin	3600	30..60	SW	36	11.0
15	90	Heavy Thin	3500	55..72	W	32	11.6
Hardy/Rebel Creek Sub-watershed							
22	55	Heavy Thin	2450	5..60	NE	45	11.3
23	67	Heavy Thin	3000	2..65	E	35	9.6
25	58	Regeneration	3750	25..60	NW	40	9.8
Totals	**706**						

The Hartz Project preferred alternative proposes thinning and regeneration harvest on 706 acres of previous regeneration units (Table B-4b). Specific unit treatments, acreage, canopy retention and logging systems are summarized in Table B-4b. The method of timber removal is based upon the existing road system and topography. Units with portions less than 30% in slope and stable soils are suitable for ground-based harvest. All units, including units steeper than 50% were examined to determine site and soil suitability for timber harvest. All units are situated on suitable soils.

Table B-4b. Hartz Project Logging Systems and Unit Treatments

Unit	Alternative 4 Treatment	Percent Canopy Retained	Logging System			Trees per Acre (merchantable)		Volume BF
			Ground-based Acres	Skyline Acres	Helicopter Acres	Pre >7" dbh	Post >7" dbh	
Quartz Creek Sub-watershed								
1	Heavy Thin	30-40	15	5		224	45	634160
2	Regeneration	0		16	10	217	0	642314
4	Regeneration	0			38	200	0	1418144
4	Riparian Reserve	40			21	200	80	385099
5	Heavy Thin	30-40		26	13	199	65	567684
6	Moderate Thin	40-50		16	3	185	80	125780
7	Moderate Thin	40-50	31			178	80	372000
8	Heavy Thin	30-40	5	33		287	65	608400
9	Heavy Thin	30-40		16	20	165	50	759168
11	Heavy Thin	30-40	10	43		162	50	933754
12	Heavy Thin	30-40			115	389	70	2729870
15	Heavy Thin	30-40			90	266	65	1511820
Hardy/Rebel Creek Sub-watershed								
22	Heavy Thin	30-40	37	18		182	60	563200
23	Heavy Thin	30-40	30	37		281	55	1129620
25	Regeneration	0	16		35	217	0	1078219
25	Riparian Reserve	40			7	217	80	26298
Totals			**144**	**210**	**352**			**13,485,530**

Existing skid trails and landings will be utilized in ground-based harvest, and minimization of new riparian reserve disturbance will occur with designation of skid trails. Restrictions in equipment proximity to channels are described in project mitigations and best management practices; Table B-5:

Table B-5 Hartz Project Mitigations and Best Management Practices.

The following list describes the mitigation measures that would be applied in the implementation of any of the action alternatives. These measures will be incorporated into individual unit prescriptions by resource specialists as needed, to mitigate potential undesirable effects:

1. Any project activity such as culvert replacement that must occur within fish bearing and other perennial streams will comply with Oregon Department of Fish and Wildlife (ODFW) seasonal restrictions on in-stream work activities. Best Management Practices (BMPs) including placement of sediment barriers, provision of flow bypass, and other applicable measures will be included in project design as necessary, to control off site movement of sediment. In the Quartz Creek sub-watershed, in-stream work must occur between July 1 and October 15. In Hardy Creek and other fish bearing streams tributary to the South Fork of the McKenzie River, in-stream work must occur between July 1 and August 15.
2. Native surfaced roads will be restricted for hauling during the winter rainy season between November 1 and May 31. The objectives are to maintain water quality and fish habitat.
3. Construction and or reconstruction of roads will not be done when soils are saturated or run off occurs to minimize erosion and sedimentation, and a stable fill would be constructed across all streams.
4. All haul roads will be maintained in stable condition. Winter hauling may be allowable when the road surface is either covered with a relatively continuous snow pack or when void of snow when runoff from the road surface is unlikely. Watering the road surface will be used if roads become unstable or dusty during the summer.
5. Ground-based yarding systems will operate only when soils are relatively dry following the rainy season in the spring though the summer, or during the winter months when there is a continuous snow pack of at least eighteen inches deep or when soils are frozen to a depth of six inches or greater. Operations will be suspended if rainfall or precipitation results in pooling of water in skid trials or landings.
6. Designated skid trails will be required in all ground based yarding units. Skid trails will be located outside drainages, seeps, springs and or concave landforms, which could accumulate and transport overland flow and sediment, except where trails currently exist

and avoid the construction of new skid trails. Existing skid trails that are outside drainages, seeps and springs that meet the needs of the yarding system will be used where ever possible.

7. Ground based equipment will be limited to slopes less than 30 percent for harvester/forwarder and conventional ground skidding operations. Short, isolated pitches up to 40 percent on otherwise suitable slopes may be approved after consultation with soil/watershed specialist determines that sediment transport to streams will not occur as a result. Adverse skidding conditions would be avoided through skid trail layout and use of alternative yarding systems.
8. Traditional ground based yarding equipment will not be permitted within Riparian Reserves of Class II (fish bearing) streams. Alternative low disturbance ground based equipment such as shovel yarding will not be permitted within 150 feet of fish bearing streams. Traditional ground based equipment will not be permitted within 50 feet of the stream channel in Class 3 and Class 4 (non-fish bearing) streams. In the remainder of the riparian reserve, traditional ground based equipment is permitted, but will be restricted to existing skid trails from previous entries. Alternative low disturbance ground based equipment such as shovel yarding are also permitted in the remainder of the riparian reserve.
9. Regardless of unit harvest prescription, portions of harvest units that lie within riparian reserves will be managed to meet riparian objectives. Prescription elements designed to accomplish this are detailed in Table B-1. Minimum canopy closure of 40% will be permitted in units harvested by helicopter to facilitate operational safety requirements.
10. Full suspension will be required when yarding over perennial stream channels. Where full suspension is not obtainable over intermittent streams, partial suspension would be required and yarding will be limited to when the stream is dry.
11. Where cable yarding requires corridors through a riparian reserve, corridors will be laid out to result in the least number of trees cut. Trees located within no-harvest buffers that must be cut to facilitate yarding corridors will be felled into the channel and left on site.
12. At the completion of logging operations in a unit or at the end of the operating season, all skid trails and landings will be water barred to provide adequate drainage. Water bars location should occur where local terrain facilitates effective drainage of the skid trail or landing. In general, water bars should be constructed every 100 feet on slopes less than 15 percent, and every 50 feet on slopes greater than 15 percent. Water bars should be “keyed in” to the cut bank and have a clear outlet on the down hill side. Where available, slash should be placed on skid trails and landings.
13. Skid trails in thinning units with ground based yarding will be scarified to a depth of 3-6 inches. Skid trails in regeneration treatments and all landings will be sub-soiled to a depth of 18-22 inches.
14. All areas of exposed soil, such as landings, skid trails, decommissioned roads, and cut and fill slopes associated with road construction or reconstruction will be seeded with non-invasive cereal grains such as winter wheat, and native perennial species.
15. Temporary, semi-permanent and existing roads identified for decommissioning will be decommissioned after completion of logging operations. Decommissioning of roads may include: berming the entrance, removal of culverts, out-sloping the road surface, pulling-back side slope fill material onto the cut slope, installation of water-bars, removal of placed rock, and re-vegetation of the road prism.
16. In units containing stream channels, all existing large woody debris will be retained within riparian reserves to maintain channel stability; provide nutrients and food to aquatic plants and insects; and provide buffering to filter sediment from runoff and maintain water quality.

A summary of logging system harvest method and acreage is found in Table B-4b. By 6th field sub-watershed, the following summary describes harvest method and acreages within riparian reserve (Table B-6).

Table B-6. Hartz Project Riparian Reserve Harvest Method

Quartz Creek Sub-watershed

Unit	Helicopter	Skyline	Ground-based
4	21.46		
5	2.27	5.46	
6	2.72	9.14	
8		2.63	
9	3.10	6.00	
12	20.45		
15	27.52		
Quartz Total	**77.52**	**23.23**	**0**
Hardy/Rebel Sub-watershed			
Unit	Helicopter	Skyline	Ground-based
22		10.5	24.24
23		26.17	
25	6.67		
Hardy/Rebel Total	**6.67**	**36.67**	**24.24**
Hardy Project Total	**84.19**	**59.90**	**24.24**

The majority of riparian reserve thinning (84.2 acres) is accomplished with full suspension via helicopter. About one-third of project total riparian reserve thinning (59.9 acres) is accomplished by skyline suspension, with a minimum of partial suspension. Full suspension will be used in skyline removal where possible and is required over stream channels. One unit will utilize ground-based harvest along low gradient portions of Class II Buoy Creek. Low impact ground-based equipment will be specified in Unit 22 adjacent to Buoy Creek, consisting of a shovel yarder, allowed no closer than 150 feet of the Buoy Creek channel and will approach the channel on existing or designated skid trails (Table B-5). Equipment will be allowed no closer than 50 feet of non-fish bearing (Class III and IV) channels. Corridors over stream channels are necessary for thinning operations in Unit 5 and 6 in the Quartz Creek sub-watershed. Skyline corridors about 10 feet wide are necessary to thin across 5.46 riparian reserve acres (Unit 5) and 9.14 riparian reserve acres (Unit 6) of Class III Lytle Creek. In Hardy/Rebel Creek sub-watershed, Unit 23 would have corridors necessary to thin along a Class III tributary of Hardy Creek, within a 9 acre riparian reserve area. Mitigations to maintain the benefits of woody material in channel and streambank stability will require trees fallen in no-harvest buffers for a corridor to be left in-stream (Table B-5) and full suspension of yarded material.

Road Reconstruction, Culvert Replacement and Quarry Development

Road reconstruction to facilitate timber management activity and hauling consist of brushing road shoulders, blading, and resurfacing with aggregate where necessary. Upgrading aged culverts includes resizing to meet Q100 flood specifications. Road 2618 has the closest proximity to proposed spring chinook critical habitat, with much of the road on private land located in or near the Quartz Creek floodplain. Near the National Forest boundary, the valley form constricts and the road climbs away from the channel as it continues southeast into the project area. All roads to be used for timber haul in the project area are gravel surface or native surface roads, with paved roads at the confluence of Quartz Creek with the McKenzie River and Hardy Creek confluence with the South Fork McKenzie River (haul routes for timber harvest follow each 6^{th} field sub-watershed down to the larger system [paved] roads). The following table summarizes road reconstruction and surfacing miles by 6^{th} field sub-watershed.

Table B-7. Road Reconstruction in the Hartz Project Area

Quartz Creek Sub-watershed			
Road Number	Surface Type	Mile Reconstructed	Miles New Aggregate
2618	A	13.48	7.00
2619	A	0.73	0.73
2619-346	A	0.34	0.01
1985	A	4.1	4.1
1985-128	A	0.8	0.4
1985-140	A	1.5	0.30
1985-141	A	0.12	0
1985-351	A	0.20	0
1985-352	A	0.13	0
1985-353	N	0.17	0
1985-354	N	0.31	0
Quartz Total		**21.88**	**12.54**
Hardy/Rebel Creek Sub-watershed			
Road Number	Surface Type	Mile Reconstructed	Miles New Aggregate
1980	A	4.50	4.50
1980-225	A	2.30	0
1980-418	A	0.20	0
1980-493	A	0.10	0
1980-500	A	0.25	0
Hardy/Rebel Total		**7.35**	**4.50**
Hartz Project Total		**29.23**	**17.04**

A = aggregate; N = native

The road system used for timber harvest activity in the Hardy/Rebel Creek sub-watershed parallel the South Fork McKenzie River tributaries in the project area and are generally located outside of riparian reserves, except when crossing tributaries.

Extensive culvert replacements are proposed in the Quartz Creek sub-watershed, to upgrade the 2618 road (Table B-8).

Table B-8. Hartz Project Culvert Replacements

Quartz Creek Sub-watershed					
Road Number	Mile Point	Culvert Diameter (inches)	Stream Type	Distance to Proposed Critical Habitat (spring chinook salmon – feet and miles)	Distance to Occupied Listed Fish Habitat (bull trout and spring chinook salmon – miles)
2618	1.52	72	P	170 feet	1.5 miles
	1.92	24	I	200 feet	1.9 miles
	3.05	24	I	100 feet	3.0 miles

	3.35	48	P	150 feet	3.3 miles
	3.41	24	I	150 feet	3.3 miles
	3.90	24	I	100 feet	3.8 miles
	4.20	24	I	200 feet	4.1 miles
	5.00	24	I	150 feet	4.9 miles
	7.89	48	I	100 feet	7.8 miles
	8.34	24	I	100 feet	8.3 miles
	8.54	24	I	100 feet	8.5 miles
	8.81	24	I	150 feet	8.7 miles
	8.86	24	I	150 feet	8.8 miles
	9.21	24	I	100 feet	9.1 miles
	9.56	60 X 84 squash	F (Lytle Ck)	100 feet	9.4 miles
	10.02	24	I	150 feet	9.9 miles
	10.15	24	I	150 feet	10.0 miles
	11.09	24	I	0.5 mile	10.5 miles
	12.01	24	I	0.5 mile	10.5 miles
	12.08	24	I	0.5 mile	10.5 miles
	12.55	24	I	0.7 mile	10.7 miles
	12.74	24	I	1.0 mile	11.0 miles
2619	0.21	24	P	1.4 mile	11.4 miles
	0.37	24	I	1.2 mile	11.2 miles
	0.47	24	I	1.1 mile	11.1 miles
1985	10.17	48	P	1.0 mile	11.0 miles
1985-128	0.80	18	I	1.0 mile	11.0 miles
1985-140	0.95	24	I	0.7 mile	10.7 miles
	1.30	24	I	0.9 mile	10.9 miles
	1.35	18	I	0.9 mile	10.9 miles
	1.40	56	P	1.0 mile	11.0 miles
	1.50	48	P	1.0 mile	11.0 miles
Hardy/Rebel Creek Sub-watershed					
Road Number	Mile Point	Culvert Diameter (inches)	Stream Type	Distance to Proposed Critical Habitat (spring chinook salmon – miles)	Distance to Occupied Listed Fish Habitat (bull trout and spring chinook salmon – miles)
1980	0.35	48	P	0.2 mile	0.2 mile
	1.04	24	I	0.4 mile	0.4 mile
	1.61	24	I	1.0 mile	1.0 mile
	2.01	24	I	1.1 mile	1.1 mile
	2.77	24	I	2.0 mile	2.0 mile

	4.36	24	I	2.9 mile	2.9 mile
1980-225	0.21	18	I	2.1 mile	2.1 mile
	0.31	24	I	2.2 mile	2.2 mile
	0.39	18	I	2.2 mile	2.2 mile
	0.50	36	I	2.3 mile	2.3 mile
	0.80	24	I	2.2 mile	2.2 mile
	1.36	24	I	2.5 mile	2.5 mile
	1.67	18	I	2.7 mile	2.7 mile
	1.76	18	I	2.7 mile	2.7 mile

I = intermittent; P = perennial (non-fish bearing); F = fish-bearing

There are four crossings of Quartz Creek along Road 2618, occurring on private land on concrete bridges. The National Forest boundary is located near the Road 2618 mile point 8.54 culvert. Road 2618 immediacy to the Quartz Creek channel and extensive culvert replacements proposed will require low flow seasonal replacement and use of sediment trapping methods to minimize introduction of fines into Quartz Creek. Improvement of Quartz Creek sub-watershed ditch relief culverts is proposed with Hartz Project; of 39 ditch relief culverts replaced, 12 will be new placements. Three perennial stream culvert replacements including Lytle Creek will meet the requirements for in-stream work period (Table B-5). One perennial culvert replacement is necessary in the Hardy/Rebel Ck watershed and its immediacy to currently occupied spring chinook habitat is subject to more restrictive in-stream work periods. As in all Hartz Project culvert replacements, mitigation measures to minimize transport of fine sediment will be implemented (Table B-5). Quarry development will utilize an existing quarry on a ridge top adjacent to Indian Ridge (accessed via Rd. 1985-126/124). Located withing the South Fork McKenzie River 5th field watershed, the quarry location is about two miles from the South Fork McKenzie River. No surface water connection is present from the quarry site to channels or river below. Approximately 14,475 cubic yards of gravel will be required of the quarry site providing material for both sub-watersheds haul route surfacing (12.5 miles in Quartz Creek sub-watershed and 4.5 miles in Hardy/Rebel Creek sub-watershed [Table B-7]). The original clearing limits of the quarry will not be extended to extract necessary aggregate.

Road Construction and Decommissioning

The Hartz Project will construct 600 feet of temporary road in the Quartz Creek sub-watershed, to access one unit. The temporary road will be built upon low gradient ground (9% slope) and will provide access to two landing sites, built to skyline yard Unit 8 (Table B-4b and B-9).

Table B-9. Hartz Project Road Construction and Fuels Treatment

Unit	Feet of Road Construction		Fuels Treatment
	System	Temporary (ft.)	
Quartz Creek Sub-watershed			
1	0	0	YTA/HP
2	0	0	BC
4	0	0	BC
5	0	0	NT/HP
6	0	0	NT/HP
7	0	0	YTA/NT/HP
8	0	600	NT/HP
9	0	0	NT/GP/HP
11	0	0	YTA/NT/HP
12	0	0	NT/HP
15	0	0	NT
Hardy/Rebel Creek Sub-watershed			
22	0	150	NT/HP
23	0	1,300	YTA/NT/HP
25	0	0	BC
Totals		**2,050**	
Fuel Treatments: YTA = yard tops attached;			
BC = broadcast burn; NT = no treatment; HP = hand pile			

Road and landing widths will remain near thinned tree spacing of 22-30 feet and will consist of native surface. Operation restrictions will require dry season operation only on native surfaces (Table B-5). Wet areas located along the western boundary of Unit 8 are no closer than 1,300 feet of proposed temporary road locations. Road location does not require entry into riparian reserve. No channels are located in Unit 8. The Hartz Project preferred alternative will construct 1,450 feet of temporary road in the Hardy/Rebel Creek sub-watershed, to access two units. The temporary roads will be built upon low gradient ground (5% in Unit 22 and 2% in Unit 23). 150 feet of temporary road will provide access to a landing site in Unit 22, providing skyline yarding of thinned trees. 1,300 feet of temporary road will access two landing sites in Unit 23. Neither temporary road location in the Hardy/Rebel sub-watershed necessitates entry into riparian reserve, and neither road approaches a wet area (Unit 22) or intermittent channel (Unit 23) closer than 330 feet. As with the Quartz Creek sub-watershed temporary road, the Hardy/Rebel Creek temp road widths will remain less than thinned stand spacing and will consist of native surfaces with duplicate operational restrictions. Culvert crossings and sediment control structures are not necessary of Hartz Project temporary road construction. Additional roads identified for decommissioning are an unclassified road (an existing surfaced road not identified in the current road system). This road is located within Unit 22 and crosses an ephemeral draw in its 4,000 foot length parallel to Hardy Creek. The road will be utilized during timber harvest operations, then decommissioned following completion of thinning. Also within the Hardy/Rebel subwatershed, the last 800 feet of Rd 1980-500 (Unit 23) will be decommissioned upon completion of timber harvest. As in temporary road decommissioning, operational restrictions will be used to minimize potential transport of fine sediments.

Timber Haul

Approximately 1,336 log truck loads would be transported over 21.9 miles (maximum distance) of gravel road in Quartz Creek sub-watershed and 350 log truck loads over 4.5 miles (max. distance) of gravel road in Hardy/Rebel Creek sub-watershed (Table B-10 and Figures A-2 and A-3). Haul route distance to proposed spring chinook critical habitat ranges from immediate on bridge crossings on Rd 2618 in Quartz Creek sub-watershed to tributary crossings 1.4 miles away.

Table B-10. Hartz Project Haul Routes

Road/Sub-watershed	Maximum Miles of Haul	Road Surface	Number of Loads	Number of Crossings			Nearest Crossing to LFH
				Bridges over LFH	Perennial	Intermittent	

2618 (Quartz)	21.9	Aggregate	1,336	4	13	49	Immediate to 1.4 mile
1980 (Hardy/Rebel)	4.5	Aggregate	350	1	8	17	Immediate to 2.9 mile

LFH = proposed spring chinook salmon critical habitat

Four bridge crossings of Quartz Creek are located in the Rd 2618 haul route. One bridge near the confluence of Hardy Creek and beginning of pavement, crosses the South Fork McKenzie River. Haul route proximity to proposed spring chinook critical habitat in South Fork McKenzie River ranges from immediate (bridge crossing) to 2.9 miles in the mid-Hardy Creek sub-watershed. Hauling will occur during dry periods and will be suspended during rainy periods to minimize water transport of suspended sediments (Table B-5). Contract requirements will specify cessation of hauling when water is running on road surfaces, or if sediment is mobilized during project activities.

Fuel Treatment

Fuel treatments will range from no treatment and minimal hand-piling along road and landing edges, to yarding tops in ground-based harvest acres. The preferred alternative will use broadcast burn treatments in regeneration Units 2, 4 and 25, and fire will be allowed to burn the understory of riparian reserve thinned stands (Unit 4 and 25 are the only regeneration units in the preferred alternative with riparian reserves). All other fuel treatments will exist outside of riparian reserves. No fire line will be built outside of riparian reserves in regeneration Units 4 and 25 and burns will be conducted during optimal site conditions (high duff moisture) in springtime. In other than regeneration units, broadcast burn within thinned stands (understory burning) or fuel treatments within the riparian reserve will not occur in the preferred alternative. Fuel treatments are described by unit in Table B-9 and summarized below in Table B-11 by sixth field sub-watershed and total project treatment.

Table B-11. Hartz Project Acres of Fuel Treatment

Sub-watershed	Yard Tops Attached	Hand Pile	No Treatment	Broadcast Burn	Total Acres
Quartz Creek	56	22.6	380.6	66.8	526
Hardy/Rebel	30	2.5	97.0	50.5	180
Hartz Total	**86**	**25.1**	**477.6**	**117.3**	**706**

C. Action Area Description

The action area is defined for ESA purposes as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” (50 CFR 402).

All project elements are confined to the Quartz Creek and Hardy/Rebel Creek 6th field sub-watersheds as shown in Figure A-2 and A-3. It is probable that effects from this project will not be of the magnitude where they will affect stream reaches downstream from the project area. Therefore, for this project, the project area and action area are synonymous, and analysis of effects will occur at the 6th field sub-watershed level.

III. STATUS OF LISTED SPECIES

A. ESA/EFH Status

Spring chinook salmon utilize habitat in the McKenzie River and South Fork McKenzie River, which flows downstream of the Hartz project area. These salmon are part of the Upper Willamette spring chinook salmon Evolutionarily Significant Unit (ESU), as designated by the National Oceanic and Atmospheric Administration (NOAA) Fisheries with a July 10 Federal Register notice, effective September 8, 2000.

The McKenzie River, South Fork McKenzie River and Quartz Creek to the confluence of Indian Creek are included in the proposed designation of Critical Habitat for the Upper Willamette spring chinook salmon ESU within a December 14, 2004 Federal Register Notice. Streams occupied by spring chinook salmon within the McKenzie River and South Fork McKenzie River downstream of Cougar Dam are also designated as Essential Fish Habitat (EFH) by National Marine Fisheries Service (NMFS) under the Magnuson-Stevens Fishery Conservation and Management Act.

Bull trout utilize habitat in the McKenzie River and South Fork McKenzie River, downstream of the Hartz project area. Bull trout sub-adults have also been documented in lower Quartz Creek, near its confluence with the McKenzie River. Bull trout were listed as Threatened by the U.S. Fish and Wildlife Service with a June 12, 1998 Federal Register notice to protect the Columbia River Distinct Population Segment, and are protected under the Endangered Species Act. No habitat within the McKenzie River sub-basin has been designated or proposed as Critical Habitat for bull trout.

The Matrix Indicators discussed below are described at the 6th field sub-watershed level (Quartz Creek and Hardy/Rebel Creek sub-watersheds), with the exception of the indicators for population characteristics, which are more appropriately discussed at the 5th Field Watershed level (McKenzie River and South Fork McKenzie River).

B. Population Size and Distribution

McKenzie River/Quartz Creek 5th Field Watershed and Quartz Creek 6th Field Sub-watershed:

Three major runs of spring chinook salmon are recognized as making up the Upper Willamette River run (North Santiam, South Santiam, and McKenzie rivers) (Kostow 1995). Adults enter the Columbia River in March and April, and ascend Willamette Falls in May and June. Migration passed the falls generally coincides with a rise in river temperature above 10 degrees C. (Howell et al. 1985, Nicholas 1995). The majority of Willamette spring chinook mature in their fourth or fifth year of life. Historically, 5-year-old fish comprised the dominant portion of the run, with a significant number of 6-year-old fish. With hatchery production currently supplementing the majority of spring chinook salmon production in the McKenzie River basin, younger fish dominate the spawning run. Spawning begins in late August and continues into early October, with peak spawning in September. One population (mainstem McKenzie population) of bull trout are present adjacent to the Quartz Creek 6th field. Two smaller populations, often described as sub-populations, are present in the South Fork McKenzie River and Upper McKenzie River. These populations are isolated above Cougar Dam and Trail Bridge Dam, respectively.

The Quartz Creek 6th field sub-watershed is believed to have historically provided spawning and rearing habitat for spring chinook and foraging habitat for bull trout. Based on the size of the watershed, quantity of flow and position of Quartz Creek in the McKenzie River sub-basin, spring chinook salmon are believed to have used lower Quartz Creek. Bull trout sub-adults have been documented in recent history as utilizing lower Quartz Creek. Currently, lower Quartz Creek does not provide spawning habitat for spring chinook. Lower Quartz Creek does likely provide rearing habitat for spring chinook juveniles, at a reduced level compared to historic use, when suitable flows allow upstream migration from the mainstem McKenzie River. Bull trout are also suspected to use lower Quartz Creek, to a reduced degree as compared to historical use, due to altered habitat conditions, reduced abundance of prey, and lower population size. The historic run of spring chinook salmon into Quartz Creek would have been limited to the low gradient portions of the channel (lower 8.3 miles) and did not likely contribute significantly to the total historic McKenzie River run estimated at 18,000 adults. Assuming the historic Quartz Creek channel had high channel complexity, a lower fluctuation range in flow regime, and storage of suitable spawning substrates for spring chinook salmon, conditions were likely present for spring chinook reproduction and rearing. Limitations to spring chinook reproduction and rearing historically in Quartz Creek channel would have been presented by small channel size and access to suitable habitat during low flow years. Nearby McKenzie River tributary Gate Creek, a similar sized tributary, currently supports remnant numbers of spawning and rearing spring chinook salmon. The probable reduced spring chinook production in Quartz Creek is expected to influence the abundance of predatory bull trout in the 6th field sub-watershed. Two bull trout sub-adults (8-10 inches in length) have been documented in Quartz Creek during 1988, observed near the confluence with McKenzie River by Oregon State University researchers. The lower 8.3 miles of Quartz Creek, suspected historic spring chinook and bull trout habitat, is currently located almost entirely on private industrial timberland.

Ratliff and Howell (1992) described the mainstem McKenzie bull trout population as “at moderate risk of extinction.” Buchanan and others (1997) upgraded the status of this population to “of special concern” This change was due to 1) recent changes in angling restrictions, 2) increased redd counts, 3) large numbers of migrating fry out of Anderson Creek, and 4) increased numbers of staging adults counted in the main stem McKenzie River. This population is estimated to be approximately 300 breeding individuals.

Table III-1. Bull trout redd counts from surveys of the mainstem McKenzie population spawning tributaries conducted by ODFW and Forest Service, 1994-2004.

Year	Anderson Ck Redd Survey	Olallie Ck Redd Survey	Mainstem McKenzie population Total redds
1994	30	3	33
1995	73	10	83
1996	82	7	89
1997	85	9	94
1998	79	7	86
1999	77	6	83
2000	83	9	92
2001	72	6	78
2002	60	10	70
2003	56	17	73
2004	49	12	62*

* 1 redd counted in mainstem McKenzie River below Trail Bridge Dam

Since Buchanan upgraded the status of bull trout in the mainstem McKenzie River in 1997, bull trout redd counts have since decreased from a peak count of 94 in 1997 to a low of 62 in 2004 (Table III-1). This fluctuation may be a reflection of normal cyclic changes in abundance, but may also reflect other influences on the population. The decrease in redds may reflect an adverse effect of the February 1996 flood event on incubating bull trout and young juvenile bull trout, and a depressed rate of recruitment of reproductive age bull trout in the early 2000’s (bull trout become sexually mature at about age 6 and the flood may have impacted several age classes of juvenile bull trout). Another influence upon bull trout abundance is angling harvest. While bull trout are protected with “no angling for bull trout” and catch-and-release regulations - bull trout have been found to be vulnerable to angling, particularly to the use of bait, and fluctuations in abundance may reflect hooking mortality and/or poaching. Still another influence is the removal of bull trout fry from the McKenzie population. Between 1997 and 2003, over 10,000 bull trout fry have been removed from Anderson Creek, the primary natal creek for the mainstem McKenzie population, for reintroduction into the Middle Fork Willamette drainage. While rearing habitat continues to appear to be fully seeded in Anderson Creek, the contribution of removed bull trout to overall mainstem McKenzie River production is unknown. Migratory bull trout fry, entering mainstem McKenzie River as rearing habitat, are believed to suffer a high rate of mortality. The rate of mortality among out-migrant fry and early life history in a large river has not been studied and the survival rate among out-migrants can only be speculated upon at this time. Described later in the description of baseline conditions, several habitat factors are functioning at risk. The likelihood fluctuations in bull trout abundance occurred due to changes in habitat conditions is unlikely. Habitat critical to bull trout has been maintained or improved since monitoring of populations began in the early 1990’s. In the absence of adverse changes to habitat quality, the population size is expected to reflect maintained or positive improvements to habitat conditions (passage improvements, road decommissioning, in-stream improvements, and Northwest Forest Plan riparian protections in forest management activities). Due to the reduced production level of spring chinook in Quartz Creek and reduced presence of prey in that channel for bull trout forage, and overall suspected pressures on

McKenzie River bull trout subpopulation size (limiting factors described by Ratliff and Howell [1992] throughout the range of McKenzie population bull trout [consisting of passage barrier dams, over-harvest from angling, hybridization with brook trout, and continuing influence of road derived sediments]), the Quartz Creek contribution to bull trout subpopulation size is characterized as FUNCTIONING AT RISK.

Due to the heavy dependence upon hatchery supplementation for spring chinook production and apparent loss of historic spawning and rearing habitat in Quartz Creek, the Quartz Creek contribution to spring chinook subpopulation size is characterized as FUNCTIONING AT RISK.

South Fork McKenzie River 5th Field Watershed and Hardy/Rebel Creek 6th Field Sub-watershed:

The South Fork McKenzie 5th field watershed historically provided spawning and rearing habitat for spring chinook. Currently, only the lowermost reach is accessible to migrating chinook (approximately 4 miles) due to the presence of Cougar Dam, completed in 1963. No passage is available at the dam. Since 1993, ODFW has transported chinook adults above the dam to utilize isolated habitat above, to provide for marine-derived nutrients, and to restore a prey base for bull trout isolated above Cougar Dam. The historic run into the South Fork McKenzie River is estimated at 2,000 to 4,000 adults, comprising a significant portion of the total historic McKenzie River run, estimated at 18,000 adults (South Fork Watershed Analysis 1994). ODFW has discovered that not all spring chinook offspring remain landlocked in Cougar Reservoir, and there are significant numbers of successful downstream migrants through the turbines and regulating outlet. Limited production occurs in the reach below Cougar Dam. Coarsening of bedload and an altered temperature regime are believed to limit spring chinook use and survival in lower South Fork McKenzie River.

Table III-2. McKenzie Hatchery Spring Chinook Releases Above Cougar Dam

Year	Males	Females	Jacks	**Total**
1993	22	33	1	**56**
1994	0	0	0	**0**
1995	0	0	0	**0**
1996	51	68	3	**122**
1997	100	100	0	**200**
1998	165	153	9	**327**
1999	366	180	3	**549**
2000	801	695	10	**1506**
2001	1233	765	57	**2055**
2002	2775	2047	56	**4878**
2003	1758	1374	62	**3194**
2004	2143	1263	24	**3430**

The Hardy/Rebel Creek 6th field does not appear to provide spawning habitat for spring chinook salmon within Hardy Creek. Chinook do spawn above and below the confluence of the South Fork and Hardy Creek. A 1997 riparian inventory conducted by the Forest Service did not locate any spring chinook salmon in Hardy Creek during snorkel surveys on September 17, 1997. The only salmonids documented during snorkel surveys were rainbow and cutthroat trout. A migration barrier was located at approximately river mile 1.0 and was a series of two waterfalls and a chute that measured 9 feet, 12 feet, and 9 feet in height, respectively. The lowermost portions of Hardy Creek may provide high water refuge for juvenile chinook that over-winter in the South Fork McKenzie River.

Columbia River Basin Bull Trout DPS (*Salvelinus confluentus*)

There are three sub-populations of bull trout in the McKenzie River system. The sub-population affected by the proposed project is the “South Fork McKenzie population”. Buchanan and others (1997) determined the status of this population to be “at high risk of extinction.” That status determination was made before we detected an increasing trend in Roaring River redd surveys. Recent monitoring in Roaring River, the only known spawning tributary for bull trout in the South Fork, has shown an increasing trend in bull trout numbers. Table III-3 below show numbers of bull trout adults redds in Roaring River. The Vaki River Watcher may have counted a few adult Chinook salmon. For example, in 2002 three adult chinook were seen in Roaring River upstream of the Vaki. However, the majority of fish counted by the Vaki are believed to be adult bull trout. In 2003 ODFW began using a video camera along with the Vaki in an attempt to increase the precision. This was successful and 9 of the 47 “bull trout size” fish moving upstream were chinook.

Table III-3. Counts of Adult Bull Trout and Potentially Chinook Salmon at the Vaki counter located in Roaring River for 1999-2001.

Year	Counts	
	Up	Down
1999	41	39
2000	81	67
2001	66	66
2002	74	unknown
2003	47 (28 were bull trout) *	43
2004	52 (48 were bull trout)	unknown

* The 9 unidentified fish in 2002 of “bull trout size” were believed to be bull trout based on relative lengths and the date they moved upstream. This would bring the bull trout total to 37.

Table III-4. Counts of bull trout redds in Roaring River 1993-2004*.

Year	Redds Observed
1993	1
1994	1
1995	2
1996	0
1997	0
1998	6
1999	13
2000	25
2001	34
2002	25
2003	27
2004	32

*Counts from 1993-1995 were from the mouth upstream to 650 feet above Road 19 bridge. Counts from 1996 to present are believed to be complete counts.

The Hardy/Rebel Creek sub-watershed does not provide spawning or early rearing habitat for bull trout. Hardy Creek may provide foraging habitat for bull trout sub-adults near its confluence with the South Fork McKenzie River. Similar sized tributaries are known to provide foraging opportunity for bull trout, however bull trout have not been observed in lower Hardy Creek during snorkel probes (bull trout nighttime presence/absence surveys) or during stream surveys. ODFW's 2003 bull trout stock status report states that they believe there are 25 to 75 adults in the South Fork McKenzie River/Cougar Reservoir/Roaring River watershed. It is unknown if bull trout spawn every year, or every other year.

Baseline Determination Spring Chinook: Not Properly Functioning (NPF)
Baseline Determination Bull Trout: Functioning At Risk (FAR)

C. Growth and Survival

McKenzie River/Quartz Creek 5th Field Watershed and Quartz Creek 6th Field Sub-watershed:

Altered habitat complexity has likely affected the ability of Quartz Creek to provide spawning and rearing habitat for spring chinook salmon and foraging habitat for bull trout. Potential spring chinook spawning habitat is limited due to the substrate coarseness of low gradient portions of Quartz Creek. Quartz Creek as foraging habitat for bull trout is believed reduced due to depressed spring chinook production in the drainage. Limited rearing of juvenile spring chinook likely occurs in the lowermost reach of Quartz Creek. Most spring chinook fry have been found to migrate to estuaries with spring flows, although some will remain in fresh water for their first year of life if suitable rearing habitat is available. Since the Quartz Creek habitat is of minimal habitat quality due to the low frequency of side channels in low gradient reaches, minimal recruitment and retention of juveniles is expected. Habitat conditions in lower Quartz Creek (portions of Quartz Creek believed used historically by listed species) are characterized as poor, limiting the potential for growth and survival of at-risk species. Current stream temperatures, sediment regime, large woody material supply and flow regime are expected to be outside the range of historic variability, leading to a reduced capacity in the 6th field to provide for optimal growth and survival. The environmental baseline is rated as FUNCTIONING AT RISK for both spring chinook salmon and bull trout in terms of growth and survival in Quartz Creek sub-watershed.

South Fork McKenzie River 5th Field Watershed and Hardy/Rebel Creek 6th Field Sub-watershed:

Upper Willamette River Spring Chinook Salmon ESU (*Oncorhynchus tshawytscha*)

Spawning and rearing habitat are underutilized above Cougar Dam. Habitat conditions are good in the South Fork McKenzie above Cougar Dam. Angling is not expected to result in significant loss of transported adults, although some poaching has been documented. Other angling restrictions, such as artificial fly and lure only and catch-and-release of all trout, and the absence of a put-and-take fishery in the river, likely benefit spring chinook adults and juveniles. Spring chinook juveniles and smolts may be harvested from Cougar Reservoir, where a put-and-take fishery exists and all non-finclipped game fish may be kept (except bull trout). All adult spring chinook in the action area are trucked around cougar dam by ODFW, and are of hatchery origin.

Columbia River Basin Bull Trout DPS (*Salvelinus confluentus*)

Habitat conditions in Roaring River are excellent for juvenile bull trout. Conditions in the South Fork are favorable for sub-adults and adults. These statements are backed by the increasing numbers of adult bull trout, and an increasing trend in redd counts. Within the action area, the South Fork provides good sub-adult and adult rearing habitat.

Baseline Determination Spring Chinook: Not Properly Functioning (NPF)
Baseline Determination Bull Trout: Functioning At Risk (FAR)

D. Life History Diversity and Isolation

McKenzie River/Quartz Creek 5th Field Watershed and Quartz Creek 6th Field Sub-watershed:

The life history form of Upper Willamette spring chinook is anadromous. Modification of marine residency has occurred in the McKenzie portion of the Upper Willamette spring chinook ESU with hatchery production. Shorter duration marine residency occurs with hatchery produced chinook (about 3 years), compared to naturally produced salmon (about 5 years). Modification of fry emergence timing in the South Fork McKenzie and McKenzie River below Cougar Dam due to altered temperature regime has been documented. Beginning in 2005, the completed Cougar Temperature Control Project will begin operating in efforts to restore historic temperature regimes in lower South Fork McKenzie River and McKenzie River below the confluence.

The McKenzie River bull trout population is a fluvial life history form, but the meta-population exhibits an adfluvial form in the South Fork McKenzie River and McKenzie River above Trail Bridge Dam. Both adfluvial forms are adaptations (since the early 1960's) to fragmentation of habitat by impassable dams. The environmental baseline is described as FUNCTIONING AT RISK.

South Fork McKenzie River 5th Field Watershed and Hardy/Rebel Creek 6th Field Sub-watershed:

Upper Willamette River Spring Chinook Salmon ESU (*Oncorhynchus tshawytscha*)

The only life history form documented is an anadromous form, but may now have an adfluvial component due to the presence of Cougar Reservoir. Landlocked adults over 20 inches have been reported by anglers using Cougar Reservoir. Whether landlocked adults in Cougar Reservoir can reach full maturity and reproduce is not known. Recently, ODFW has documented that smolt sized,male, spring chinook in Trail Bridge Reservoir were producing milt. Some modification of the life history pattern in naturally spawning adults in the South Fork and McKenzie River below Cougar Dam may be expected to occur due to altered temperature regime. Those salmon above Cougar Dam are isolated. There is one way passage downstream thru turbines or regulating outlet(s). Adults are trucked over the dam by ODFW.

Columbia River Basin Bull Trout DPS (*Salvelinus confluentus*)

Bull trout require cold, clear water with low amounts of fine sediment in the stream bed, relatively constant flows, and high frequencies of large and fine woody material to successfully spawn and rear. Within three years of emerging from the redd, fluvial and adfluvial bull trout migrate downstream from their natal stream to live in a river or lake. As sub-adults (age 3-5), bull trout have less specific habitat requirements than juveniles. It is believed bull trout become nomadic, following food sources. Adult bull trout require relatively cold temperatures (9-13 degrees C preference range in rivers), but not as cold as what is required for embryonic development (1-6 degrees C optimum range), and optimal juvenile growth (4-10 degrees C) (Spence et al. 1996).

Fluvial bull trout use the South Fork McKenzie River above and below Cougar Dam.
Bull trout above Cougar may be adapting to an adfluvial existence. It is unknown how many bull trout pass thru the turbines and regulating outlet on Cougar. ODFW has a rotary screw trap and PIT tag reader below the dam and they have documented bull trout passing thru the turbines, and the diversion tunnel used during the Temperature Control project at Cougar Dam. See www.dfw.state.or.us/ODFWhtml/springfield/cougar_project.html.
The rates of mortality or survival are unknown, but the research project ODFW has been conducting associated with the Cougar temperature control project will likely provide this information. Trail Bridge and Cougar Dams have blocked upstream migration to the Upper McKenzie and the South Fork McKenzie, respectively. This has forced isolation of the three sub-populations (South Fork, Mainstem, and Upper McKenzie above Trail Bridge). The only upstream passage for bull trout has been by ODFW researchers trucking them above the dam.

Baseline Determination Spring Chinook: Not Properly Functioning (NPF)
Baseline Determination Bull Trout: Functioning At Risk (FAR)

E. Persistence and Genetic Integrity

McKenzie River/Quartz Creek 5th Field Watershed and Quartz Creek 6th Field Sub-watershed:

Populations of listed species present and access to habitat in mainstem McKenzie River and South Fork McKenzie River have been fragmented with construction of flood control and hydroelectric projects. The distribution and access to habitat of spring chinook salmon and bull trout in the McKenzie basin has changed with completion of Cougar (1963) and Blue River (1968) dams by Army Corps of Engineers, and Trail Bridge Dam (1963) by Eugene Water & Electric Board. Chinook access to 18 miles of historic habitat in the South Fork McKenzie River is blocked by Cougar Dam, and about 4 miles of historic habitat above Trail Bridge Dam. A run size of 5,360 spring chinook is estimated to have used the South Fork McKenzie River based on redd numbers in 1956, prior to construction of Cougar Dam. A run size of about 200 spring chinook is estimated to have used the McKenzie and Smith Rivers above current Trail Bridge Dam. In an effort to restore marine-derived nutrients provided by spring chinook and a source of bull trout prey supplied by naturally produced chinook juveniles, ODFW places spring chinook adults above Cougar and Trail Bridge Dam by trap and haul. Chinook salmon access to habitat below dams remains unobstructed (a fish ladder provides passage over Leaburg Dam at McKenzie river-mile 39). Current distribution of spring chinook spawning production above Leaburg Dam is estimated at 30% in the mainstem McKenzie between the Leaburg Dam and the South Fork McKenzie confluence; 10% spawning in the South Fork McKenzie below Cougar Dam; and 60% in the mainstem McKenzie above the South Fork McKenzie confluence.

Table III-5. Spring Chinook Salmon Counts Over Leaburg Dam.

Year	Total Spring Chinook Count
1993	3,554
1994	1,507
1995	1,622
1996	1,440
1997	1,110
1998	1,848
1999	1,862
2000	2,652
2001	4,302
2002	5,692
2003	9,913

Bull trout populations in the McKenzie River and South Fork McKenzie River have been isolated by the Cougar and Trail Bridge Dams. Three separate populations of bull trout currently exist in the sub-basin. Above Trail Bridge Dam on the mainstem McKenzie, an isolated Trail Bridge bull trout population consists of about 50-75 adults. Above Cougar dam, an isolated South Fork McKenzie bull trout population consists of about 75 adults. Below the dams, the mainstem McKenzie River bull trout population consists of about 150-200 adults.

Hatchery production dominates in sustaining Willamette spring chinook. Multiple brood stocks have been the basis for hatchery production in the Clackamas, Santiam, McKenzie, and Middle Fork Willamette rivers (Kostow 1995). Recent monitoring of spring chinook migration through Leaburg fish passage on the McKenzie found that about half of upper river fish migration consists of hatchery origin salmon (S.P. Cramer & Associates 1996), (Schroeder, et. al 2003). Genetic fitness may be at risk due to the high proportion of hatchery produced chinook in the McKenzie. A high rate of straying by hatchery chinook has likely adversely affected wild stocks. The likely absence of locally adapted fish, low adult returns and high rates of hatchery straying leads to a baseline rating of FUNCTIONING AT RISK

The potential for hybridization between brook trout and bull trout exists in the watershed. This has the potential to negatively influence bull trout gene pool and persistence. Isolation of the McKenzie River bull trout meta-population has occurred with construction of Cougar and Trail Bridge Dams. Historic rates of straying and natural mixing among bull trout populations is suppressed by impassable dams in an upstream direction and is likely detrimental to the long-term health of each population. Some mixing among the Trail Bridge and McKenzie River population has occurred artificially with reintroduction of fry into Sweetwater Creek (1993-1999; from a McKenzie River natal stream to a Trail Bridge natal stream). The presence of brook trout and isolation of three bull trout populations by upstream impassable dams leads to a baseline rating of FUNCTIONING AT RISK.

South Fork McKenzie River 5th Field Watershed and Hardy/Rebel Creek 6th Field Sub-watershed:

Upper Willamette River Spring Chinook Salmon ESU (*Oncorhynchus tshawytscha*)

Hatchery production dominates in sustaining Willamette spring chinook. Multiple brood stocks have been the basis for hatchery production in the Clackamas, Santiam, McKenzie, and Middle Fork Willamette rivers (Kostow 1995). Recent monitoring of spring chinook migration through Leaburg diversion fish passage on the McKenzie found that 48% of upper river fish migration consisted of hatchery origin salmon (S.P. Cramer & Associates 1996). Genetic fitness may be at risk due to the high proportion of hatchery produced chinook in the McKenzie.

Currently, adults utilized for transport above Cougar Dam are not expected to possess local (South Fork McKenzie River) adaptations since hatchery stock are utilized. There may be remnant genetic information in adults returning to use the South Fork McKenzie River below Cougar Dam. However, a high rate of straying by hatchery chinook has been documented and has likely affected wild stock. The likely absence of locally adapted fish, very low adult returns and high rates of hatchery straying leads to a baseline rating of not properly functioning .

Columbia River Basin Bull Trout DPS (*Salvelinus confluentus*)

Brook trout were first introduced to the South Fork watershed in the early 1900's. The use of brook trout as a sport fishery has ceased in all waters where potential impacts to native species is possible. Naturally barren high mountain lakes lacking the opportunity for downstream migration are the only locations currently used for brook trout stocking. The potential for hybridization between brook trout and bull trout exists in the watershed. This has the potential to influence the bull trout gene pool. In addition, the South Fork population is small (25-75 adults) (ODFW 2003).

Baseline Determination Spring Chinook: Not Properly Functioning (NPF)
Baseline Determination Bull Trout: Not Properly Functioning (NPF)

IV. DESCRIPTION OF ENVIRONMENTAL BASELINE

A. General Information

The Hartz Young Stand Management Project Area constitutes 20,034 acres on the McKenzie River Ranger District (Figures A-1, A-2 and A-3). The proposed action would occur on either side of Indian Ridge, in the Quartz Creek sub-watershed to the west of Indian Ridge, and Hardy/Rebel Creek sub-watershed, to the east of Indian Ridge. The north half of the Quartz Creek sub-watershed is comprised mostly of private land. The Quartz Creek sub-watershed is tributary to the McKenzie River/Quartz Creek 5th field watershed; the Hardy Rebel Creek subwatershed is tributary to the South Fork McKenzie River 5th field watershed. The South Fork McKenzie River is classified as a Tier 1 Key Watershed in the Northwest Forest Plan.

The project lies south of Cougar Reservoir and west of Aufderheide National Scenic Byway on Forest Road 19. The Three Sisters Wilderness is east of Forest Road 19. Major drainages within the project area include Quartz, Indian, and Lytle Creeks in the Quartz Creek portion of the project area, and Hardy and Buoy Creek in the South Fork portion. Elevations range from approximately 2,000 feet along the South Fork McKenzie River to over 5,400 feet Indian Ridge.

Legal Description of the Project Area:

T.7S, R.4E, Section 31; T.17S, R.5E, Section 31; T.18S. R.4E, Sections 1-6, 8-15, 22-24, 26, and 27; T.18S, R.5E, Sections 3-11, 14-23, and 16-30; Willamette Meridian; Lane County, Oregon.

B. Land Ownership/Allocation

Table IV-1 describes the land ownership by entity for the Quartz Creek and Hardy/Rebel Creek 6th field sub-watersheds.

Table IV-1. Land Ownership.

Management Entity	Quartz Creek 6th		Hardy/Rebel Creek 6th	
	Acres	% of Watershed	Acres	% of Watershed
Willamette NF	12,423	46	16,958	100
Private	14,646	54	0	0
Total	**27,069**	**100**	**16,958**	**100**

The Forest Plan, as amended, contains Forest-Wide Standards and Guidelines as well as Management Area Standards and Guidelines for specific land allocations.

Table IV-2 displays Management Area acres within the McKenzie River Ranger District (MRRD) portion of the project area, as designated in the amended Willamette Forest Plan. The table also includes the overlying land allocations from the 1994 Northwest Forest Plan. Five of the Northwest Forest Plan allocations are present and consist of Administratively Withdrawn, Congressionally Reserved Areas, Late-Successional Reserves, and Matrix, and Riparian Reserves. However, Riparian Reserves are not represented in Table IV-2 so that total Willamette Forest Plan Management Area acres can be accurately displayed. Hartz project area riparian reserve acres are described in Table B-2.

Table IV-2. Willamette Forest Plan Management Areas in the Hartz Young Stand Management Project Area

Willamette Forest Plan Management Areas	Northwest Forest Plan Land Allocations	Acres
5a – Special Interest Areas	Administratively Withdrawn	962
6c – Wild and Scenic River – S Fork McKenzie	Congressionally Reserved	

9c – Wildlife Habitat-Marten	Administratively Withdrawn	169
9d – Wildlife Habitat-Special Areas	Administratively Withdrawn	280
11a - Scenic-Modification Middleground	Matrix	3,520
11c – Scenic-Partial Retention Middleground	Matrix	800
14a – General Forest	Matrix	9,382
16b – Late Successional Reserves	Late Successional Reserves	4,144
16b – 100-acre Late Successional Reserves	Late Successional Reserves	736
Total Acres		**19,031**

C. Historical Management

Stand conditions on National Forest System (NFS) lands in the area where actions are proposed (Quartz Creek and Hardy/Rebel Creek sub-watersheds) is characterized by extensive regeneration harvesting during the 1970's and 1980's. Clearcutting and subsequent planting of primarily Douglas-fir was done to comply with sustainable yield timber management objectives of the time.

Past timber harvesting in the Hartz Young Stand Management Project area occurred in land allocations that were then designated for timber production, including what is now designated Late Successional Reserves (LSRs), Matrix, and Riparian Reserves by the 1994 Northwest Forest Plan (Table IV-2). In most cases, stands on this landscape were planted at a density that typically requires pre-commercial and commercial thinning to control density and keep the stands in a healthy condition. The long-term view was to schedule final regeneration harvest when the stands reached certain ages or stand density levels, usually at 80 years.

Approximately 448 acres of regeneration harvesting has occurred on National Forest System land in the planning area in the past 10 to 15 years. Higher rates of regeneration harvest have occurred on privately owned lands within the Quartz Creek sub-watershed, downstream from the Hartz Young Stand Management Project Area.

Table IV-3: Historic Stand Treatment on N.F. Lands within the Hartz Young Stand Management Project Area

Decade	Acres of Managed Stands	Acres of Regeneration Harvest
1950-1959	746	746
1960-1969	1960	1915
1970-1979	3779	3608
1980-1989	2301	2294
1990-1999	849	448
Totals	**9635**	**9011**

About 30% of National Forest land in Quartz Creek sub-watershed was regeneration harvested between 1976 and 1993. Since 1993, there has been no activity on N.F. land in Quartz Creek. All timber harvest in Hardy/Rebel Creek sub-watershed has been regeneration harvest with the exception of Hardy Thin 1993 (401 acres) and salvage projects.

Current stand age classes for the National Forest portion of the Project Area: 6,331 acres are over 150 years old; 4,084 acres are 81-150 years; 1,631 acres are 41-80 years; 2,450 acres are 31-40; and 5,538 acres are 10-30 years.

Non-federal Lands

Of the 27,069 acres of land in the Quartz Creek 6th field sub-watershed, the northern or downstream half of the sub-watershed (16,646 acres or 54%) is privately owned and managed as industrial timberland. Increased levels of timber harvest occurred in Quartz Creek following World War II, on both private and national forest land. Currently an estimated 300 acres of regeneration harvest occurs annually on private land in Quartz Creek, based upon privately owned acreage and a 45-year rotation. The entire Hardy/Rebel Creek sub-watershed is National Forest land (Table IV-1).

D. AP Current Environmental Baseline Condition

This section provides a description of the environmental baseline for: 1) the Quartz Creek 6th field sub-watershed, 2) and the Hardy/Rebel Creek 6th field sub-watershed, considered the Action Area.

Table IV-4 provides a summary of the current habitat and watershed conditions, as compared to the biological requirements of the listed species from the AP table entitled: *FWS/NOAA Fisheries Table Of Population And Habitat Indicators For Use In The Northwest Forest Plan Area*.

Most of the larger fish bearing streams in the watershed have been surveyed in the past decade. Data collected from these stream surveys, water quality monitoring, queries of the GIS database, and watershed analyses were compared to the default AP values resulting in a determination of the appropriate condition category of Properly Functioning, At Risk, or Not Properly Functioning. This analysis was conducted at the 6th field watershed scale. Two ESA listed species and habitat are assessed below, both present downstream of the project area. A separate determination of condition between species will be made only when there is a difference (between species) within an indicator.

Table IV-4. Summary of baseline conditions.

Indicator	Environmental Baseline Condition Category					
	Quartz Creek 6th			Hardy/Rebel Creek 6th		
	PF	FAR	NPF	PF	FAR	NPF
Temperature		X			X	
Sediment			X		X	
Chemicals/Nutrients	X			X		
Physical Barriers		X		X		
Substrate Embeddedness		X			X	
Large Woody Debris			X			X
Pool Frequency and Quality		X		X		
Large Pools			X		X	
Off-channel Habitat		X				X
Refugia		X				X
Width:Depth Ratio		X				X
Streambank Condition		X				X
Floodplain Connectivity			X	X		
Change in Peak/Base Flows		X		X		
Drainage Network Increase		X			X	
Road Density & Location			X			X

Disturbance History		X			X	
Riparian Reserves			X		X	
Disturbance Regime		X			X	

PF = Properly Functioning, FAR = Functioning At Risk, and NPF = Not Properly Functioning

<u>Temperature</u>:

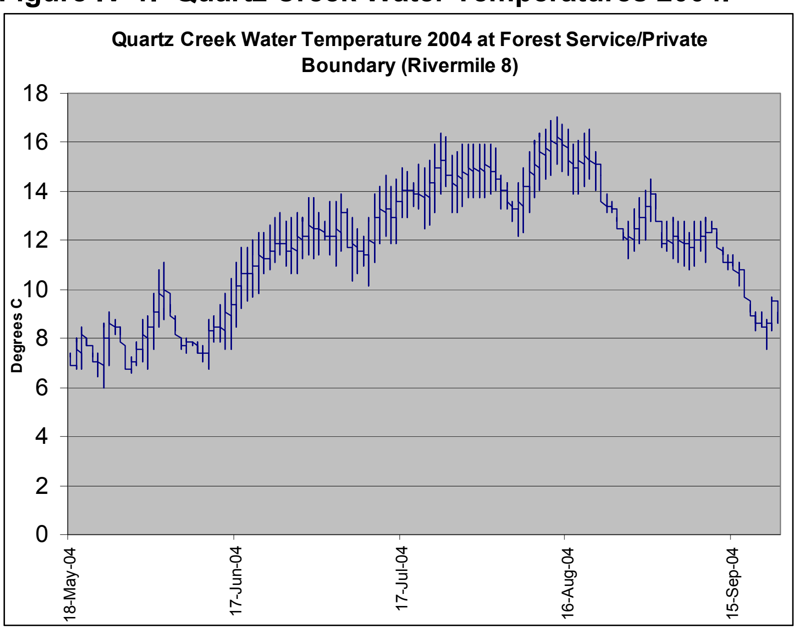
Quartz Creek 6th Field Sub-watershed:

There are no stream segments within the Quartz Creek sub-watershed currently identified by the Oregon Department of Environmental Quality 303(d) List as being water quality limited due exceeding water temperature standards.

Adult spring chinook require cold temperatures for spawning ranging from 5.6 to 12.8 degrees C, egg incubation ranging from 4.5 to 12.8 degrees C, and optimal juvenile rearing ranging from 10.0 to 15.6 degrees C (Spence et al. 1996). Quartz Creek is described a *Core Cold Water Habitat* in Oregon Administrative Rules, with ODEQ water quality standards not to exceed 16.0 degrees C in seven-day-average maximum temperatures.

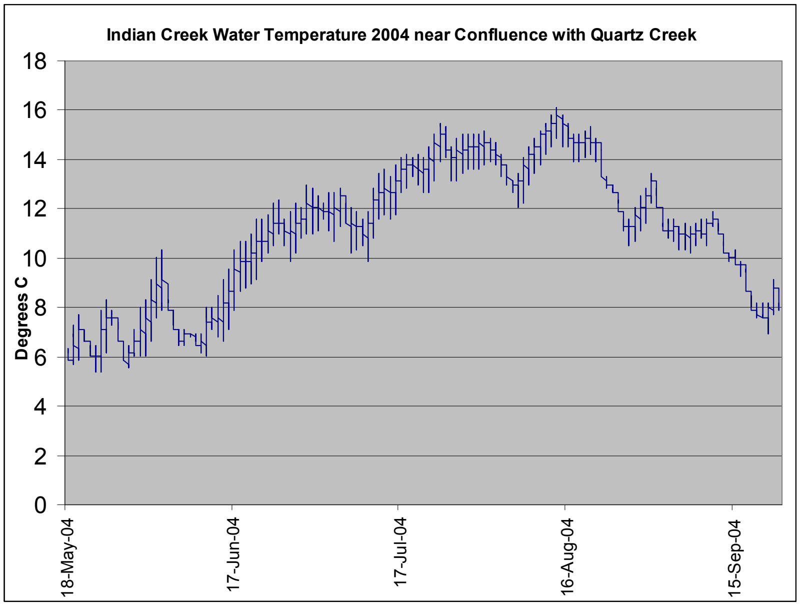
Bull trout require cold, clear water with low amounts of fine sediment in the stream bed, relatively constant flows, and high frequencies of large and fine woody material to successfully spawn and rear. Within three years of emerging from the redd, fluvial and adfluvial bull trout migrate downstream from their natal stream to live in a river or lake. As sub-adults (age 3-5), bull trout have less specific habitat requirements than juveniles. It is believed bull trout become nomadic, following food sources. Adult bull trout require relatively cold temperatures (9-13 degrees C preference range in rivers), but not as cold as requirements for embryonic development (1-6 degrees C optimum range), and optimal juvenile growth (4-10 degrees C) (Spence et al. 1996).

Figure IV-1. Quartz Creek Water Temperatures 2004.



The most recent available stream temperature data for Quartz Creek was recorded during 2004. Quartz Creek, at the lower extent of federally managed land near rivermile 8, met Oregon Department of Environmental Quality temperature standards for Core Cold Water Habitat as the seven-day-average maximum temperature did not exceed 16.0 degrees Centigrade.

Figure IV-2. Indian Creek Water Temperatures 2004.



Similarly, Indian Creek (Figure IV-2) meet ODEQ temperature standards for Core Cold Water Habitat. Temperatures in Quartz Creek as it flows through National Forest system lands may be expected to be near the natural range of variation on federally managed land due to the condition of riparian areas. Rationale for this assumption is the absence of recent stream adjacent management, absence of fire disturbance and a closed canopy since most recent stream adjacent management during the 1980's. While no temperature data is available for privately owned industrial forestland, Quartz Creek is characterized as functioning at risk for providing cold water salmonid habitat.

Baseline Determination: Functioning At Risk (FAR)
The rationale is timber harvest adjacent to perennial waterways, and expected elevated water temperatures in tributaries and the lower 8 miles of Quartz Creek (temperatures in areas believed used by adult chinook historically and migrating bull trout are expected to regularly exceed 60^{o}F or 16^{o}C).

Hardy/Rebel Creek 6th Field Sub-watershed:

Within the Hardy Creek/Rebel Creek sub-watershed, an un-named tributary of Rebel Creek is 303(d) listed by Oregon Department of Environmental Quality as water quality limited based on water temperature during the summer season. The stream is listed for exceeding the summer temperature criteria of 18 degrees C. for salmon and trout rearing habitat. No other streams are listed.

2004 stream temperatures for Hardy Creek are available. The lower Hardy Creek site was located at the 1980204 road crossing which is less than 0.5 miles from the mouth of Hardy Creek. The upper Hardy Creek site was at the 1980225 road crossing which is approximately 3 miles from the mouth. Anadromous fish and bull trout can only access about the lower 1 mile of Hardy Creek.

7 day average maximum for lower Hardy Creek site: 16.09 degrees C. (60.91 degrees F)
7 day average maximum for upper Hardy Creek site: 11.32 degrees C. (52.38 degrees F)

Bull trout do not use Hardy Creek for spawning or early rearing. Even if the sub-watershed were in a pristine condition, it would not provide the stream temperatures necessary for bull trout spawning, incubation, and early rearing. This is because Hardy Creek does not have a large, cold-water spring influence. Therefore, the standard used to make the bull trout determination was, "…also temperatures in areas used by adults during migration sometimes exceeds 15 degrees C."

Spring chinook do not use Hardy Creek to spawn. The 7 day average high at the lower Hardy Creek site was around August 13. Chinook spawning typically takes place in September and October when temperatures in Hardy Creek are cooler.

Baseline Determination: Functioning At Risk (FAR)
The rationale for this determination is temperatures in lower Hardy Creek (water temperature in areas of suspected use by juvenile chinook and migrating bull trout) exceed 60^{o}F or 16^{o}C.

Suspended sediment-intergravel dissolved oxygen/turbidity:

Quartz Creek 6th Field Sub-watershed:

Based on a limited analysis of aerial photo series, synoptic surveys, and field reviews that were conducted immediately following storm events, mass soil movement from managed areas in Quartz Creek appear to be more common today than under undisturbed, reference conditions. (Quartz Creek and Minor Tributaries Watershed Analysis, 1998) Terrain analysis and field reconnaissance suggests that sediment transport processes in the Quartz Creek watershed are dominated by mass wasting processes. For the most part, material moves into channels slowly via soil creep where it is stored. Along larger perennial channels, this material is removed relatively frequently by winter storm flows. In smaller intermittent channels this material is commonly stored for longer periods until a relatively large event carries the stored materials down stream in a debris torrent. Management activities have influenced these processes in several ways. Road construction on steep inner gorge slopes and steep headwater swales create crossings with culverts and large fills. Historically, undersized or poorly designed installations resulted in failure during storm events. As the surge of water and fill material move downstream, stored sediments are also mobilized and debris torrents can be generated. Also, clearcut harvest of riparian reserves on National Forest system lands prior to implementation of the Willamette National Forest Land and Resource Management Plan in 1990 removed anchoring trees that provided stability to banks and stored materials in these channels. Frequently, existing large woody debris that anchored stored sediments was removed from the channels as well. The net result was that smaller storm events were needed to mobilize stored sediments into debris torrents, and the frequency of torrenting increased. These harvest practices and their resulting impacts on sediment delivery to streams also occurred, and continue to occur on private forest lands in Quartz Creek.

In addition to the role that road crossings play in torrent events, roads in Quartz Creek are also a source of chronic erosion and sediment delivery to streams through erosion and transport of surface fines, especially on rutted and poorly maintained roads. Fire suppression during the past century is expected to contribute to some reduction in natural rates of sediment input associated with fire disturbance, but not at levels significant in comparison to road related input.

As a result of delivery of surface fines from travel ways, and the risk of crossing failures, associated with a moderately high road density in Quartz Creek, and the continued removal of stabilizing riparian vegetation on private forest lands, suspended sediment was placed in the category of not properly functioning.

Baseline Determination: Not Properly Functioning (NPF)

Hardy/Rebel Creek 6th Field Sub-watershed:

Terrain analysis and field reconnaissance suggests that sediment transport processes in the Hardy Creek/Rebel Creek sub-watershed are dominated by mass wasting processes. Throughout the sub-watershed, material moves into channels slowly via soil creep where it is stored. Along larger perennial channels, this material is removed relatively frequently by winter storm flows. In smaller intermittent channels this material is commonly stored for longer periods until a relatively large event carries the stored materials down stream in a debris torrent.

Management activities in the Hardy Creek portion of the sub-watershed have influenced these processes in several ways. Road construction on steep inner gorge slopes and steep headwater swales create crossings with culverts and large fills. Historically, undersized or poorly designed installations resulted in failure during storm events. As the surge of water and fill material move downstream, stored sediments are also mobilized and debris torrents can be generated. Also, clear-cut harvest of riparian reserves on National Forest system lands prior to implementation of the Willamette

National Forest Land and Resource Management Plan in 1990 removed anchoring trees that provided stability to banks and stored materials in these channels. Frequently, existing large woody debris that anchored stored sediments was removed from the channels as well. The net result was that smaller storm events were needed to mobilize stored sediments into debris torrents, and the frequency of torrenting increased. These management induced effects are much less pronounced in the Rebel Creek portion of the sub-watershed, as harvest and road activities are limited due to wilderness designation of the majority of the drainage.

In addition to the role that road crossings play in torrent events, roads in the sub-watershed are also a source of chronic erosion and sediment delivery to streams through erosion and transport of surface fines, especially on rutted and poorly maintained roads. Fire suppression during the past century is expected to contribute to some reduction in natural rates of sediment input associated with fire disturbance, but not at levels significant in comparison of road related input.

Hardy Creek specifically has an additional large source of sediment and turbidity. A large Quaternary failure of material perched along the east flank of Indian Ridge generated an earth-flow covering several square miles that moved eastward towards the South Fork of the McKenzie River and southward toward Hardy Creek. In the process, approximately 2.5 miles of the lower portion of Hardy Creek was displaced by up to a half mile to the southeast and up against the more resistant rock of the adjacent ridge. The earth-flow itself is a relic structure that is no longer active. However, Hardy Creek has been, and continues to erode back into the toe of the earth-flow in an attempt to return to its former location and gradient. This results in a very active source of sediment of all sizes. Field examination has identified the existence of lens deposits of fine clay minerals. As these deposits are encountered by Hardy Creek, high levels of turbidity are generated due to the relatively high rate of suspension of these minerals in water.

As a result of delivery of surface fines from travel-ways, and the risk of crossing failures, associated with a moderately high road density in Hardy Creek, suspended sediment was placed in the category of functioning at risk.

Baseline Determination: Functioning At Risk (FAR)
[A high rate of sediment production and turbidity along Hardy Creek and tributaries draining the ancient earthflow are considered products of natural geomorphic processes and are not used in incrementing this indicator or in characterizing this source of sediment production as an adverse process.]

<u>Chemical contaminants/nutrients</u>:

Quartz Creek 6th Field Sub-watershed:

Excess nutrients or chemical contaminants are not considered a significant risk in Quartz Creek watershed. Some risk of contamination exists with forest traffic, logging systems, and a privately operated equipment shop near the confluence of Quartz Creek with the McKenzie River. Contract equipment requirements and proximity to waterways, contract spill response requirements, accident communication and response time have improved in recent history, to allow mitigation of potential contamination and reduction of toxic effects to aquatic animals. There are no ODEQ 303d designated reaches in Quartz Creek.

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Baseline Determination: Properly Functioning (PF)

Hardy/Rebel Creek 6th Field Sub-watershed:

Excess nutrients or chemical contaminants are not considered a significant risk in the Hardy Creek/Rebel Creek sub-watershed. Some risk of contamination exists that is associated with potential traffic accidents along forest roads and mechanical failure of harvest equipment such as broken hydraulic lines or oil/fuel leaks. Contract equipment requirements and use restrictions in proximity to waterways, contract spill response requirements, accident communication and response time have improved in recent history, to allow mitigation of potential contamination and reduction of toxic effects to aquatic animals.

Baseline Determination: Properly Functioning (PF)

Physical barriers:

Quartz Creek 6th Field Sub-watershed:

The environmental baseline is described as functioning at risk due to a potential culvert barrier on federally managed land (Lytle Creek). Also, culvert access between Quartz Creek and tributaries on privately managed land (beneath Quartz Creek Road) have not been inventoried. The federal culvert on Lytle Creek drops over steep topography which in itself may present a migration barrier. Native cutthroat trout are isolated upstream of the Lytle Creek culvert beneath Rd 2618, distributed from near the Lytle Creek confluence with Quartz Creek to 0.6 mile upstream. It is unlikely Lytle Creek has served as habitat for spring chinook salmon or bull trout due to its size and location within the Quartz Creek sub-watershed.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:

The only barriers to chinook and bull trout migration in the action area are natural barriers. There are “human made” barriers in the watershed, but they are upstream of natural barriers. The stream crossing on the 1980204 road is a bridge.

Baseline Determination: Properly Functioning (PF)

Substrate character and embeddedness:

Quartz Creek 6th Field Sub-watershed:

Embeddedness was measured during a 1996 stream survey of Quartz Creek by USFS fisheries technicians. Embeddedness ranged from 0-25% in pool habitat and 0-40% in riffle habitat through three Quartz Creek reaches surveyed on federally managed land. No measurement of cobble embeddedness was taken during a simultaneous survey on privately owned reaches of Quartz Creek (conducted by Soil and Water Conservation District contracted crews). The steep and generally constrained character of reaches surveyed on federally managed portions of Quartz Creek (rivermile 8-13), the channel appears to efficiently transport fine sediments. Due to the level of embeddedness described in surveys on federal land and lack of embeddedness information of privately owned portions of Quartz Creek, this environmental baseline is described as functioning at risk.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:

The only embeddedness data we have is for the first reach in the 1997 survey. In 22 measured units, embeddedness ranged from 0% to 25% with an average of 9%. The dominant from of substrate in Reach 1 was boulder.

Baseline Determination: Functioning At Risk (FAR)

Large woody debris:

Quartz Creek 6th Field Sub-watershed:

At the scale of 6th field sub-watershed, Quartz Creek and tributary streams have reaches ranging from negligible to minimum levels of large woody material to maintain proper stream function. Mainstem Quartz Creek and tributaries experienced removal of in-stream wood into the 1980's, and future supply will depend almost entirely upon recruitment from federally managed land. Stream enhancement projects occurred on federally managed land near rivermile 8.5 during 1988. The stream enhancement reach continues to be monitored by Oregon State University Department of Fisheries and Wildlife

Table IV-5. Quartz Creek Stream Survey 1996.

Reach	Reach Length (mile)	Average Gradient %	Bankfull Width (feet)	Bankfull Width/Depth Ratio	LWD/mile ≥ 24 inch diameter	Dominant Substrate	% Pool Area	% Side Channel Area	Fish Present
1	4.5	2	59	18.2	2.0	Cobble	10.3	7.3	RB/CT
2	4.0	2	49	15.3	1.8	Cobble	11.0	4.6	RB/CT
3	2.2	5	30	21.7	30.5	Cobble	28.1	7.1	RB/CT
4	1.7	13	20	16.4	26.5	Sm. Boulder	9.5	8.6	CT
5	1.5	13	14	16.2	35.9	Cobble	14.8	6.4	CT
Privately owned portions of Quartz Creek, surveyed in 1996 by East Lane Soil and Water Conservation District									
All other reaches on National Forest, surveyed by Forest Service or under Forest Service contract. RB = rainbow trout; CT = cutthroat trout									

in large woody debris mobility studies, nutrient trapping, fish community response, and flood response (project name; Quartz Creek Restoration Project). A cooperative project between Rosboro Lumber Co., ODFW, SWCD and FS to supplement large wood in privately owned portions of Quartz Creek treated one mile of channel during 1997. Approximately 30 pieces of large woody material was added to the lower Quartz Creek channel. In the short-term future, the supply of potentially recruited large wood in the watershed is probably sufficient to maintain current densities of in-stream wood. In the long-term, the quality and quantity of significant woody material (≥ 24 inch diameter) is expected to improve as previously managed stands on federal land develop and are recruited into the Quartz Creek channel.

Table IV-6. Lytle Creek Stream Survey 1996.

Reach	Reach Length (mile)	Average Gradient %	Bankfull Width (feet)	Bankfull Width/Depth Ratio	LWD/mile ≥ 24 inch diameter	Dominant Substrate	% Pool Area	% Side Channel Area	Fish Present
1	0.6	17	11.2	7.8	11.6	Cobble	16.9	3.5	CT
CT = cutthroat trout									

Table IV-7. Indian Creek Stream Survey 1993.

Reach	Reach Length (mile)	Average Gradient %	Bankfull Width (feet)	Bankfull Width/Depth Ratio	LWD/mile ≥ 24 inch diameter	Dominant Substrate	% Pool Area	% Side Channel Area	Fish Present
1	0.9	8	23	16.7	18.8	Cobble	18.5	8.7	RB/CT/ Sculpin
2	1.3	10	23	12.8	8.1	Cobble	7.1	0.6	CT
3	0.7	11	20	14.1	52.3	Cobble	2.9	0.0	CT
RB = rainbow trout; CT = cutthroat trout									

Due to in-stream wood being maintained below minimum levels desired on private land with little prospect of short-term improvement, and potential sources of long-term woody debris improving on federally managed land, this indicator is described as not properly functioning.

Baseline Determination: Not Properly Functioning (NPF)

Hardy/Rebel Creek 6th Field Sub-watershed:

A stream survey was conducted in Hardy Creek in 1997, and in Bouy Creek (a tributary to Hardy Creek) in 2000. The following table provides a summary of the large wood counts.

Table IV-8. Large Wood Counts in Hardy and Buoy Creeks 1997.

Hardy Creek Reach	LWM/Mile ≥ 24 inches in diameter	Buoy Creek Reach	LWM/Mile ≥ 24 inches in diameter
1	19.2	1	26.4
2	27.9	2	22.8
3	16.3	N/A	N/A

The standard used in the habitat indicators table is 80 pieces per mile that are >24" diameter on the Coast. The only reach where listed fish could occupy Hardy Creek is Reach 1 which has a large wood inventory of 19.2 pieces per mile. The only appropriate diagnostic or pathway call would be "current levels are not at those desired values for 'properly functioning,' and potential sources of woody debris for short and long term are lacking." There is no shortage of small pieces of woody material. However, it is the large "key" pieces that are in short supply.

Baseline Determination: Not Properly Functioning (NPF)

Pool frequency and quality:

Quartz Creek 6th Field Sub-watershed:

Pool frequency in low gradient reaches of Quartz Creek and tributaries is expected to be at or below the low end of the range of variability, due largely to low densities of in-stream wood. The quality or quantity of pools is not expected to be reduced due to deposition of fine sediment, as fine sediments appear to be transported efficiently from this system. As the recruitment potential for short-term supply of large woody debris is expected to maintain current densities with an improving long-term supply, this indicator is described as functioning at risk.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:

Pool frequency in low gradient lower Hardy Creek, accessible to migrating bull trout and spring chinook salmon juveniles, has a density of quality pools likely within the range of historic condition.

Table IV-9. Hardy Creek Stream Survey Summary (1997) Pool Frequency.

Reach	Bankfull Width (feet)	Pool Area (%)	Pools / Mile
1	41	27.9	64.34
2	26	17.3	50.14
3	13	14.0	48.96

Baseline Determination: Properly Functioning (PF)

Large pools:

Quartz Creek 6th Field Sub-watershed:

The portion of the 6th field watershed with widths greater than 3 meters at baseflow are the lower three reaches of Quartz Creek. Reaches 1-3 currently have few high quality pools, due largely to a low density of in-stream wood. Existing high quality pools are formed around large boulders and along bedrock. It is expected the frequency of high quality pools is at or below the low end of the range of variability. This indicator is described as functioning at risk as deep pools are present in the reaches described above, but at low frequency.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:

Hardy Creek is a small stream system in comparison to the South Fork McKenzie River. It would make more sense to use this standard for a system like the South Fork where listed fish do occur. Hardy Creek is a cutthroat stream.

Table IV-10. Hardy Creek Stream Survey Summary (1997) Pool Depth.

Reach	Residual Pool Depth in Feet
1	1.91
2	1.85
3	1.52

The standard for this diagnostic pathway is, "In adult holding, juvenile rearing, and overwintering reaches where streams are >3m in wetted width at base flow." Hardy Creek would not be expected to be used as adult holding, but potentially for juvenile rearing. It might also be used for juvenile over-wintering habitat.

Baseline Determination: Not Properly Functioning (NPF)

Off-channel habitat:

Quartz Creek 6th Field Sub-watershed:

The quantity of off-channel habitat is expectedly greater where in-stream wood densities are greater (Tables 2 through 4) and channel characteristics such as gradient and entrenchment allow lateral migration of the channel. Side channels in the lower two reaches of Quartz Creek have greatest potential to favor the early life history of spring chinook salmon by providing rearing habitat. Side channel area is expected to be at or below the lower range of the range of variability. This habitat indicator meets the criteria as functioning at risk, at current reduced levels of off-channel area and low volumes of flow-deflecting in-stream wood. However, levels of off-channel habitat in Quartz Creek, especially the lower gradient, broader valley reaches on private lands are far below what could potentially exist if the system were operating as it was prior to management.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:

Hardy Creek is a channel type (Rosgen type B) where you would not expect a lot of off channel habitat. Since only 0.5 percent of reach one is in off channel habitat, this diagnostic is not properly functioning.

Table IV-11. Hardy Creek Stream Survey Summary (1997) Off Channel Habitat.

Reach	Percent Off Channel Habitat
1	0.5
2	4.5
3	3.0

Baseline Determination: Not Properly Functioning (NPF)

Refugia:

Quartz Creek 6th Field Sub-watershed:

At the sub-watershed scale, Quartz Creek does not present access problems for migrating fish (in or out of the McKenzie River sub-basin). However, in providing habitat to support various life stages of native and listed species, Quartz Creek in general is described as functioning at risk. Most indicators described in this assessment are functioning less than appropriately and are at a reduced capability to meet the habitat and water quality needs of listed species. Some native fish refugia is provided in federally managed portions of Quartz Creek, in the form of habitat for all life stages of resident cutthroat trout, and for spawning and rearing habitat for fluvial rainbow. Native fish production provides foraging opportunity for bull trout, if lower watershed reaches do not present seasonal thermal barriers to migrating bull trout.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:

Hardy Creek is within the South Fork McKenzie River Tier I Key Watershed. Hardy Creek does not contain the habitat characteristics to provide for all life history phases for bull trout. Chinook could use the lower reach to spawn, but baseflows are quite low and chinook could have difficulty getting over the alluvial fan at the mouth of Hardy Creek. Hardy Creek does not provide refugia habitat.

Baseline Determination: Not Properly Functioning (NPF)

<u>Average wetted width/maximum depth ratio</u>:

Quartz Creek 6th Field Sub-watershed:

Width to depth ratios can increase due to bank instability, removal of riparian vegetation, or increases in bedload, and are an indicator of stream channel condition. Width to depth is measured by the Willamette NF after Rosgen (1996) as the ratio of bankfull surface width to mean depth of the bankfull channel in riffle areas. It is not measured as stated in the matrix - average wetted width to maximum depth at scour pools. Lower reaches of Quartz Creek exhibit a relatively wide single thread channel with few side channels (Table IV-5). Current use of Quartz Creek by spring chinook is thought to be limited to rearing in these reaches as removal of large wood and riparian forest on private lands resulted in simplification from a multi-threaded network of narrower channels to the current predominantly single channel system.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:

Width to depth ratios can increase due to bank instability, removal of riparian vegetation, or increases in bedload, and are an indicator of stream channel condition. Width to depth is measured by the Willamette NF after Rosgen (1996) as the ratio of bankfull surface width to mean depth of the bankfull channel in riffle areas. It is not measured as stated in the matrix (average wetted width to maximum depth at scour pools). Different stream types will have differing width:depth ratios and both accurate measurements and understanding of stream channel types and dynamics are necessary to correctly interpret measurements. Channel widening and downcutting have been observed in management impacted streams, such as Hardy Creek, a tributary to the mainstem South Fork.

Table IV-12. Hardy Creek Stream Survey Summary (1997) Width to Depth Ratio.

Reach	Width to Depth Ratio
1	20.5
2	16.4
3	18.0

Since the width to depth ratio is greater than 20 in the reach where listed fish could access Hardy Creek this diagnostic is not properly functioning.

Baseline Determination: Not Properly Functioning (NPF)

<u>Stream-bank condition</u>:

Quartz Creek 6th Field Sub-watershed:

Varying quantities of stream-bank instability were noted during stream surveys, resulting from natural and management induced causes. Management induced stream-bank instability in Quartz Creek likely results from increased susceptibility to the effects of peak flows, as timber harvest, road construction, stream clean-out, and other activities have altered channel configurations and removed large wood from streams in the watershed. Additional alteration of riparian vegetation is not expected to contribute to stream-bank instability, due to protections from state and federal riparian protections (Oregon Forest Practices and Northwest Forest Plan). Lower Quartz Creek has likely coarsened in bed-load composition from historic conditions, including coarser stream-bank composition. Stream-bank conditions here are expected to be at or below the lower range of natural variability. Upper reaches of Quartz Creek and tributaries with a diversity of stand composition are expected to experience flow regimes within the range of historic conditions, and possess stream-bank conditions reflecting a natural range of peak flows. Based on field observations during stream surveys, the stream-bank indicator is described as functioning at risk.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:
Historically, management induced stream-bank instability in the Hardy Creek/Rebel Creek sub-watershed likely resulted from increased susceptibility to the effects of peak flows, as timber harvest, road construction, stream clean-out, and other activities have altered channel configurations and removed large wood from streams in the watershed.

Additional alteration of riparian vegetation is not expected to contribute to stream-bank instability, due to protective management direction in the Willamette National Forest Land and Resource Management Plan and the Northwest Forest Plan.

Stream-bank conditions in Hardy Creek are not expected to stabilize in the foreseeable future along the area affected by the Quaternary earth-flow. As previously discussed under the sediment heading, Hardy Creek will continue to attempt to return to a stable channel profile and cross section. Based on field observations during stream surveys, and the inherent natural instability along Hardy Creek, the stream-bank indicator is described as not properly functioning.

Baseline Determination: Not Properly Functioning (NPF)

Floodplain connectivity:

Quartz Creek 6th Field Sub-watershed:
For the reasons described under the discussion of off-channel habitat, including loss of historical channel complexity and apparent loss of side channel habitat, this indicator is rated as not properly functioning for the Quartz Creek sub-watershed. Loss of floodplain connectivity has occurred in low gradient portions of lower Quartz Creek (Reaches 1-3), where opportunity for lateral channel migration exists (Table IV-5), and where in-stream wood was salvaged and riparian harvest occurred. In more constrained upper watershed reaches, where harvest of riparian zones along tributary streams occurred 1960's-1980's, similar effects occurred, but the consequences were not as pronounced in these steep, narrow streams that lack the broad floodplain areas that are prevalent in the lower reaches.

Baseline Determination: Not Properly Functioning (NPF)

Hardy/Rebel Creek 6th Field Sub-watershed:
Within the Hardy Creek/Rebel Creek sub-watershed, the only stream that has substantial segments of flood plain is the South Fork of the McKenzie River. While removal of large wood and road construction have occurred along these reaches, for the most part the river is still connected with it's flood plain.

While not exactly flood plain by definition, Balm Creek and Buoy Creek are streams that to some extent have developed on the surface of the Quaternary earth as previously discussed under the sediment heading. These relatively young streams flow through and among a variety of ponds and wetlands that are located on the rolling, hummocky terrain that characterizes the surface of the earth flow. As they do so, they readily interact hyporheically with these features. This indicator is rated as properly functioning for the Hardy Creek/Rebel Creek sub- watershed.

Baseline Determination: Properly Functioning (PF)

<u>Change in peak/base flows</u>:

Quartz Creek 6th Field Sub-watershed:
Quartz Creek does not have a gage or hydrograph and indications of potential changes in peak flow are based upon other indicators. Peak flows may have increased in Quartz Creek as a result of timber harvest and road construction during the 1950's through the 1970's (Quartz Creek and Minor Tributaries Watershed Analysis, 1998). Aggregate Recovery Percentage (ARP) is used to estimate sub-watershed area vegetative recovery and resilience in rain-on-snow events. Current vegetative conditions place most of the Quartz Sub-watershed at or above desired levels of recovery following initial harvest entries.

Table IV-13. Calculated versus desired mid-point Aggregate Recovery Percentage (ARP) for planning sub-watersheds (Psubs) in the Quartz Creek 6th field watershed as of 2005.

Psub	Calculated ARP	Mid-point ARP
Fawn Buck	88.4	80
Wycoff-Sugar	82.8	80
Lytle-Indian	88.4	85
Upper Quartz	91.3	85
Lower Quartz	80.9	80
Cane Coffee	84.5	85

With recovery levels near or above desired levels in Quartz Creek, and a moderately high road density of 3.16 miles/square mile was constructed to access timber (increasing the drainage network and efficiency), it is not likely that peak flows are outside the historic range currently. The indicators of adverse channel response to peak flows in the lower Quartz Creek channel: such as coarse bed-load, low channel complexity compared to nearby tributaries of similar size, and low channel and floodplain storage of sediments noted in the watershed analysis are more likely the result of the removal of riparian forests and large wood from these reaches. What this means is that peak flows that have not substantially changed in magnitude from historic peaks are relatively more damaging due to increased channel vulnerability. These same attributes associated with wood removal could cause a reduction in base flow, with poorer floodplain connectivity/storage of groundwater, and more efficient interception and delivery of precipitation via watershed roads.

Overall the Quartz Creek sub-watershed does not meet the matrix indicator of being comparable to an undisturbed watershed of similar size and geology. However, increased channel vulnerability to peak flow impacts and the potential for reduced base flows in Quartz Creek that are based on ARP, road density and channel condition indicators result in an environmental baseline that is functioning at risk.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:
There are no gauges in the Hardy Creek/Rebel Creek sub-watershed and indications of potential changes in peak flow are based upon other indicators. Peak flows may have increased in Hardy Creek and Starr Creek as a result of timber harvest and especially road construction. Road densities in these drainages are quite high and create a high likelihood that stream network extension has occurred. (South Fork McKenzie River Watershed Analysis, 1994).

Aggregate Recovery Percentage (ARP) is used to estimate sub-watershed area vegetative recovery and resilience in rain-on-snow events. Current vegetative conditions place the sub-watershed well above desired levels of recovery following initial harvest entries.

Table IV-14. Calculated versus desired mid-point Aggregate Recovery Percentage (ARP) for planning sub-watersheds (Psubs) in the Hardy/Rebel Creek sub-watershed as of 2005.

Psub	Calculated ARP	Mid-point ARP
Hardy Creek	91.4	80
Starr Creek	90.0	75
Trail Creek	98.9	80
Rebel Creek	99.0	80

With recovery levels well above desired levels in the sub-watershed, and despite relatively high road that may have increasing the drainage network and efficiency, it is not likely that peak flows are outside the historic range currently. Indicators of adverse channel response to peak flows in streams such as coarse bed-load, channel incision, and bank instability are more likely the result of natural geomorphic instability and to a lesser extent, removal of large wood from these reaches. What this means is that peak flows that have not substantially changed in magnitude from historic peaks are relatively more damaging due to increased channel vulnerability. These same attributes associated with wood removal could cause a reduction in base flow, with poorer floodplain connectivity/storage of groundwater, and more efficient interception and delivery of precipitation via watershed roads.

Overall the sub-watershed does not meet the matrix indicator of being comparable to an undisturbed watershed of similar size and geology and the baseline value for this sub-watershed should be properly functioning.

Baseline Determination: Properly Functioning (PF)

<u>**Primary Constituent Elements of Proposed Spring Chinook Critical Habitat**</u>:

Quartz Creek 6th Field Sub-watershed:
Primary Constituent Elements (PCE's) currently present in the Quartz Creek sub-watershed are potential rearing sites near the confluence of Quartz Creek with the McKenzie River and freshwater migration corridors to and from those rearing sites, also near the confluence. Migration corridor conditions are described in indicator descriptions above (peak/base flows, temperature, chemical contaminants/nutrients, physical barriers, large woody debris, pool frequency and quality, large pools, off-channel habitat, stream-bank condition, and floodplain connectivity). Current conditions do not provide for a third PCE in Quartz Creek as spawning habitat for spring chinook salmon, and that element is no longer present (although desired future conditions and Hartz project objectives seek to enhance this element in Quartz Creek).

Freshwater rearing habitat is described in indicator descriptions above with the exception of foraging habitat supporting juvenile development. Baseline condition of spring chinook juvenile foraging habitat in Quartz Creek sub-watershed describes a small area of suspected use by spring chinook juveniles. Tributaries confluences of similar size are known to provide rearing habitat for spring chinook, provided during periods of cool temperatures, flow refuge, available cover and food supply. The period of suspected habitat use in Quartz Creek is September following cooling of temperatures through February/March when high flows provide for the last of smolt migration. The use of Quartz Creek as rearing/foraging habitat is believed minimal due to current habitat conditions. Absence of channel complexity and in-stream wood provides little cover in Quartz Creek for rearing spring chinook and their aquatic insect prey. High rates of turbidity during fall/winter storms are expected to limit aquatic insect diversity to those species tolerant of episodic turbidity. The ability of lower Quartz Creek to recruit and retain spring chinook salmon juveniles is significantly reduced compared to historic conditions, due to simplified habitat conditions, absence of flow refuge, the current sediment regime and expected low aquatic insect diversity.

Hardy/Rebel Creek 6th Field Sub-watershed:
Primary Constituent Elements (PCE's) currently present in the Hardy/Rebel Creek sub-watershed are rearing sites in the South Fork McKenzie River, freshwater migration corridors to and from those rearing sites, and spawning habitat in the South Fork McKenzie River. Spawning habitat and migration corridor conditions are described in indicator descriptions above (peak/base flows, temperature, chemical contaminants/nutrients, physical barriers, large woody debris, pool frequency and quality, large pools, off-channel habitat, stream-bank condition, and floodplain connectivity).

Freshwater rearing habitat is described in indicator descriptions above with the exception of foraging habitat that supports juvenile development. Baseline condition of spring chinook juvenile foraging habitat describes the main stem South Fork McKenzie River in the Hardy/Rebel Creek sub-watershed (proposed critical habitat), known to be used by juvenile spring chinook salmon. Rearing habitat for spring chinook in the South Fork McKenzie is provided year-round with cool water temperatures, flow refuge, available cover and food supply. The period of habitat use in the South Fork McKenzie River is of short duration or year-round following emergence until juveniles smoltify and migrate downstream. A large portion of juveniles will migrate to estuaries immediately upon emergence, and a portion will remain in freshwater for one year, the number remaining depending largely upon the quality of habitat and available food supply. The use of the South Fork McKenzie River below the project area as rearing/foraging habitat is believed significant due to current habitat conditions. Largely a transport reach, the South Fork McKenzie River downstream of the project area possesses desirable levels of channel complexity and in-stream wood to provide cover and food supply to rearing spring chinook. Low water temperatures and low rates of turbidity during fall/winter storms are expected to contribute to aquatic insect diversity with species intolerant to turbidity present in the assemblage. The ability of the South Fork McKenzie River to recruit and retain spring chinook salmon juveniles is believed slightly reduced compared to historic conditions, due to simplified habitat conditions.

Increase in drainage network:

Quartz Creek 6th Field Sub-watershed:
Based on road density in the watershed, there has probably been a moderate increase in active channel length.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:

Based on road density in the watershed, there has probably been a moderate increase in active channel length.

Baseline Determination: Functioning At Risk (FAR)

Road density and location:

Quartz Creek 6th Field Sub-watershed:
Quartz Creek road density exceeds not properly functioning values for bull trout and spring chinook salmon habitat. Road density is estimated at 3.16 miles/square mile. Existing road density is estimated using federal road density and expanding that density onto private land, where road information is not available.

Baseline Determination: Not Properly Functioning (NPF)

Hardy/Rebel Creek 6th Field Sub-watershed:
The road density in Hardy Creek is greater than 3.0.

Table IV-15. Road Density SummaryHardy/Rebel Creek Sub-watershed.

Hardy/Rebel 6th Field	Watershed Area	Miles of Road	Road Density
Wilderness Included	26.5 square miles	62.5 miles	2.36
Non-Wilderness Hardy Creek	17.5 square miles	62.5 miles	3.57

Baseline Determination: Not Properly Functioning (NPF)

<u>Disturbance history</u>:

Quartz Creek 6th Field Sub-watershed:
Aggregate Recovery Percentage (Table IV-13) is a relative measure of the hydrologic recovery of a watershed and is used by the Willamette National Forest to determine when the possibility of augmenting peak flows and causing stream channel damage is an issue at a planning sub-watershed scale. All federally managed sub-watersheds (except privately managed Cane and Coffee Creek) are currently above their recommended ARP level as determined by the Forest Plan. Historic timber harvest in current Riparian Reserves has modified approximately 40% of reserve area in the watershed since the 1950's. Based on harvest and fire history, road density, watershed processes of mass failure, and current watershed channel conditions, the environmental baseline is described as functioning at risk.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:
Aggregate Recovery Percentage is a relative measure of the hydrologic recovery of a watershed and is used by the Willamette National Forest to determine when the possibility of augmenting peak flows and causing stream channel damage is an issue at a planning sub-watershed scale. All portions of the Hardy Creek/Rebel Creek sub-watershed are currently well above desired levels. Historic timber harvest in current Riparian Reserves has modified approximately 45.1% of reserve area in the watershed since the 1960's. Based on harvest and fire history, road density, watershed processes of mass failure, and current watershed channel conditions, the environmental baseline is described as functioning at risk.

Table IV-16. Calculated versus desired mid-point Aggregate Recovery Percentage (ARP) for planning sub-watersheds (Psubs) in the Hardy/Rebel Creek Sub-watershed as of 2005.

Psub	Calculated ARP	Mid-point ARP
Hardy Creek	91.4	80
Starr Creek	90.0	75
Trail Creek	98.9	80
Rebel Creek	99.0	80

Baseline Determination: Functioning At Risk (FAR)

<u>Riparian Reserves</u>:

Quartz Creek 6th Field Sub-watershed:
The impacts of the large scale fires around the turn of the 20th century and intensive management of riparian areas/in-stream salvage in the Quartz Creek watershed are apparent in the low volume of in-stream wood in lower Quartz Creek. Timber harvest prior to the 1990 Willamette National Forest Land and Resource Management Plan also allowed for removal of riparian vegetation on sites that are now considered only for thinning or protection. Currently on federal land, there is less riparian vegetation in the late seral stage (30% measuring 48 inches in diameter and larger) than was present prior to management within the watershed. Riparian vegetation less than 21 inches in diameter on federal land

is expected to exceed historic levels at 46%. Several intensively managed tributaries on federal land, including Lytle Creek, have more area of riparian reserve in the young seral/small tree stage than the surrounding watershed. There has been a significant influence on riparian stand structure to impact the composition of in-stream wood delivered through natural processes throughout the watershed in the decades of 1950-1980.

Baseline Determination: Not Properly Functioning (NPF)

Hardy/Rebel Creek 6th Field Sub-watershed:
The impacts of the large scale fires around the turn of the century (e.g. 1900's) and major floods of 1861 and 1964 are still a dominant feature of riparian areas in the South Fork McKenzie watershed. Timber harvest prior to the 1990 Willamette National Forest Land and Resource Management Plan also allowed for removal of riparian vegetation on sites that would now be considered only for thinning or full protection.

Table IV-17. Riparian Reserve Impacts Hardy/Rebel Creek Sub-watershed.

Total Riparian Reserve Acres	Riparian Reserve Acres Roaded and Percentage Affected	Riparian Reserve Acres Harvested and Percentage Affected
8,083	83.3 (1%)	3642 (45.1%)

Baseline Determination: Functioning At Risk (FAR)

<u>Disturbance regime</u>:

Quartz Creek 6th Field Sub-watershed:
Impacts apparent from previous management in the Quartz Creek 6th field watershed were identified during watershed analysis, primarily as mass failures originating from mid-slope roads built with poor methods on unstable ground. Quartz Creek flows do not appear to be highly variable and unpredictable, and upper watershed channels retain moderate amounts of channel complexity.

Baseline Determination: Functioning At Risk (FAR)

Hardy/Rebel Creek 6th Field Sub-watershed:
While many of the prior indicators that could be associated with this parameter, risks associated with increased road densities such as the potential for crossing failure, and past removal of large wood and riparian vegetation create some increased vulnerability to disturbances. The environmental baseline is rated as functioning at risk.

Baseline Determination: Functioning At Risk (FAR)

<u>Summary/Integration of All Species and Habitat Indicators</u>:

Quartz Creek 6th Field Sub-watershed:
Most habitat parameters in the Quartz Creek 6th field are altered as compared to pre-disturbance conditions, and are likely linked to the absence of spring chinook reproduction and rearing in lower Quartz Creek. Habitat conditions limiting production of spring chinook are expected to impact the quality of foraging habitat utilized by bull trout in Quartz Creek. Habitat conditions improve as federal land is approached at Quartz Creek rivermile 8.3, and upper watershed channels contain moderate levels of channel complexity and cool water habitat required of listed species. Lower Quartz Creek channel conditions are generally described as poor in condition. Habitat parameters described in this assessment are not expected to recover within a short period (one to ten generations; 5-50 years). The environmental baseline summarizing species and habitat indicators is described as not properly functioning due to long period of recovery in the entire 6th field required to provide habitat conditions favorable to spring chinook salmon and bull trout.

Hardy/Rebel Creek 6th Field Sub-watershed:

Some habitat parameters in the South Fork McKenzie above Cougar Dam have been altered as compared to pre-disturbance conditions, but these are not clearly linked to the decline in spring chinook population size. Cougar Dam remains the dominant influence on spring chinook use of the South Fork McKenzie River. Habitat condition is generally described as in good condition currently, and is underutilized by spring chinook due to the presence of the dam. While the habitat parameters (e.g. stream temperature and sediment generated from roads) may recover within a short period (one to ten generations; 5-50 years) the adaptations local populations have had to the South Fork McKenzie River may be lost.

V. EFFECTS OF THE PROPOSED ACTION

A. Introduction

The effects to baseline indicators was assessed for each of the project elements associated with Hartz Project:

1. Timber falling
2. Timber yarding
3. Road reconstruction, culvert replacement and quarry development
4. Road construction and decommissioning
5. Timber haul
6. Fuel treatment

The potential effects (negative, positive, or neutral) that the implementation of each project element may have on each indicator or group of indicators was assessed, where applicable, using the AP factors as defined below:

Proximity ~ The geographic relationship between the project element or action and the species/designated critical habitat.

Probability ~ The likelihood that the species or habitat will be exposed to the biotic or abiotic effects of the project element or action to the indicator.

Magnitude ~ The severity and intensity of the effect.

Distribution ~ The geographic area in which the disturbance would occur (may be several small effects or one large effect).

Frequency ~ How often the effect would occur.

Duration ~ How long the effect would last. Potential categories include (a) short-term event whose effects subside immediately (pulse effect); (b) sustained, long-term effect, or chronic effect whose effects persist (press effect); and (c) permanent event that sets a new threshold for a species' environment (threshold effect).

Timing ~ When the effect would occur in relation to the species' life-history patterns.

Nature ~ Effects of the action on elements of a species' life cycle, population size or variability, or distribution; or on the primary constituent elements of critical habitat, including direct and indirect effects.

As the AP directs, the Proximity, Probability, and Magnitude factors are to be considered first. If either of the following conclusions are made, no further analysis of the PE for that indicator is needed:

(1) There is no probability or there is a discountable (extremely unlikely to occur) probability of the impact occurring; and/or

(2) The magnitude of the effect is insignificant (not able to be meaningfully measured, detected, or evaluated) or non-existent.

B. Effects to Indicators

The following narrative describes all of the potential effects that the implementation of this project may have on each indicator (or group of indicators). This discussion is conducted for each project element (or group of elements) and then a summary of the effect is provided for the indicator.

Temperature:

Baseline Condition: Quartz Creek sub-watershed/Action Area = FAR
Hardy/Rebel Creek sub-watershed/Action Area = FAR

Project effects to this indicator address certain Primary Constituent Elements (PCE's) of proposed spring chinook salmon critical habitat. PCE's addressed by the Temperature indicator are freshwater spawning sites with water quality supporting spawning, incubation and larval development, and water quality supporting juvenile development, and juvenile and adult mobility and survival.

Effects of the Action by project element:

Timber Falling

Proximity:
Trees within the stands proposed for treatment are 70-80 feet tall currently, and slopes typically fall within a 30% to 60% range. Proximity of riparian stands proposed for thinning to listed species habitat is described in Table B-3. All fish bearing streams (Class II) are provided a minimum of 60 feet of primary shade buffer to retain effective shade for stands of this height and these slopes. Smaller perennial (Class III) streams have primary shade buffers ranging from 30 feet to 50 feet. Intermittent (Class IV) streams do not have specific shade buffers designed as these streams are dry during the portion of the year that elevated temperatures are a problem. However, bank stability trees and in some cases 30 foot no harvest buffers will be retained for other resource objectives, and will provide some measure of shade regardless.
Probability: For all classes of stream, 40% to 50% crown closure will be retained within the remainder of the riparian reserve that is outside the no harvest buffer. Field observation of these smaller, more constrained streams indicate that recommended widths are adequate to provide effective shade. In addition, the no harvest buffer width/channel setback, meet the recommendations of Sufficiency Analysis for Stream Temperature (FS/BLM, 2004) for maintaining stream temperatures in perennial channels, leading to an assessment of very low probability of influencing stream temperature. With little or no project influence to stream temperature, the possibility of affecting listed fish species or their habitat is discountable.
Magnitude: Excluding riparian reserve thinning along Class IV channels (which would not contribute to alteration of occupied habitat stream temperatures), the area of riparian reserves thinning is very small within both sub-watersheds (3% of federally managed Quartz Creek sub-watershed [approximately 1.5% of entire Quartz Creek sub-watershed] and 0.7% of Hardy/Rebel Creek subwatershed), and would not be expected to contribute to a measurable increase in water temperature in habitat occupied or proposed as critical to listed species. Coupled with no harvest buffers in thinned riparian reserve stands, and small sub-basin area of riparian thinning, the severity and intensity of project activities is considered insignificant.
Element Summary: Hartz Project timber falling effects on this indicator are considered insignificant (not measurable).

Timber Yarding

Proximity: Timber harvest units are located from 700 feet to 2.0 miles from proposed critical habitat for spring chinook in Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in Hardy/Rebel Creek sub-watershed. Chinook salmon and bull trout are not presently known to occupy Quartz or Hardy Creek, except for possible rearing and foraging approximately 8 miles downstream from the harvest units in Quartz Creek, and 0.7 mile downstream in Hardy Creek. Skyline corridors across perennial channels in Quartz Creek (corridors through 14.6 acres of riparian reserve) and Hardy Creek (corridors through 9.0 acres of riparian reserve) sub-watersheds will occur with corridor widths of about 10 feet (thinned tree spacing in riparian reserve stands will be about 20 feet).

Probability: Corridor widths are typically 10 to 15 feet wide and eliminate very little actual effective shade. Minor reduction in stem density immediately adjacent to channels from the corridor units (Units 5, 6, 23) is expected with construction of 33 corridors. The net area of opening adjacent to channels for corridors (within the no cut buffer area) and within the 14.6 riparian reserve acres in Quartz Creek is 0.26 acre and within 9.0 acres in Hardy Creek is 0.10 acre. Project mitigations require retaining trees fallen for corridor construction within the no harvest buffer. Mitigations requiring full suspension over channels and retention of immediate LWD to the channel is expected to protect understory vegetation close to the channel and retain some shade provided by downed wood. Any effect that does occur would be of short duration as the young stands would be expected to re-close openings in 3 to 5 years, based on rates of new growth. Due to the small area of stream adjacent opening, the potential to raise stream temperature any amount is considered slightly negative of short duration.
Magnitude: The magnitude (intensity) of corridor yarding on stream temperature as an influence on the life history needs of listed species located downstream is expected to be insignificant due to the small area of effect and mitigation measures required during corridor construction and use.
Element Summary: Hartz Project yarding effects on this indicator is not expected to raise stream temperature a measurable amount. Effects are characterized as very minor negative effects of short duration. Short-term reduction of stream adjacent canopy is small in area, mitigations in place protect streambank and understory vegetation, and canopy is expected to re-close within 3-5 years. The extent of effect is considered insignificant (immeasurable).
Indicator Summary: The project elements of: Road Reconstruction, Culverts and Quarry Development; Road Construction and Decommissioning; Timber Haul; and Fuels Treatment will not affect standing trees, down woody material in the riparian reserve or other aquatic shade providing features, and therefore have no causal mechanism to affect this indicator. These elements will have no effect on this indicator. The timber yarding project element is expected to have a very slight negative effect on this indicator of short duration, and other project elements no or insignificant effects. The slight effects due to project implementation are expected to be insignificant in magnitude, and present negligible risk to listed species habitat.

Sediment/Substrate Embeddedness:

Baseline Condition: Quartz Creek sub-watershed/Action Area = NPF
Hardy/Rebel Creek sub-watershed/Action Area = NPF

Project effects to this indicator address certain Primary Constituent Elements (PCE's) of proposed spring chinook salmon critical habitat. PCE's addressed by the Sediment/Substrate Embeddedness indicator are freshwater spawning sites with substrate supporting spawning, incubation and larval development.

Analysis used to describe sediment yield:

To evaluate the effects of the preferred alternative on sediment delivery, an annual sediment budget was prepared by Dave Kretzing, McKenzie River District Hydrologist. Rates of sediment delivery were calculated for surface erosion, roadway erosion, debris torrents, and earth-flow related erosion, which in the case of Hardy Creek really constitutes accelerated bank erosion. Temporary road construction and culvert replacement were evaluated qualitatively with an estimate of sediment production based upon professional judgment rather than model use. A discussion of the analysis methods and the results of the analysis are described below.

Surface erosion was modeled using rates for natural erosion and sediment yield and activity related yields derived from Swanson and Grants analysis (Swanson and Grant, 1982). To analyze past management activities, it was assumed that erosion would be proportional to disturbance. For the purpose of analysis, the percent of the analysis area considered "un-recovered" in the ARP analysis discussed below in Change in Peak/Base Flows was considered to behave as clear-cut areas in terms of sediment yield and recovered areas were considered to have returned to natural rates.

Roadway erosion was separated out from surface erosion as a different tool was used to complete the analysis. Roads within the sub-watersheds were placed into 5 categories for analysis: Paved, Gravel

Mainline, Lower Slope, Mid Slope, and Ridge top, and mileages of each category were estimated based on map review. The Road WEPP module of the FSWEPP model was used to estimate sediment yields for each category of road. Several runs for each category were completed to account for differing levels of use and maintenance condition. The results were used to analyze existing condition, sediment yield while sale operations are in progress, and post sale conditions.

Sediment delivery resulting from debris torrents was identified as a major source of sediment in watershed analysis and during field investigation of the project area. Based on reconnaissance observations during the analysis, it was estimated that debris torrents were at least twice as important as a sediment source in these sub-watersheds as surface erosion. Also during field reconnaissance, torrents were estimated to have occurred two to three times as frequently on private lands in Quartz Creek as on National Forest lands in the sub-watershed as expected, reflecting the dramatic reduction of existing and potential large wood in channels on the private lands. Actual analysis for sediment yield for debris torrents was basically the same as for surface erosion, except that rates of sediment yield were adjusted upward in the analysis based on the results of the field observations.

The situation in Hardy Creek, where the stream is aggressively eroding away at the toe slope of the relic Quaternary earth-flow through bank erosion, was analyzed separately. Average heights of bank scarps and an annual rate of incision were estimated based on field reconnaissance and stream survey information. The amount of erosion was a simple volumetric calculation using this information and the length of stream adjacent to the earth-flow.

Tables C-1 and C-2 below summarize the results of these analytical procedures for the Quartz Creek sub-watershed and the Hardy/Rebel Creek sub-watershed. All values are expressed as cubic yards of sediment delivered per year unless otherwise noted. Sources are displayed for National Forest System lands and private lands individually and cumulatively for Quartz Creek.

Table C-1 Sediment Yield Summary for the Quartz Creek Sub-watershed.

Sediment Source (cubic yards)	Alternative1 No Action	Alternative 4
NF Surface Erosion	407.1	431.9
Private surface Erosion	407.1	407.1
NF Debris Torrents	711.82	737.56
Private Debris Torrents	1131.57	1131.57
NF Roadway Erosion	113.53	102.47
Private Roadway Erosion	158.42	148.36
Total NF Erosion	1232.45	1271.93
Total Private Erosion	2262.88	2252.82
Total Erosion	3495.33	3524.75
% Increase from No Action	NA	0.84
Actual Increase from No Action	NA	29.42

The actual direct and indirect effects of the preferred alternative on sediment yield are displayed for each mechanism in each sub-watershed table. In the preferred alternative, sediment yields from surface erosion and debris torrents increase from the no action based on increased levels of management disturbance. Sediment yield from roadway erosion decreases from the no action to the preferred alternative as a result of road condition improvement associated with maintenance and improvement activities. Culvert replacements will result in short-term sediment delivery, described below (Road Reconstruction project element). The cumulative impacts to sediment yield in the sub-watersheds of all mechanisms are also displayed in Table C-1 and C-2. Actual increases in sediment yield range from 29.42 cu.yd./year (Quartz Creek) to 16.21 cu.yd./year (Hardy/Rebel Creek), and when expressed as a percent increase from the no action alternative, the preferred alternative increase sediment yield in both sub-watersheds by less than 1%.

Table C-2. Sediment Yield Summary for the Hardy/Rebel Creek Sub-watershed.

Sediment Source (cubic yards)	Alternative1 No Action	Alternative 4
Surface Erosion	405.06	415.16
Debris Torrents	719.73	729.83
Earth flow	612	612
Roadway Erosion	105.42	101.43
Total Erosion	1842.21	1858.42
% Increase from No Action	NA	0.88
Actual Increase from No Action	NA	16.21

Sediment yield associated with the Hardy Creek earth flow remains unchanged as no activities occur that would affect that mechanism.

Effects of the Action by project element:

Timber Falling

Proximity: Timber falling near channels presents a potential source of sedimentation to waterways. The proximity of thinned stream adjacent stands to listed species habitat and proposed critical habitat (whichever is closer) is described in Table B-3. Timber harvest units are located from 700 feet to 2.0 miles from proposed critical habitat for spring chinook in Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in Hardy/Rebel Creek sub-watershed. Chinook salmon and bull trout are not presently known to occupy Quartz or Hardy Creek, except for possible rearing and foraging approximately 8 miles downstream from the harvest units in Quartz Creek, and 0.7 mile downstream in Hardy Creek. A few trees will be fallen in the vicinity of channels to construct yarding corridors (Units 5,6,23), otherwise trees will be fallen away from channels, toward yarding equipment and landing sites.
Probability: Due to the small tree diameter (9.6-12 inches DBH) and lack of movement once a corridor tree is fallen into the channel, the likelihood of sediment mobilization is minimal.
Magnitude: The area of effect of openings adjacent to channels for corridors is 0.26 acre in Quartz Creek sub-watershed and 0.10 acre in Hardy/Rebel Creek sub-watershed. Project intensity and severity in terms of potential to mobilize sediments is negligible.
Element Summary: The lack of mobilized sediment from this element results in a neutral effect.

Timber Yarding

Proximity: Ground-based harvest methods have the greatest potential to disturb soils and mobilize sediments. Mitigation measures restrict the proximity ground-based equipment can approach

channels (150 feet). Table B-6 describes the closest proximity of ground-based equipment to channels (24 acres of ground-based riparian reserve thinning in Unit 22) in the Hardy/Rebel Creek sub-watershed. Table B-3 describes specific unit and channel proximity. In addition, low impact equipment is specified for ground-based portions of Unit 22, requiring use of a shovel-yarder, capable of full suspension once the timber is grasped. Use of existing skid trails and designation of new trails is expected to minimize ground disturbance by ground-based equipment. Skyline corridors will be used to thin stands, with some increased risk of soil disturbance.
Probability: Due to the limited extent of stream adjacent area subject to ground-based harvest, and mitigation measures to minimize potential ground disturbance, the likelihood of soil mobilization and alteration of listed species habitat is very low. To a much lesser degree, skyline yarding presents some increased potential, but due small tree diameter and at least partial suspension, the likelihood of soil mobilization with skyline yarding is low. Helicopter yarding presents little risk of soil disturbance. Summarized in Table C-1 and C-2 are sub-watershed total surface erosion rates with project implementation. There is a slight increase in sediment yield associated with harvest activity, but net sediment yield is less than 1% of the no-action alternative. There is a slight negative influence presented by project ground-based activity (compared to no activity), but at an insignificant level.
Magnitude: The presence of ground-based equipment present minimal increased risk of mobilization of sediments. Mitigations negate potential adverse effects with restrictions on equipment type and proximity to channels.
Element Summary: Slight negative effect of short-term duration and local in extent; insignificant in terms of negative impact on listed species or habitat.

Road Reconstruction, Culverts and Quarry Development

Proximity: A number of culverts will be replaced that are currently in poor repair or inadequately sized to pass Q100 flows. Proximity of culvert replacements to occupied listed species habitat (bull trout and spring chinook), including existing spring chinook spawning habitat ranges from 0.2 to 2.7 miles in Hardy/Rebel Creek sub-watershed (Table B-8) and 1.5 to 9.7 miles in Quartz Creek sub-watershed. Proximity of culvert replacements to proposed critical habitat is described in Table B-8. Perennial stream culvert replacements along Rd. 2618 that occur at road mile 1.52; 3.35; and 9.56 are in the immediate vicinity of Quartz Creek proposed critical habitat (Table C-2a), while other perennial replacements are located further from proposed critical habitat (Table B-8).

Table C-2a. Perennial Culvert Replacements in Close Proximity to Proposed Spring Chinook Critical Habitat.

Quartz Creek Sub-watershed						
Road Number	Mile Point	Culvert Diameter (inches)	Stream Type (perennial: P fish bearing: F)	Distance to Proposed Critical Habitat (feet)	Channel Gradient Downstream (percent)	Estimated Flow During Replacement (cfs)
2618	1.52	72	P	170	2	< 0.5
	3.35	48	P	150	10	< 0.5
	9.56	60 X 84 squash	F	100	20	< 0.5
Hardy/Rebel Creek Sub-watershed						
1980	0.35	48	P	1460	7	< 0.5

Replacement will require in-stream work in perennial crossings. Work will be done during non-flow periods for intermittent streams, and engineering practices of sediment barriers and flow bypass will be implemented to minimize impacts to perennial streams and transmission of fine sediments to habitat downstream.
Probability: It is not possible to replace culverts without some sediment delivery. Accurate estimates are not predictable, but depending on weather behavior and other variable factors, sediment yields should fall between 0.1 and 1.0 cubic yards per installation based on professional experience. Concurrent with culvert replacement will be resurfacing of the same haul routes, and an expected reduced rate of fine sediment transmission into waterways. Approximately 21 fewer cubic yards in Quartz Creek sub-watershed and 4 fewer cubic yards in Hardy Creek sub-watershed are expected with

preferred vs. no action alternative (Table C-1 and C-2; road related sediment yield). The probability of increased levels of sedimentation originating from road reconstruction and culvert replacement exists and is estimated in the following magnitude discussion.

Because the culverts to be replaced are in poor condition or undersized for Q100 flows, they currently represent an elevated risk of fill failure.

Table C-3 Culvert Replacements in Perennial and Intermittent Streams in Hartz Project.

Sub-watershed	Stream Type	# of Culverts Replaced	Fill Stabilized
Hardy/Rebel	Intermittent	13	5,850 cu. yd.
	Perennial	1	450 cu. yd.
Quartz Creek	Intermittent	26	11,700 cu. yd.
	Perennial	7	3,150 cu. yd.
Hartz Project Total	All	47	21,150 cu. yd.

Engineering personnel estimated average fill volume of 450 cubic yards. This material is at risk of entering the streams and potentially generating debris torrents if the existing culvert fails. Should the proposed culvert replacements precede a significant storm event (>50 year event), fill materials will be at a reduced risk of failure. For example, the Lytle Creek replacement will increase the capacity of the culvert 2.5 times to accommodate Q100 bedload and flow (from 69 cubic feet per second [cfs] to 162 cfs). While the Lytle Creek culvert did not fail during the February 1996 flood (estimated at a 50 year event), its capacity was challenged and the road fill was at risk of failure. Should a significant storm occur following replacement, fill materials for many of the culverts described above would be less likely to fail. Table C-3 provides a summary of these replacements and the potential amount of fill material that will have a reduced risk of entering streams.

<u>Magnitude:</u> Local disturbance and sediment delivery resulting from culvert replacements range from 4.7 to 47 cu. yds (1.3 - 13 cu. yds. In Hardy/Rebel Ck sub-watershed; 2.6 - 26 cu. yds in Quartz Ck sub-watershed). Net increase of potential sediment from road reconstruction activity (minus road related reduction in sediment yield) is approximately 0 - 9 cubic yards in Hardy Rebel/Creek sub-watershed and 0 – 5 cubic yards in Quartz Creek sub-watershed. The upper range of the volume of sediment described above, mobilized through the sub-watersheds over a several day period, could result in suspended concentrations of 1.9 mg/l (Quartz Creek) to 6.0 mg/l (Hardy Creek), if all sediment mobilized could remain in suspension. As all sediment will not remain suspended as it is transported, the totals above overestimate actual potential concentrations. Mitigation methods to minimize mobilization and trap fines may be expected to reduce a portion of this amount. A fraction of the concentrations described above would be expected to be actually suspended, and are not expected to adversely effect listed species, or to incrementally increase background levels to a level to cause adverse effects. Spring chinook salmon in the vicinity of the Quartz Creek sub-watershed are believed to use the Quartz Creek confluence area as rearing habitat, and bull trout as foraging habitat. Under conditions of a fall/winter first storm, both species are expected to exhibit avoidance behavior in response to existing turbid tributary conditions, and temporarily vacate turbid water (66-88 mg/l) (Newcombe and MacDonald 2001). Effects to spring chinook spawning habitat located downstream of Hardy Creek and Quartz Creek confluences, is also considered negligible, due to the small volume of potential increase delivered during the first season following reconstruction/culvert replacements. The volume of fine sediment mobilized may be expected to have a slight negative effect on this indicator, but the quantity is considered insignificant. A longer term stabilization of stream crossings in each sub-watershed may be expected to contribute to reduced rates of road generated sediment and mobilization of significant volumes of sediment or debris torrents in either system, for the life of the replacement culverts (~ 50 years).

<u>Duration:</u> Potential sediment flushes typically occur during the first fall/winter significant storm (≥ bankfull event or 1.5 year recurrence interval). Potential increases in road related reconstruction sediment yield would be expected at this point in time. Increased flow duration during and following a storm is usually several days long or about 72 hours. Fine sediments generated during replacement of perennial culverts (during summer low flow) would not be expected to transport lengthy distances, rather they would be expected to deposit rapidly due to low volume and low velocity flows present during summer. The first fall/winter storm and high flows would be expected to re-suspend and transport fine sediments mobilized during summer culvert replacements.

Timing: The timing of such an addition to background levels of sedimentation being delivered in both sub-watersheds would potentially affect rearing juvenile spring chinook suspected to use lower Quartz and Hardy Creeks. Foraging adult bull trout are also potential inhabitants of the confluences of both streams. Downstream of both confluences, are spawning habitats for spring chinook salmon that would contain incubating eggs during the first fall/winter bankfull event.

Element Summary: There would be an expected slight negative effect to this indicator, but insignificant due to the quantity of sediment mobilized and low concentration of suspended sediment added to background levels of turbidity. Avoidance behavior by native and listed species is believed to occur during existing first-storm turbidity levels. Potential project generated concentrations would not significantly increment existing turbidity to present a risk to listed species. Similarly, the volume of potential sediment mobilized during road reconstruction/culvert replacements is of low volume and sufficient distance from spring chinook spawning habitat to not present risk to incubating eggs downstream of tributary confluences (0.2 mile to over 8 miles). The concentrations of suspended sediment would not be expected to arrive at spring chinook spawning habitat in measurable levels (over background concentrations).

Road Construction and Decommissioning

Proximity: Implementation of Hartz Project would require construction of 2,050 feet of temporary road (600 feet in Quartz and 1,450 feet in Hardy/Rebel Creek sub-watershed). Upon completion of sale activities, 6,850 feet of existing and temporary road would be decommissioned and re-vegetated (600 feet in Quartz and 6,250 feet in Hardy/Rebel Creek sub-watershed). Proposed temporary road construction occurs beyond riparian reserves and does not require stream crossings. Decommissioning of an existing unclassified road in Unit 22 in Hardy/Rebel Creek sub-watershed will obliterate a 4,000 foot long roadbed within 400 feet of the Hardy Creek channel (paralleling Hardy Creek for approximately 3000 feet), which is located no closer than 900 feet to proposed critical habitat. Decommissioning an existing system road outside Unit 23 in Hardy/Rebel Creek sub-watershed will obliterate a 500 foot long roadbed near ridge-top, which is located no closer than 2.1 mile to proposed critical habitat.

Probability: All of the temporary roads to be constructed and existing roadways to be decommissioned are situated on relatively flat, stable terrain, and all are outside of riparian reserves. These conditions make transport of sediment from disturbed soils unlikely, and consequently no measurable amounts of sediment are expected to reach stream channels as a result of this activity.

Magnitude: The intensity and severity of this activity are reduced with seasonal (dry season) restrictions on temporary road construction and road decommissioning activities. Stream crossings and erosion control features are not necessary.

Element Summary: The lack of mobilized sediment from this project element results in a neutral effect.

Timber Haul

Proximity: Timber haul in close proximity to proposed spring chinook critical habitat occurs largely in Quartz Creek sub-watershed when the haul parallels Quartz Creek on Rd. 2618. Most of 1,336 log truck loads from Quartz Creek units are expected to parallel Quartz Creek for 11 miles of haul along Rd 2618 (aggregate surface). About 350 log loads are expected to cross several tributaries to South Fork McKenzie River in timber haul on the Hardy/Rebel Creek sub-watershed. Proximity to proposed spring chinook critical habitat ranges from immediate to 2.9 miles (Table B-10). Proximity to bull trout and spring chinook occupied habitat is a greater distance in the Quartz Creek sub-watershed; the haul route ranging from an immediate concrete bridge crossing near the Quartz Creek confluence, to over 10 miles distant.

Probability: Aerially delivered dust to surrounding vegetation and into Quartz Creek is probable with timber haul in the Quartz Creek sub-watershed. Dust transmission into Hardy/Buoy and South Fork McKenzie River is much less likely and reduced in extent at several perennial stream crossings.

Magnitude: The quantity of fine sediment delivered will be of small volume, but delivered consistently during the dry season haul. A discountable quantity of fine sediment is expected to be delivered into Hardy/Rebel Creek sub-watershed tributaries. A slight negative impact to this indicator is expected in the Quartz Creek sub-watershed, due to the proximity of Rd. 2618 to Quartz Creek, but insignificant quantities in terms of adverse impact to listed species or their habitat.
Element Summary: A slight negative effect to Quartz Creek sub-watershed, of insignificant quantity. A neutral effect is expected in Hardy/Rebel Creek sub-watershed.

Fuel Treatment

Proximity: Sediment yield would be most likely in regeneration units, or broadly burned (broadcast) areas. Several units are prescribed for regeneration harvest (Unit 2, 4 and 25) with the following area: 73 acres in Quartz Creek; 51 acres in Hardy Creek.
Probability: Burning activity will occur during spring when soil and duff moistures are high enough to avoid loss of duff and mobilization of soil. Desired burn intensity is low to conserve soil resources. Minimal fire creeping into riparian reserves is expected in regeneration units due to site conditions (unit aspects and spring season burning). No fire line will be dug along riparian reserves.
Magnitude: Due to the low intensity of fire used in broadcast burn, absence of fire in close proximity to waterways, riparian buffer width, and relatively small area treated by broadcast burn, there is neutral effects of fuel treatment upon this indicator.
Element Summary: Neutral effect upon sedimentation/substrate embeddedness.
Indicator Summary: Several project elements have a slight negative effect upon potential to cause sedimentation to aquatic habitat (Timber yarding, road reconstruction/culvert replacement, and timber haul). Cumulatively, these several project elements do not add significant quantities of sediment beyond the "no-action" level of sediment yield (Table C-1 and C-2) to place listed species or their habitat at risk. A less than 1% increase in the rate of sedimentation delivered throughout project activities is considered an insignificant quantity and will not harm bull trout or spring chinook, or their habitat.

Chemical Contaminants/Nutrients:

Baseline Condition: Quartz Creek sub-watershed/Action Area = PF
Hardy/Rebel Creek sub-watershed/Action Area = PF

Project effects to this indicator address certain Primary Constituent Elements (PCE's) of proposed spring chinook salmon critical habitat. PCE's addressed by the Chemical Contaminants/Nutrients indicator are freshwater spawning sites with water quality supporting spawning, incubation and larval development, and water quality supporting juvenile development, and juvenile and adult mobility and survival.

Effects of the Action by project element

All project elements have the potential for fuel and/or hydraulically operated equipment spills. Use of fire in treatment of fuels has the potential of increasing nutrient supply to aquatic habitat.

Timber Falling

Proximity: Fuel powered equipment used in timber falling activity (chain saws) will be used within the riparian reserves at varying distance from stream channels (Table B-1). Timber harvest units are located from 700 feet to 2.0 miles from proposed critical habitat for spring chinook in Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in Hardy/Rebel Creek sub-watershed (Table B-3). Chinook salmon and bull trout are not presently known to occupy Quartz or Hardy Creek, except for possible rearing and foraging approximately 8 miles downstream from the harvest units in Quartz Creek, and 0.7 mile downstream in Hardy Creek.
Probability: The small diameter of tree fallen during riparian thinning (minimizing falling time) and untreated buffer distance to perennial channels is sufficient to minimize the potential transport of spilled gasoline or bar oil to a discountable risk.
Magnitude: Contract requirements specify spill containment measures for all machinery and equipment used in timber harvest activities. A fuel spill kit is required of operators in case of accidental

spill, to minimize adverse aquatic effects. As have been demonstrated in past projects with riparian thinning elements, 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.
Element Summary: A slight negative impact, discountable.

Timber Yarding

Proximity: Fuel-powered and hydraulic equipment are used from landings, roadways, skid-trails and aerially during yarding operation. Proximity to channels can be as close as 50 feet in ground-based yarding to skyline landings located beyond the riparian reserve to aerial removal by helicopter that cross and suspend above channels. Timber harvest units are located from 700 feet to 2.0 miles from proposed critical habitat for spring chinook in Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in Hardy/Rebel Creek sub-watershed (Table B-3). Chinook salmon and bull trout are not presently known to occupy Quartz or Hardy Creek, except for possible rearing and foraging approximately 8 miles downstream from the harvest units in Quartz Creek, and 0.7 mile downstream in Hardy Creek. Helicopter service landings (fueling and service sites) are located away from waterways, with extensive fuel containment requirements.
Probability: The no harvest riparian reserve width buffering perennial channels is sufficient to minimize potential transport of spilled fuels and fluids during ground-based harvest. The greater distance skyline landings are located from channels further reduces possible transmission of fuels to waterways. Fuel spills originating from helicopter yarding or helicopter fueling operations are very rare, and transmission into waterways rarer still. The likelihood of fuel or fluid transmission during yarding operation is a discountable risk to aquatic habitat.
Magnitude: Contract requirements described above (Timber Falling) are designed to minimize potential adverse aquatic effects and have been effective as demonstrated by past projects. There is a discountable possibility of spill with yarding operations and the severity and intensity of effect is rendered insignificant by prevention and containment measures.
Element Summary: A slight negative effect, discountable.

Road Reconstruction, Culverts and Quarry Development

Proximity: Fuel powered and hydraulic fluid equipment are used in road reconstruction (Table B-7), culvert replacement and quarry development activities. Culverts replaced in perennial channels have closest proximity to channels (Table B-8), several immediate to proposed spring chinook critical habitat in Quartz Creek sub-watershed.
Probability: 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.
Magnitude: As demonstrated by past culvert replacement projects, the minimization of potential adverse effects to a discountable possibility, and ability of operators to contain potential spills with required containment kits, renders insignificant the severity and intensity of potential effects to aquatic habitat.
Element Summary: A slight negative effect, discountable.

Road Construction and Decommissioning

Proximity: Proposed temporary road construction occurs beyond riparian reserves and do not require stream crossings. Road decommissioning of an unclassified road in Unit 22 in Hardy/Rebel Creek sub-watershed will obliterate a roadbed within 400 feet of the Hardy Creek channel (paralleling Hardy Creek for approximately 3000 feet).
Probability: Distance from channels and project contract spill containment requirements and mitigation measures sufficiently reduce the possibility of aquatic habitat contamination to a discountable risk.
Magnitude: Distance from channels and operator ability to contain potential spills, renders insignificant the severity and intensity of potential effects to habitat.
Element Summary: A slight negative effect, discountable.

Timber Haul

Proximity: Proximity of timber haul near proposed spring chinook critical habitat and occupied bull trout habitat ranges from immediate in both sub-watersheds (Table B-9) to 1.4 and 2.9 miles. Crossing of proposed critical habitat occurs in one bridge location in Hardy/Rebel sub-watershed and four bridge locations within Quartz Creek sub-watershed.
Probability: Project contract requirement (spill abatement) combined with past project implementation ability to transport timber without incident (truck communications are excellent and accidents rare) sufficiently reduce the possibility of aquatic habitat contamination to a discountable risk.
Magnitude: Operator ability to respond to potential spill efficiently greatly reduces the risk of severe or intense spill effects to habitat, therefore magnitude of effects is considered insignificant.
Element Summary: A slight negative effect, discountable.

Fuel Treatment

Proximity: Fuels treatment will occur outside of riparian reserves in thinned units. Regeneration units will allow fire to creep into thinned riparian reserves, but ignition of fuels will not occur within the reserves. Timber harvest units are located from 700 feet to 2.0 miles from proposed critical habitat for spring chinook in Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in Hardy/Rebel Creek sub-watershed (Table B-3). Chinook salmon and bull trout are not presently known to occupy Quartz or Hardy Creek, except for possible rearing and foraging approximately 8 miles downstream from the harvest units in Quartz Creek, and 0.7 mile downstream in Hardy Creek.
Probability: Risk of transmission of ignition fuels (gel fuels used to ignite slash piles) to waterways is discountable due to the distance slash piles are located from channels and small area of actual slash burning (Table B-10). Increased nutrient supply to channels is greatest in broadcast burn units (66.8 acres in Quartz Creek sub-watershed; 50.5 acres in Hardy/Rebel Creek sub-watershed) with increased quantities of nitrate and phosphate available to the channel. However the small area of effect, location of burn beyond the riparian reserve, and rare occurrence of natural fire with fire suppression, reduce potential increases in nutrients to aquatic habitat to less than available within the historic fire regime. Therefore a discountable risk is considered present with project fuels treatment.
Magnitude: The small area of fuel treatment, exclusion of stream adjacent treatment and spring season burning (low intensity) combine to reduce risk potential and magnitude to a level considered insignificant. The majority of duff layer is maintained with the low intensity fuel treatments planned for Hartz Project.
Element Summary: A slight negative effect, discountable.
Indicator Summary: All project elements present increased level of risk of contamination of aquatic habitat with the use of fuel operated and hydraulic equipment. As demonstrated by contact requirements, mitigation measures, no treatment areas in riparian reserves, and ability of operators to contain potential spills, risk is discountable and severity and intensity of potential spill is insignificant. All project elements are expected to be slightly negative on this indicator, with discountable effects.

Physical Barriers:

Baseline Condition: Quartz Creek sub-watershed/Action Area = AR
Hardy/Rebel Creek sub-watershed/Action Area = PF

Project effects to this indicator address certain Primary Constituent Elements (PCE's) of proposed spring chinook salmon critical habitat. PCE's addressed by the Physical Barriers indicator are freshwater migration corridors free of obstruction supporting juvenile and adult mobility and survival.

Effects of the Action Indicator Summary

No passage barrier to anadromous salmon or bull trout migration will be addressed in this project. Those barriers exist at the 5th field watershed scale. A barrier culvert to coastal cutthroat and potentially rainbow trout exists and will be replaced with this project. Project elements will not address or create additional barriers to listed fish species. Therefore this action (all project elements) will have a neutral effect on this indicator.

Large Woody Debris/Recruitment Potential/Riparian Reserves:

Baseline Condition: Quartz Creek sub-watershed/Action Area = NPF

Hardy/Rebel Creek sub-watershed/Action Area = NPF

Project effects to this indicator address certain Primary Constituent Elements (PCE's) of proposed spring chinook salmon critical habitat. PCE's addressed by the Large Woody Debris/Recruitment Potential/Riparian Reserves indicators are freshwater rearing sites and migration corridors with natural cover provided by submerged and overhanging large wood, log jams, floodplain connectivity and side channels supporting juvenile development, mobility and survival, and adult mobility and survival.

Effects of the Action by project element

Timber Falling

Proximity: Timber falling will occur with varying distances from intermittent and perennial channels based upon yarding ability to achieve full or partial suspension. Thinning spacing and proximity to channels are designed to positively influence stem diameter development and future in-stream wood supply while maintaining stream shade and undisturbed ground cover near channels. Unit proximity to proposed spring chinook critical habitat (Table B-3) is sufficiently close to contribute LWD given each 6th field sub-watershed propensity to debris torrent (Quartz Creek) or mass failure (Hardy Creek). Current obstacles to wood migration are road crossings/culverts such as Lytle Creek, however changing emphasis in habitat management focus on maintaining or improving in-stream wood densities (for example, instead of salvaging debris, moving debris accumulations from upstream to downstream of road crossings), and current obstacles to wood migration are overcome with changes in management priority. Untreated portions of the riparian reserve (no-harvest areas within 30-75 feet of the channel; Table B-1) will remain unaltered in terms of stem density and available for recruitment in an un-thinned condition. The exception is units with skyline corridors across perennial channels (summarized in Timber Yarding effects).

Probability: Thinning within riparian reserve stands is designed to encourage stem diameter development for future LWD supply. Table C-4 describes anticipated stem development compared to no thinning (no action).

Table C-4. Hartz Project Riparian Reserve Thinning Effect on Tree Diameter.

Unit	Existing Condition - Average Diameter at Breast Height (DBH)	DBH following thinning	DBH in 40 years	
		Action Alternative 4	Action Alternative 4	Alternative 1, No Action
4	13.3”	16.3”	21.6”	17.7”
5	12.4”	13.6”	19.0”	17.0”
6	10.9”	12.3”	18.3”	16.8”
8	12.1”	14.3”	21.1”	17.0”
9	14.5”	16.6”	23.1”	19.5”
12	10.8”	14.1”	20.0”	14.9”
15	11.9”	14.5”	21.6”	17.7”
22	11.9”	13.7”	21.9”	19.9”
23	10.8”	13.4”	19.6”	15.7”
25	11.1”	12.2”	18.5”	16.2”

An under abundance of medium diameter trees (21-31.9 inch DBH) and large diameter trees (32-47.9 inch DBH) in Quartz Creek and Hardy Creek riparian reserves reflects the effects of past management and is expected to be supplemented in the long-term by thinning even-aged riparian reserve stands. A short-term reduction in available LWD volume will be present as provided from riparian reserve acres treated with Hartz Project (Table C-5), but overall potential watershed contribution from treated acres is minor (due to the small diameter of wood currently available from the riparian reserve and small

Table C-5. Hartz Project Percent Riparian Reserve Prescribed for Thinning.

Sub-watershed	Acres Riparian Reserve (Federal)	Alt. 4 Riparian Reserve Acres Thinned	Alt. 4 Percent Riparian Reserve Thinned
Quartz Creek	2,754	100.8	3.7%
Hardy/Rebel Creek	8,083	53.9	0.7%

likelihood this area would contribute LWD within the next 40 years). Timber harvest activity will occur only on suitable soils; no harvest activity will occur on unstable slopes or slopes prone to debris torrent. In the long-term, the treated acres are expected to contribute to diameter class deficiencies in both sub-watersheds at an accelerated rate (compared to no action alternative). An accelerated rate of downed wood recruitment is expected of riparian reserves adjacent to regeneration units (Unit 4 in Quartz Creek sub-watershed and Unit 25 in Hardy Creek sub-watershed; Table B-2 summarizes riparian reserve unit acreage). Approximately 30% of buffer leave trees have been found to be subject to wind-throw in narrow leave strips (Hairston-Strang and Adams 1998; Grizzel and Wolf 1998). Broad riparian reserves may be expected to significantly reduce risk of increasing stream adjacent wind-throw due to exposed edge locations at 300 or 150 feet from the channel, depending on stream class (Table B-1), moving the risk of wind-throw further from the channel.
<u>Magnitude:</u> Acceleration of stem development in even-aged stands is expected to contribute 3.7% of Quartz Creek federally managed riparian reserve (or 100.8 acres) and 0.8% of Hardy/Rebel Creek riparian reserve (or 60.9 acres) toward significantly sized LWD (>24 inch DBH). Untreated similar stands would be expected to take significantly longer to develop (>80 years) via natural thinning rates with contribution of less than significant sized material to watershed tributaries in the mean time. Due to the small area of affect in riparian reserves in regeneration units 4 and 25 (21.5 acres in Quartz Creek and 6.7 acres in Hardy Creek; Table B-2), and reduction of wind-throw risk with broad riparian reserves, the magnitude of accelerated stream adjacent recruitment of LWD is expected to be low and risk to listed species habitat insignificant.
<u>Element Summary:</u> The Hartz Project prescriptions were designed to minimize the short-term impacts to this indicator and provide a long-term positive impact to supply of significantly sized LWD supply for future in-stream recruitment. There may be a slight negative effect on this indicator in the short-term at the site scale due to a reduction in immediate LWD volume available for recruitment, but the effects are expected to be insignificant. Effects are expected to be further dampened and the larger scale (5th field watershed) as the 6th field contribution to LWD is very small in terms of thinned riparian reserve area.

Timber Yarding

<u>Proximity:</u> Skyline corridors across perennial channels in Quartz Creek (corridors through 14.6 acres of riparian reserve) and Hardy Creek (corridors through 9.0 acres of riparian reserve) sub-watersheds will occur with corridor widths of about 10 feet (thinned tree spacing in riparian reserve stands will be about 20 feet). Timber harvest units are located from 700 feet to 2.0 miles from proposed critical habitat for spring chinook in Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in Hardy/Rebel Creek sub-watershed (Table B-3). Chinook salmon and bull trout are not presently known to occupy Quartz or Hardy Creek, except for possible rearing and foraging approximately 8 miles downstream from the harvest units in Quartz Creek, and 0.7 mile downstream in Hardy Creek. Mitigations requiring full suspension over channels and retention of immediate LWD to the channel are expected to protect understory vegetation close to the channel and retain immediate quantities of LWD thinned for corridor construction.

Probability: Minor reduction in stem density immediately available from the corridor units (Units 5, 6, 23) is expected with construction of 33 corridors. The net area of opening adjacent to channels for corridors (within the no cut buffer area) within the 14.6 riparian reserve acres in Quartz Creek is 0.26 acre and within 9.0 acres in Hardy Creek is 0.10 acre, leading to a minimal and discountable effect.
Magnitude: The magnitude of corridor yarding on LWD supply and recruitment potential is expected to be insignificant due to the small area of effect and mitigation measures retaining immediate quantities of LWD in-stream during corridor construction.
Element Summary: Hartz Project yarding effects on LWD recruitment supply and potential may have a minimal short-term reduction due to small area of effect. The effects of yarding are expectedly insignificant and of limited magnitude due to the small treatment area and retention of LWD in-stream in constructing corridors.

Fuel Treatment

Proximity: Fuel treatments will not be used within riparian reserves, with the exception of fire allowed to creep into thinned riparian reserves adjacent to regeneration units, and present minimal risk to LWD recruitment potential in both 6^{th} field sub-watersheds.
Probability: Some increased risk of wildfire is presented with untreated (non-burned) fuels that accumulate with thinning, however fuel loading levels remain below Willamette N.F. Plan standard and guide levels indicating the risk level is satisfactory in regards to post-thinning loading standards. The likelihood Hartz Project and this project element will adversely affect the supply of LWD is low.
Magnitude: The absence of fuel treatment within the riparian reserve and seasonal use of fire to treat slash piles is of insignificant intensity to present risk to LWD supply and recruitment potential.
Element Summary: There are no expected negative effects from fuels treatment in Hartz Project and effects are expected to be neutral in terms of LWD supply and recruitment potential.
Other Elements: The project elements of Road Reconstruction, Culverts and Quarry Development; Road Construction and Decommissioning; and Timber Haul will not affect standing trees or down woody material in the riparian reserve and therefore have no causal mechanism to affect this indicator. These elements will have no effect on this indicator.
Indicator Summary: Cumulatively, falling, yarding and fuel treatment project elements are expected to have a slight negative effect on this indicator, and other project elements no effect. The slight effects due to project implementation are expected to be insignificant in magnitude, and present negligible risk to listed species habitat.

Pool Frequency and Quality, Large Pools, Off-channel Habitat, Refugia, Width to Depth Ratio, Streambank Condition, Flood Plain Connectivity, Riparian Reserves:

Baseline Condition: see Table IV-4.

Project effects to this indicator address certain Primary Constituent Elements (PCE's) of proposed spring chinook salmon critical habitat. PCE's addressed by the Pool Frequency and Quality, Large Pools, Off-channel Habitat, Refugia, Width to Depth Ratio, Streambank Condition, Flood Plain Connectivity, Riparian Reserve indicators are freshwater rearing sites with physical habitat conditions such as shade, submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, floodplain connectivity, side channels and undercut banks that support juvenile growth and mobility. These indicators also describe freshwater migration corridors with habitat conditions supporting juvenile and adult mobility and survival.

Effects of the Action Indicator Summary

Analysis of project effects to Large Woody Debris and Recruitment Potential described above, describe a slight negative effect in terms of recruitment potential in the short-term, present at the Action Area scale and negligible at larger scales (5^{th} field watershed). How a potential short-term reduction in LWD supply affects in-stream habitat conditions will be the discussion in this indicator summary. The same project elements influence LWD supply (Timber Falling and Timber Yarding) are seen as influencing in-stream habitat conditions.

Timber Falling and Timber Yarding

Proximity: Untreated portions of riparian reserve (the inner 30-75 feet on perennial streams; Table B-1) will remain unaltered in terms of stem density and potential for in-stream recruitment. Processes of stream adjacent recruitment are most prevalent in project area perennial streams, and especially prevalent in Hardy Creek and tributaries draining the ancient earthflow. Trees most likely to contribute to in-stream habitat are located within 100 feet of the channel. Those of sufficient diameter and height to contribute wood large enough to store sediment and contribute to habitat formation and floodplain connectivity (Montgomery 2004), largely fall from this zone in Hardy Creek. The Hartz Project would effect trees 30 to100 feet or 50 to 100 feet from Class III channels (depending upon full or partial suspension; Table B-1) with greater no harvest zones required of Class II channels and smaller no harvest zones required of Class IV channels. Timber harvest units are located from 700 feet to 2.0 miles from proposed critical habitat for spring chinook in Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in Hardy/Rebel Creek sub-watershed (Table B-3). Chinook salmon and bull trout are not presently known to occupy Quartz or Hardy Creek, except for possible rearing and foraging approximately 8 miles downstream from the harvest units in Quartz Creek, and 0.7 mile downstream in Hardy Creek. The process of debris torrent is most prevalent on the steep headwater tributaries in the project area, generally intermittent channels. Thinning would treat nearly all of Class IV (intermittent) riparian reserve area in project units (11.05 acres in Quartz Creek sub-watershed; 3.03 acres in Hardy/Rebel Creek sub-watershed; Table B-2).

Probability: The project would influence trees falling into streams from adjacent riparian reserve and resulting sediment storage/habitat formation (generally from within 100 feet of the channel) at the following percentage of thinned riparian reserve: Acres thinned are 33-50% of Class II stream adjacent acres; 50-58% of Class III stream adjacent acres; 70-95% of Class IV stream adjacent acres. Percentage of the 0-100 foot zone thinned depends upon full or partial suspension (Table C-6).

Table C-6. Hartz Project Riparian Reserve Acres Thinned within 100 feet of Channels.

Sub-watershed	Stream Class		
	Class II	Class III	Class IV
Quartz Creek	4.0 - 6.1	34.9 - 40.4	7.7 - 10.5
Hardy/Rebel Creek	12.5 - 18.9	5.5 - 6.3	2.1 - 2.9

There is a very small likelihood of diminished in-stream wood supply providing for sediment storage and habitat development from the area described in Table C-6, in part due to the small diameter of stem currently present and in part due to the small area of thinning within the 100 foot zone adjacent to the channel. An increased risk of stream adjacent blow down in thinned stands in regeneration units is possible as discussed in LWD recruitment indicator, however for the same rationale described there (riparian reserve width and un-thinned area) the edge susceptible to blow down would be located further than 100 feet from the channel. Minor increases in wood recruitment are expected in regeneration units riparian reserves, but not that would adversely influence future wood supply (within 100 feet of the channel) significantly. Debris torrents, the prevalent habitat forming or contributing process in the Quartz Creek sub-watershed and influential in the Hardy/Rebel Creek sub-watershed, occur in response to large storm events, usually rain-on-snow events. The likelihood of Class IV thinned riparian reserve in Hartz Project torrenting is very remote due to the small overall area of thinning in both 6th field sub-watersheds (7.7-10.5 acres in Quartz Creek; 2.1-2.9 acres in Hardy/Rebel; Table C-6). The probability riparian reserve thinning would adversely affect habitat building and sediment storage capacity in either 6th field sub-watershed is discountable due to the small diameter of wood being thinned and its immediate value to the channel as a habitat forming/sediment storage element and small area in terms of 6th field riparian reserve area being thinned. An accelerated rate of stem development and tree height in even-aged stands is expected to contribute toward significant sized LWD (>24 inch DBH), but the small overall area of treatment in riparian reserves is not expected to contribute significantly to future in-stream wood quantity, rather accelerated development is expected to contribute minimally in terms of quality of potential in-stream wood (Table C-6), and its habitat forming potential.

Magnitude: Due to the relatively small portion of each 6th field watershed riparian reserve thinned, and minimal probability to influence current in-stream wood density with significant wood, the magnitude of project effect on the primary habitat forming component (and deficient component in both sub-watersheds) of in-stream wood is insignificant. There is a slight negative effect on immediately available supply as described earlier, but this is not expected to translate into adverse effect on habitat elements. A slight positive effect is expected in the future as the recruitment supply attains the desired diameters exceeding 24 inches (>40 years), and those trees function to store sediments and contribute to habitat formation.

Element(s) Summary: Project design is intended to contribute large tree diameters to stream adjacent stands that have been previously managed. Current under-abundance of trees measuring 21.0-31.9 inches and 32.0-47.9 inches in diameter in both sub-watersheds reflects past management effects upon riparian reserve composition. Acceleration of even-aged riparian reserve at this point in time is not expected to influence currently available significant wood, nor the immediate volume of in-stream wood, found deficient in both sub-watersheds. The slight negative effects due to riparian thinning on listed species habitat are expected to be of discountable probability.

Other Elements: The project elements of: Road Construction and Decommissioning; Timber Haul and Fuel Treatment have no causal mechanism to affect these indicators and will not affect aquatic habitat indicators. These elements will have no effect on these indicators. The project element of Road Reconstruction, Culverts and Quarry Development may have a slight negative effect of insignificant magnitude to these indicators as influenced by the Sediment indicator and described in the Sediment/Substrate Embeddedness effects discussion.

Indicator Summary: The slight negative effects on habitat indicators from timber falling and timber yarding are discountable. The slight negative effects on habitat indicators from road reconstruction, culverts and quarry development are insignificant. Other project elements will have no effect on these indicators.

Change in Peak/Base Flows:

Baseline Condition: Quartz Creek sub-watershed/Action Area = FAR
Hardy/Rebel Creek sub-watershed/Action Area = PF

Project effects to this indicator address certain Primary Constituent Elements (PCE's) of proposed spring chinook salmon critical habitat. PCE's addressed by the Change in Peak/Base Flows indicators are freshwater spawning sites with water quantity conditions supporting spawning, incubation and larval development; freshwater rearing sites with water quantity conditions supporting juvenile growth and mobility; and freshwater migration corridors with water quantity supporting juvenile and adult mobility and survival.

Effects of the Action by project element

Timber Falling/Yarding

Proximity: Within the Quartz Creek sub-watershed, activities that affect ARP values only occur in the Lytle-Indian planning sub-watershed and in the Hardy/Rebel Creek sub-watershed, activities that affect ARP values only occur in the Hardy planning sub-watershed (planning sub-watersheds are at about the 7th field sub-watershed level or a subset of a 6th field sub-watershed).

Probability: Effects of proposed harvest activities could be expected to be greatest immediately after implementation. Timber removal in the Hartz Project is anticipated to be completed by 2008. Conditions and ARP levels in 2005 prior to implementation were discussed in baseline conditions (Table IV-13, Quartz Creek; Table IV-14, Hardy/Rebel Creek).

Magnitude: Tables C-7 and C-8 below summarize levels of recovery immediately after implementation of the project in 2008 for the two sub-watersheds where the project is located.

Table C-7. Recovery Levels Immediately after Project Implementation in Quartz Creek Sub-watershed.

Planning Sub-watershed	Alternative 1 (No Action)	Alternative 4	LRMP Midpoint

Fawn Buck	90	90	80
Wycoff-Sugar	83.7	83.7	80
Lytle-Indian	91.2	89.5	85
Upper Quartz	96.4	96.4	85
Lower Quartz	81.4	81.4	80
Cane Coffee	85.2	85.2	85

Table C-8. Recovery Levels Immediately after Project Implementation in Hardy/Rebel Creek Sub-watershed

Planning Sub-watershed	Alternative 1 (No Action)	Alternative 4	LRMP Midpoint
Hardy Creek	95	93.6	75
Starr Creek	93	93	80
Trail Creek	98.9	98.9	80
Rebel Creek	99	99	70

Land Resource Management Plan (LRMP or Forest Plan) direction recommends midpoint levels of recovered forest condition (closed canopy conditions of stands generally greater than 15 years old). Midpoint values are determined by site conditions and beneficial uses. In the preferred alternative (Alt. 4), post implementation recovery levels drop from 95 to 93.6 in Hardy Creek, and from 91.2 to 89.5 in Lytle-Indian when compared to the No Action alternative. All planning sub-watersheds continue to exceed recommended Midpoint values in the LRMP. Movement of the ARP (% recovered) value toward the midpoint indicates a slightly negative effect, but of insignificant magnitude. Consequently, no direct, indirect, or cumulative changes in flow regime are anticipated, and the effect to listed species habitat is insignificant.
Element Summary: There will be an expected slight negative effect to flow regimes from thinning and regeneration harvest in the Hartz Project, but at insignificant levels.

Road Construction and Decommissioning

Proximity: 600 feet of temporary road would be constructed in Quartz Creek sub-watershed and 1,450 feet of temporary road in Hardy/Rebel Creek sub-watershed.
Probability: No temporary road will enter riparian reserves, require surfacing or drainage features. The temporary roads will exist for the season of timber harvest, then will be obliterated upon completion of harvest activity (less than 1 year).
Magnitude: This temporary increase in the road network will not add significantly to the total road network. The low gradient topography, native surface and lack of necessity for drainage features may be expected to disperse water into the road bed and adjacent forest floor rather than concentrate it as runoff. Due to the small area of road surface increase and short-term duration, road construction in the Hartz Project may be expected to lead to a slight negative contribution to flow regimes but at an insignificant level. Decommissioning 4,800 feet of road in the Hardy Creek sub-watershed may be expected to contribute to improvement of the flow regime, as well as ripping of historic skid roads, but at a non-measurable level (insignificant).
Element Summary: An increase in road surface through temporary road construction is expected to lead to a greater efficiency in the drainage network for a short-term, but at an insignificant level. A longer term improvement through reduction in road surface in the Hardy Creek sub-watershed (4,800

feet) is expected to be insignificant as well. The slight negative effect from this project element is insignificant in magnitude and presents no risk to listed species or habitat.
Other Elements: Other project elements have no causal mechanism to affect this indicator through modification of canopy or increase in drainage network and efficiency. A slight improvement in drainage network, described below from road reconstruction and culvert upgrade will occur with the project, but not at a level considered measurable or significant (neutral effect). The elements of timber haul and fuel treatment will have no effect on this indicator.
Indicator Summary: Road construction is expected to have slight negative effects to this indicator at insignificant levels. Other project elements will have no effects or neutral effect (road reconstruction). The slight effects due to project implementation are expectedly insignificant and present no risk to listed species habitat.

Freshwater Rearing Forage Conditions:

This indicator is a Primary Constituent Element of proposed critical habitat. This effects summary examines the effects of project elements on spring chinook salmon foraging habitat, a Primary Constituent Element of proposed spring chinook critical habitat in Quartz Creek sub-watershed and in Hardy/Rebel Creek sub-watershed.

Effects of the Action by project element:

Timber Falling/Yarding

Proximity: The modification of canopy in both sub-watersheds is described above and summarized in Tables C-7 and C-8 (in terms of Peak/Base flow influence). The modification of landscape in both sub-watersheds is described above and summarized in Tables C-1 and C-2 (in terms of mass failure influence). Timber harvest units are located from 700 feet to 2.0 miles from proposed critical habitat for spring chinook in Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in Hardy/Rebel Creek sub-watershed (Table B-3). Chinook salmon and bull trout are not presently known to occupy Quartz or Hardy Creek, except for possible rearing and foraging approximately 8 miles downstream from the harvest units in Quartz Creek, and 0.7 mile downstream in Hardy Creek.
Probability: Due to the limited extent of stream adjacent area subject to ground-based harvest, and mitigation measures to minimize potential ground disturbance, the likelihood of soil mobilization and alteration of proposed critical habitat is very low. To a much lesser degree, skyline yarding presents some increased potential, but due small tree diameter and at least partial suspension, the likelihood of soil mobilization with skyline yarding is low. Helicopter yarding presents little risk of soil disturbance. Summarized in Table C-1 and C-2 are sub-watershed total surface erosion rates with project implementation. There is a slight increase in sediment yield associated with harvest activity, but net sediment yield is less than 1% of the no-action alternative. There is a slight negative influence presented by project ground-based activity (compared to no activity), but at an insignificant level.
Magnitude: The presence of ground-based equipment present increased risk of mobilization of sediments. Mitigations negate potential adverse effects with restrictions on equipment type and proximity to channels. The magnitude of effect is considered insignificant.
Element Summary: A negative effect, insignificant in terms of impact to proposed spring chinook critical habitat.

Road Reconstruction, Culverts and Quarry Development

Proximity: Proximity of culvert replacements to proposed critical habitat is described in Table B-8. Perennial stream culvert replacements along Rd. 2618 that occur at road mile 1.52; 3.35; and 9.56 are in the immediate vicinity of Quartz Creek proposed critical habitat (Table C-2a), while other perennial replacements are located further from proposed critical habitat (Table B-8). Replacement will require in-stream work in perennial crossings. Work will be done during non-flow periods for intermittent streams, and engineering practices of sediment barriers and flow bypass will be implemented to minimize impacts to perennial streams and transmission of fine sediments to habitat downstream.
Probability: Accurate estimates are not predictable, but depending on weather behavior and other variable factors, sediment yields should fall between 0.1 and 1.0 cubic yards per installation based on professional experience. Concurrent with culvert replacement will be resurfacing of the same haul routes, and an expected reduced rate of fine sediment transmission into waterways. Approximately 21

fewer cubic yards in Quartz Creek sub-watershed and 4 fewer cubic yards in Hardy Creek sub-watershed are expected with preferred vs. no action alternative (Table C-1 and C-2; road related sediment yield). The probability of increased levels of sedimentation originating from road reconstruction and culvert replacement exists and is estimated in the following magnitude discussion.

Magnitude: Sediment yield estimates are summarized in the magnitude section of the Sediment indicator above. Due to the small volume of potential increase delivered during the first season following road reconstruction and culvert replacements, the effects to spring chinook rearing/foraging habitat is considered insignificant. The extent of effects on aquatic macroinvertebrates would be expectedly insignificant due to the high levels of turbidity currently experienced in Quartz Creek during first storm events, and the distance of culvert replacements from suspected foraging habitat in lower Quartz Creek. The extent of effects on aquatic macroinvertebrates in the South Fork McKenzie River would be insignificant due to the low concentrations of sedimentation delivered from project replacement culverts and distance of replacement culverts from known foraging habitat in the South Fork. A longer term stabilization of stream crossings in each sub-watershed may be expected to contribute to reduced rates of road generated sediment and mobilization of significant volumes of sediment or debris torrents in either system, for the life of the replacement culverts (~ 50 years).

Duration: Potential sediment flushes are expected to occur during the first fall/winter significant storm (≥ bankfull event or 1.5 year recurrence interval). Potential increases in road related reconstruction sediment yield would be expected at this point in time. Increased flow duration during and following a storm is usually several days long or about 72 hours. Fine sediments generated during replacement of perennial culverts (during summer low flow) would not be expected to transport lengthy distances, rather they would be expected to deposit rapidly due to low volume and low velocity flows present during summer. The first fall/winter storm and high flows would be expected to re-suspend and transport fine sediments mobilized during summer culvert replacements.

Timing: The timing of such an addition to background levels of sedimentation being delivered in both sub-watersheds would potentially reach juvenile rearing habitat in lower Quartz and the South Fork McKenzie River during the first fall/winter storm of significant size (October – December), and last several days.

Element Summary: There would be an expected negative effect to this indicator, but insignificant due to the quantity of sediment mobilized and low concentration of suspended sediment added to background levels of turbidity. Potential project generated concentrations would not significantly increment existing turbidity to present a risk to forage species (aquatic macroinvertebrates). The quality of forage habitat would not be adversely affected by road reconstruction and culvert replacement activity, and foraging habitat downstream of the project would be maintained.

Timber Haul

Proximity: Timber haul in close proximity to proposed spring chinook critical habitat occurs largely in Quartz Creek sub-watershed when the haul parallels Quartz Creek on Rd. 2618. Most of 1,336 log truck loads from Quartz Creek units are expected to parallel Quartz Creek for 11 miles of haul along Rd 2618 (aggregate surface). About 350 log loads are expected to cross several tributaries to South Fork McKenzie River in timber haul on the Hardy/Rebel Creek sub-watershed. Proximity to proposed spring chinook critical habitat ranges from immediate to 2.9 miles (Table B-10). Proximity to spring chinook currently occupied habitat is a greater distance in the Quartz Creek sub-watershed; the haul route ranging from an immediate concrete bridge crossing near the Quartz Creek confluence, to over 10 miles distant.

Probability: Aerially delivered dust to surrounding vegetation and into Quartz Creek is probable with timber haul in the Quartz Creek sub-watershed. Dust transmission into Hardy/Buoy and South Fork McKenzie River is much less likely and reduced in extent at several perennial stream crossings.

Magnitude: The quantity of fine sediment delivered will be of small volume, but delivered consistently during the dry season haul. A discountable quantity of fine sediment is expected to be delivered into Hardy/Rebel Creek sub-watershed tributaries. A slight negative impact to this indicator is expected in the Quartz Creek sub-watershed, due to the proximity of Rd. 2618 to Quartz Creek, but insignificant quantities in terms of adverse impact to proposed spring chinook critical habitat.

Element Summary: A negative effect to Quartz Creek sub-watershed proposed critical habitat of insignificant magnitude. A neutral effect to proposed critical habitat in the South Fork McKenzie River is expected in Hardy/Rebel Creek sub-watershed.

Other Elements: Other project elements will have a neutral effect on this indicator (Road Construction and Decommissioning and Fuel Treatment) due to the absence of sediment generating effects.
Indicator Summary: Project elements are expected to have slight negative effects to this indicator at insignificant levels. Other project elements (Road Construction and Decommissioning and Fuel Treatment) will have neutral effects. The negative effects due to project implementation are expectedly insignificant and present no risk to proposed spring chinook critical habitat.

Road Density and Location, and Drainage Network:

Baseline Condition: Quartz Creek sub-watershed/Action Area = NPF
Hardy/Rebel Creek sub-watershed/Action Area = NPF

Effects of the Action by project element

Timber Yarding

Proximity: Ground-based timber harvest will utilize existing skid roads and will designate skid road avenues where skid roads are not present but necessary. Existing skid roads are present in the riparian reserve and will be used in lieu of new skid road construction, with equipment proximity to channels restricted. Ground-based timber harvest within riparian reserves occurs on one unit (Unit 22) in Hardy/Rebel Creek sub-watershed (Table B-6). Proximity of unit 22 to proposed critical habitat is 3,650 feet. Other timber harvest units are located from 700 feet to 2.0 miles from proposed critical habitat for spring chinook in Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in Hardy/Rebel Creek sub-watershed (Table B-3). Chinook salmon and bull trout are not presently known to occupy Quartz or Hardy Creek, except for possible rearing and foraging approximately 8 miles downstream from the harvest units in Quartz Creek, and 0.7 mile downstream in Hardy Creek.
Probability: Potential to compact soils with ground-based yarding exists in previously managed stands and re-use of skid roads. Project mitigations will require treatment of existing skid roads upon completion of yarding activity (Table B-5) to treat potential compaction (and to address compaction occurring from past projects), reducing risk to aquatic habitat to a discountable level.
Magnitude: Due to the low amount of area thinned by ground-based equipment, specification of use of low impact shovel-yarder equipment in Unit 22, the intensity and severity of ground-based timber harvest on the drainage network is insignificant. There will be a short-term very slight negative effect during the dry season of operation with the use of existing and new skid roads, and an expected long-term slightly positive effect on this indicator by treating a network of previously compacted skid roads.
Element Summary: Both negative and positive effects of this element are expected to be insignificant upon this indicator and present no risk to listed species or habitat.

Road Reconstruction, Culvert Replacement and Quarry Development

Proximity: New ditch relief culverts will be placed in the Quartz Creek sub-watershed as well as culvert replacements in both sub-watershed along the haul route (Table B-8).
Probability: Culvert replacements and new placements, combined with road-blading (restoring road crown) and aggregate surfacing may be expected to have a slight positive effect on the drainage network, as replacements are expected to decrease the probability of road failure and new placements and road treatments are expected to improve dispersal of road concentrated flow onto the forest floor.
Magnitude: This project element does not increase road density but does make improvements to the existing drainage network as affected by the road network. An expected slight positive effect on this indicator may occur.
Element Summary: A slightly positive effect is expected from this project element on drainage network at an insignificant level.

Road Construction and Decommissioning

Proximity: In Quartz Creek sub-watershed, 600 feet of temporary road construction and in the Hardy/Rebel Creek sub-watershed 1,450 feet of temporary road construction would occur outside of riparian reserve and without stream crossings (Table B-9). Unit and road proximity to proposed critical habitat ranges from 0.7 to 2.1 mile (Table B-3). Temporary roads will not require drainage relief or sediment control structures due to the low gradient topography.

Probability: New temporary road construction will result in a short-term increase in road density and drainage network, so there will be a slight negative effect to this indicator for short duration (about one year). Road decommissioning will remove 4,000 feet of existing road and 2,050 feet of temporary road constructed for Hartz Project upon completion of timber harvest for a long-term slight positive effect to this indicator.
Magnitude: The 600 feet of new temporary road in Quartz Creek sub-watershed and 1,450 feet of new temporary road in Hardy/Rebel Creek sub-watershed will not add a discernable increase to road density as measured in 1/100th's of miles per square mile, nor will decommissioning of existing roads discernibly decrease road density (<.01 mile/square mile). However, there will be a slight negative effect on this indicator due to any increase in road density, for a short term period.
Element Summary: A slightly negative effect on this indicator is expected due to any increase in road length, however the effects are at an insignificant level due to the small level of increase (<.01 mile/square mile) in each sub-watershed.

Other Elements: Other project elements have no causal mechanism to affect this indicator since they will not be affecting the extent or location of road system or its drainage network. The elements of Timber Falling, Timber Haul, and Fuel Treatment will have no effect on this indicator.
Indicator Summary: Construction of 600 feet of temporary road in Quartz Creek sub-watershed and 1,450 feet of temporary road in Hardy/Rebel Creek sub-watershed will have a slight negative effect on road density indicator which will be of short duration. This minor change is insignificant at the sub-watershed scale. It is not expected that project elements evaluated above would adversely affect habitat elements and is therefore described as insignificant in magnitude of effects. There is very small potential to favorably influence road density and drainage network through removal of 4,800 feet of existing road, and treatment of existing skid roads upon completion of ground-based harvest activity. This potential benefit is similarly described as insignificant in magnitude of effects and influence on habitat elements.

Disturbance History/Regime:

Baseline Condition: Quartz Creek sub-watershed/Action Area = FAR
Hardy/Rebel Creek sub-watershed/Action Area = FAR

Effects of the Action by project element

Timber Falling/Yarding

Proximity: The modification of canopy in both sub-watersheds is described above and summarized in Tables C-7 and C-8 (in terms of Peak/Base flow influence). The modification of landscape in both sub-watersheds is described above and summarized in Tables C-1 and C-2 (in terms of mass failure influence). Timber harvest units are located from 700 feet to 2.0 miles from proposed critical habitat for spring chinook in Quartz Creek sub-watershed and 3,650 feet to 2.4 miles in Hardy/Rebel Creek sub-watershed (Table B-3). Chinook salmon and bull trout are not presently known to occupy Quartz or Hardy Creek, except for possible rearing and foraging approximately 8 miles downstream from the harvest units in Quartz Creek, and 0.7 mile downstream in Hardy Creek.
Probability: Project activities continue to exceed mid-point ARP values recommended in the LRMP. Some influence with management activity may be expected on rate of mass failure in both sub-watersheds.
Magnitude: Project post implementation recovery levels for ARP drop from 95 to 93.6 in Hardy Creek, and from 91.2 to 89.5 in Lytle-Indian when compared to the No Action alternative. All planning sub-watersheds continue to exceed recommended Mid-point values in the LRMP. Consequently, no direct, indirect, or cumulative changes in flow regime are anticipated, and the effect to listed species habitat is neutral. Landscape susceptibility to debris torrents with increased levels of management activity is accounted for in the sediment discussion above. As debris torrents are a naturally occurring process in both sub-watersheds, management activities may influence their rate of occurrence. Tables C-1 and C-2 above summarize sub-watershed increase in mass waste origin sedimentation, compared to a no action alternative. The volumes of sediment potential are less than 1% of existing sediment yield in each sub-watershed. This amount is considered slightly negative, but insignificant in terms of potential adverse effects on listed species or their habitat.

Element Summary: There is no expected vulnerability of listed species habitat to increases in flood frequency, increases in peak flow or decreases in base flow as a result of project activities. The effect is considered neutral. There is a slight negative effect from sediment delivery through influence of mass failure processes, but it is insignificant in terms of potential adverse effect on listed species or their habitat.

Road Construction and Decommissioning

Proximity: In Quartz Creek sub-watershed, 600 feet of temporary road construction and in the Hardy/Rebel Creek sub-watershed 1,450 feet of temporary road construction would occur of forest soils not subject to failure. Unit and road proximity to proposed critical habitat ranges from 0.7 to 2.1 mile (Table B-3).
Probability: Low gradient topography and short duration of road existence will not be expected to contribute to road related failure. Temporary roads are to be used during one season of timber extraction then obliterated.
Magnitude: The small area and short duration of road presence on the landscape are not expected to contribute to road-related mass failure. The likelihood of road-related mass failure is negligible due to low gradient topography and soil suitability.
Element Summary: Modification of the disturbance regime is not expected to occur with this project element. The effect is neutral.

Fuel Treatment

Proximity: A small area of fuel treatment will occur with project activities (Table B-11), to be burned during high soil and duff moisture periods in spring time. Limited burning activity will occur in riparian reserves, where fire is allowed to creep into thinned riparian reserves adjacent to regeneration Units 4 and 25. Unit 4 within the Quartz Creek sub-watershed is located within 700 feet of proposed critical habitat for spring chinook. Unit 25 is located 2.4 miles from proposed critical habitat for spring chinook in the Hardy/Rebel Creek sub-watershed.
Probability: The small area of treatment and low intensity burn presents little risk of wildfire to the sub-watersheds. Fire suppression in the past century has delayed historic fire return intervals. The area and intensity of fire used in this project is expectedly below the range of historic fire disturbance, resulting in a neutral effect on disturbance regime.
Element Summary: Neutral effect.
Other Elements: Other project elements have no causal mechanism to affect this indicator through modification of the disturbance regime. A slight improvement in drainage network and reduced susceptibility to road failure, described above in road reconstruction and culvert upgrade will occur with the project, but not at a level considered measurable or significant (neutral effect). The element of timber haul will have no effect on this indicator.
Indicator Summary: Timber falling and yarding project elements potentially influence this indicator negatively but at an insignificant level. Timber haul has no effect, and other project elements are considered neutral in effect.

VI. ESA EFFECTS DETERMINATION

The analysis of potential effects to bull trout and spring chinook salmon using a habitat approach was discussed in detail in the previous chapter. The results of this analysis is summarized in Table VI-1.

Table VI-1. Summary of effects to indicators or grouped indicators.

Indicator	Timber falling	Timber yarding	Road reconstruction culverts and quarry development	Road construction and decommissioning	Timber Haul	Fuel Treatment	Indicator Summary
Temperature	Insignificant	Insignificant	Neutral	Neutral	Neutral	Neutral	Insignificant
Sediment	Neutral	Insignificant	Insignificant	Neutral	Insignificant	Neutral	Insignificant

Chemical	Discountable	Discountable	Discountable	Discountable	Discountable	Discountable	Discountable
Barriers	Neutral						
Wood	Insignificant	Insignificant	Neutral	Neutral	Neutral	Neutral	Insignificant
Habitat Indicators and Riparian Reserves	Discountable	Discountable	Insignificant	Neutral	Neutral	Neutral	Insignificant
Flows	Insignificant	Neutral	Neutral	Insignificant	Neutral	Neutral	Insignificant
Roads	Neutral	Insignificant	Insignificant	Insignificant	Neutral	Neutral	Insignificant
Disturbance	Insignificant	Insignificant	Neutral	Neutral	Neutral	Neutral	Insignificant

The AP provides a dichotomous key which is utilized to reach the appropriate ESA effect determination. Utilizing the indicator summaries from Chapter V and Table VI-1 of this document, the key provided an effect determination of **Not Likely to Adversely Affect** (NLAA), as shown in Table VI-2.

Table VI-2. AP Effects Determination Key.

AP Project Effects Determination Key For Species and Designated Critical Habitat	
1) Do any of the indicators summaries have a positive or negative conclusion?	
X	Yes - Go to 2
	No – No Effect
2) Are the indicator summary results only positive?	
	Yes – NLAA
X	No – Go to 3
3) If any of the indicator summary results are negative, are the effects insignificant or discountable?	
X	Yes – NLAA
	No – LAA, fill out Adverse Effects Form

The Hartz project is located in close proximity to currently unoccupied proposed spring chinook salmon critical habitat in the Quartz Creek sub-watershed, and is more distantly located (approximately 8 miles downstream) to habitat currently utilized by spring chinook salmon and bull trout in the Quartz Creek sub-watershed. The Hartz project is located within 0.2 to 2.7 miles from proposed spring chinook salmon critical habitat in the Hardy/Rebel Creek sub-watershed, and is the same distance to habitat currently utilized by spring chinook salmon and bull trout in the Hardy/Rebel Creek sub-watershed. The project was designed to minimize negative effects to listed species or proposed critical habitat. Some of the project elements will have negative effects, but these effects have been determined to be either insignificant or discountable. Effects to habitat occupied by spring chinook salmon and bull trout or to the fish themselves are also expected to be either insignificant or discountable.

This Biological Assessment analyzed the effect this project may have on proposed spring chinook critical habitat. Project elements will have negative effects to proposed critical habitat for spring chinook salmon, and these effects are expected to be insignificant or discountable. Analysis of effects to in-stream and other habitat elements address Primary Constituent Elements in proposed spring chinook salmon critical habitat, as described in Effects to Indicators analysis. This analysis finds no adverse effect to Primary Constituent Elements or to proposed spring chinook critical habitat.

VII. AGGREGATED FEDERAL EFFECTS

We are not aware of any proposed federal actions for which a Biological Assessment has been submitted contemporaneously with this BA for ESA consultation, which would affect the ESA action area for this project. All ongoing actions with potential adverse effects (where ESA consultation has been concluded), and effects of completed federal actions, are included in the environmental baseline for each indicator and have been considered in this analysis.

VIII. ENDANGERED SPECIES ACT CUMULATIVE EFFECTS

Endangered Species Act cumulative effects are the future effects of state, tribal, local, and private actions that are reasonably certain to occur within the action area associated with the federal action. The private land in Quartz Creek sub-watershed is located downstream from the action area and Hartz project effects could combine cumulatively (beneficially or detrimentally) downstream of the federal action area. It is expected that intensive timber management in privately owned portions of Quartz Creek sub-watershed will continue in the future. It is also expected that activities on these lands will comply with county, state, and federal laws and regulations. It is estimated timber harvest from privately owned timberlands will occur at a rate of about 300 acres per year in regeneration harvest, based upon a 45 year rotation. Hartz project includes objectives and design elements to maintain or improve water and aquatic habitat quality, and contribute to an improved future supply of in-stream large woody debris, both on federal land and via woody debris migration to private land. Combined with estimated rates of harvest on private land downstream, the Hartz Project will not contribute significantly to adverse effects at a level to place endangered species or their habitat at risk.

IX. EFH ASSESSMENT

When the Magnuson-Stevens Act of 1976 was re-authorized in 1996, it directed Regional Fishery Management Councils to identify Essential Fish Habitat (EFH) for commercial fish species of concern. Effects analysis contained in this Biological Assessment address potential effects to EFH. One commercially valuable species may be impacted by this project, spring chinook salmon. The examination of potential project element effects on habitat elements important to ESA listed spring chinook finds the Hartz Project is not expected to adversely affect fish habitat in the Quartz Creek or Hardy/Rebel Creek sub-watersheds, nor habitat downstream of these tributaries, thus the Hartz Project will Not Adversely Affect EFH for spring chinook salmon.

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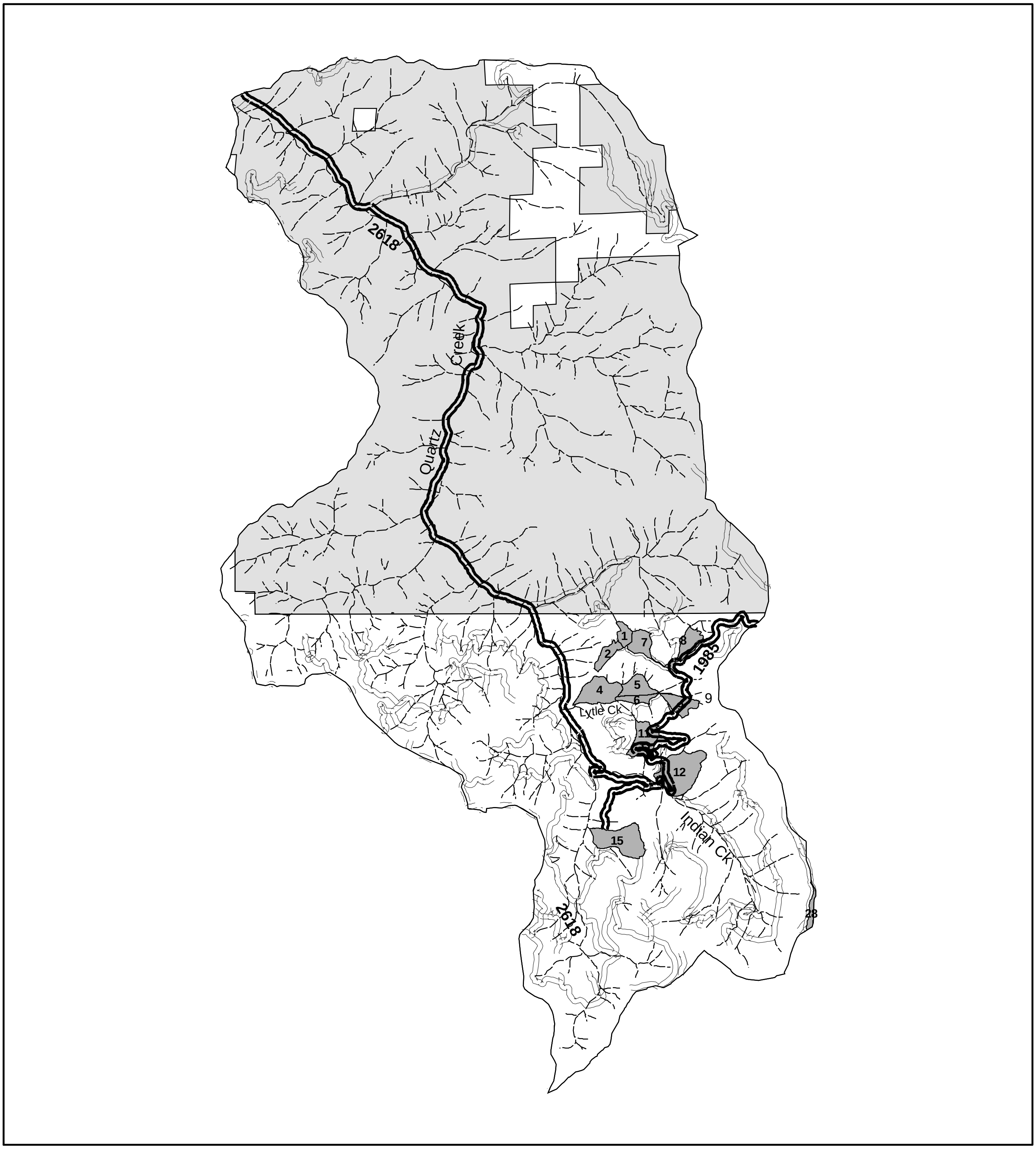
Figure A-2.

Hartz Project in Quartz Creek Sixth Field Sub-watershed



	Watershed Boundary
	Non National Forest
	Units
	Haul Route
	Roads
	Streams

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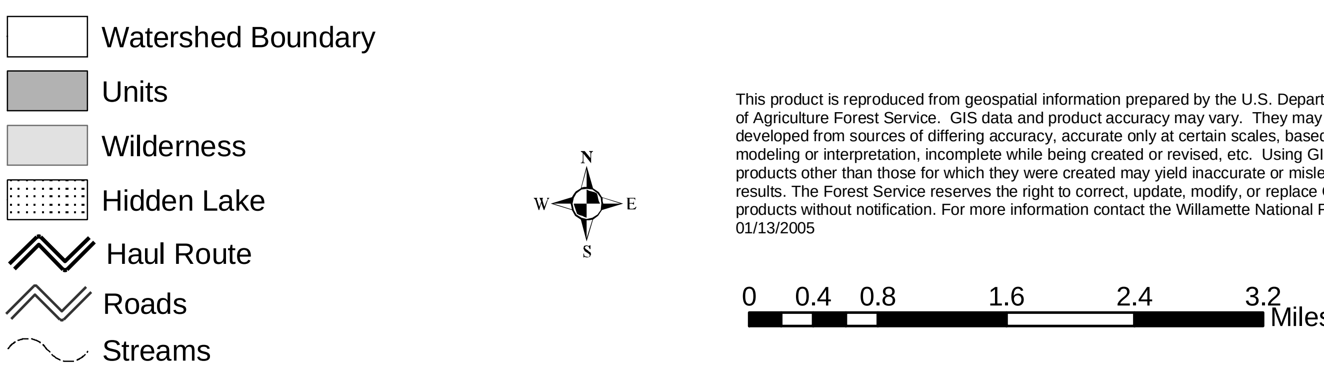
01/13/2005

Figure A-3.

Hartz Project in Hardy/Rebel Creek
Sixth Field Sub-watershed



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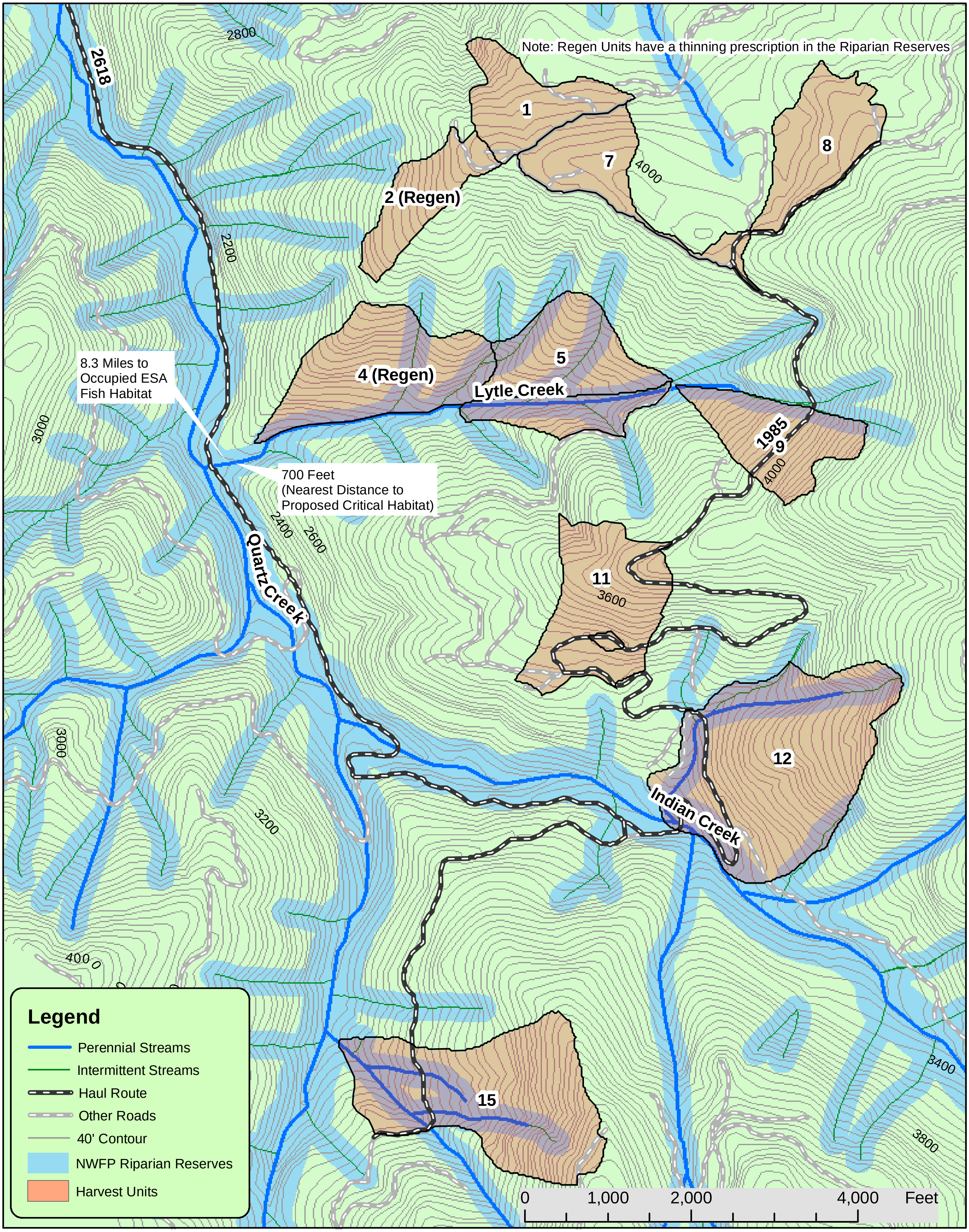
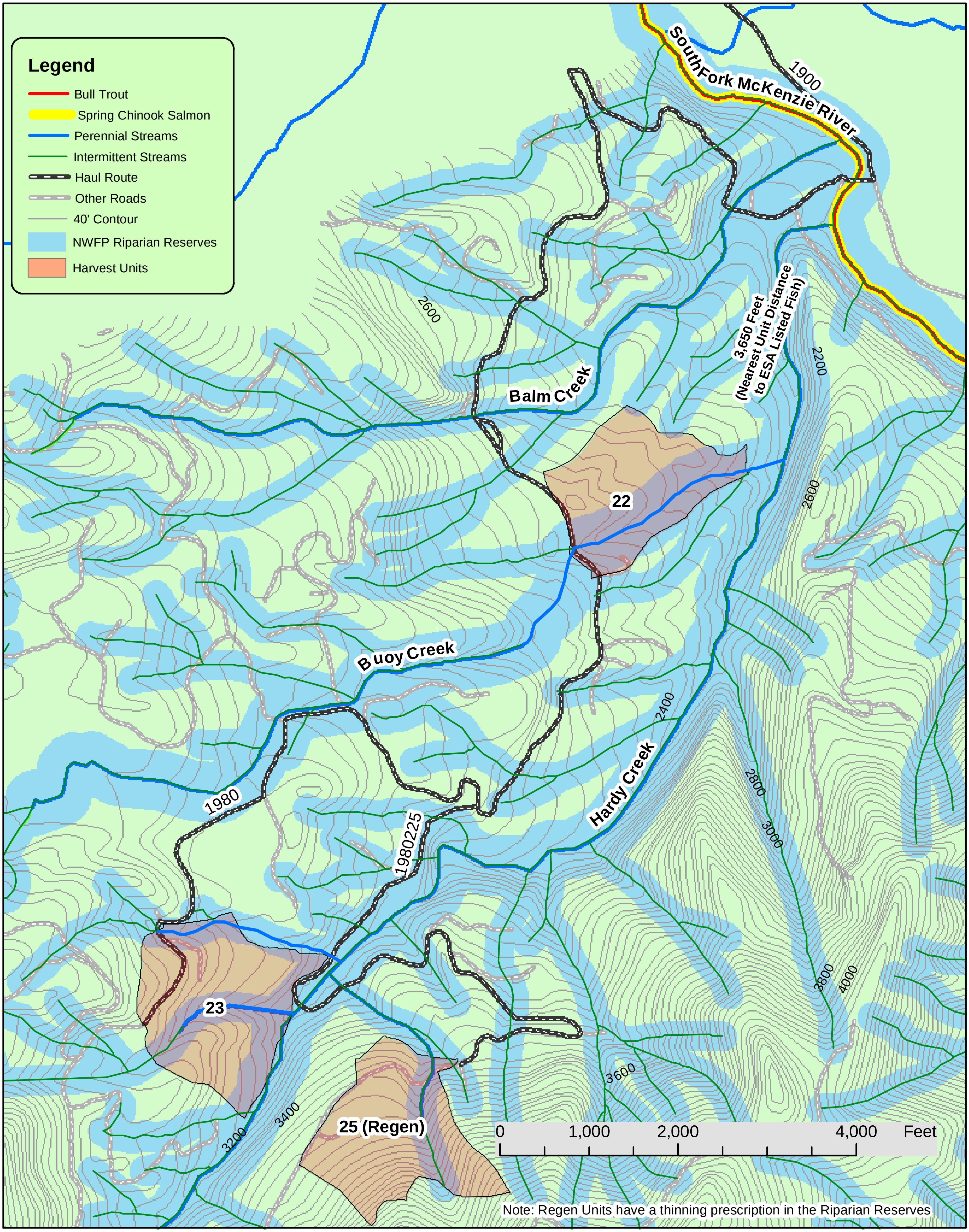
Unit Info, Hartz TS, Quartz Creek Watershed



Unit Info, Hartz TS, SF McKenzie Watershed



Project area
Bull trout rearing, foraging, migration routes
Spring chinook salmon spawning, rearing, migration routes
Spring chinook salmon/bull trout reservoir habitat (rearing, foraging, mig
Proposed spring chinook salmon Critical Habitat
N Scale:

Appendix C –Wildlife Biological Evaluation

Appendix C

United States Department of Agriculture | Forest Service | Willamette National Forest McKenzie River Ranger District | 57600 McKenzie Hwy McKenzie Bridge, OR 97413 Tel (541) 822-3381 FAX (541)822-7254

File Code: 2670 – Biological Evaluations
2410 – Timber Sale Planning

Date: April 19, 2005

Subject: Wildlife Biological Evaluation

To: Analysis File (EA)
Hartz Young Stand Management Project

Caring for the Land and Serving People

MANAGEMENT RECOMMENDATIONS

The following information should be included in the Environmental Assessment, Timber Sale Contract, Road Contract, and Burn Plans, as applicable:

Mitigation

Hazard Tree Removal on the Access Route

Along the haul route down Road 2618-Quartz Creek, hazard trees would be felled between August 1 and January 1st, which is during the non-breeding season for threatened, endangered and sensitive birds, as well as cavity nesters. This will protect them from noise disturbance during the nesting season in unsurveyed nesting habitat, as well as possible nesting harlequin ducks along suitable habitat adjacent to Quartz Creek, which cannot be effectively surveyed for. Non-listed cavity nesters using snag habitat will also be protected by this seasonal restriction.

For the haul route hazard tree removal, minimize damage to existing adjacent trees and vegetation during falling and yarding. Protection of the adjacent larger diameter trees and snags planned to be left shall be a priority when falling and yarding.

No removal of existing down woody material along the haul route. Only those hazard trees marked for falling and determined to provide greater than the down wood requirements may be removed. These are a minimum of 240 linear feet/acre of decay class 1 and 2 and greater than 20” dbh shall be left (NWFP Standards and Guidelines C-40). Trees left as large down wood should reflect the size and species mix of the stand.

Hartz Unit Operations

If Threatened, Endangered, or Sensitive (TES) wildlife species are found in future field work or during activities associated with this project, and potential for adverse effects exists, project modifications will be pursued and Contract Provision C6.25 will be implemented.

A seasonal operating restriction on falling, yarding, heavy equipment operation, helicopter use, burning, snag and log creation is required if shown in the following table. These restrictions may be lifted if surveys are conducted and non-nesting is verified for the year of operation. Seasonal restrictions are required due to adjacent activity centers for spotted owls, as well as unsurveyed habitat with nesting potential.

If changes are made to this project which may alter the need for seasonal restrictions, the wildlife biologist shall be notified. These may result in areas with lifted or additional seasonal restrictions. Examples include changes in locations of helicopter landings, additional helicopter use or blasting.

Hartz Young Stand Management Project Seasonal Restrictions

Unit	Seasonal Restriction for falling, ground-based yarding, burning, snag and log creation, helicopter landing and rockpit development without blasting?	Seasonal restriction for helicopter use and blasting at rockpit development?
1	No	Yes, March 1-July 15
2	No	Yes, March 1-July 15
4	No	Yes, March 1-July 15
5	No	Yes, March 1-July 15
6	No	Yes, March 1-July 15
7	Yes, west half only: January 15-July 15 (Peregrine Falcon), entire unit: March 1-July 15 (Spotted Owl)	Yes, January 15-July 15 (Peregrine Falcon), March 1-July 15
8	Yes, January 15-July 15 (Peregrine Falcon)	Yes, January 15-July 15 (Peregrine Falcon), March 1-July 15
9	Yes, January 15-July 15 (Peregrine Falcon)	Yes, January 15-July 15 (Peregrine Falcon), March 1-July 15
11	No	Yes, March 1-July 15
12	No	Yes, March 1-July 15
15	No	Yes, March 1-July 15
22	Yes, January 15-July 15 (Peregrine Falcon)	Yes, March 1-July 15
23	Yes, April 1-July 30 bottom 150 feet near Hardy Creek (Harlequin Duck)	Yes, March 1-July 15
25	No	Yes, March 1-July 15
Helicopter Landing 1	No	Yes, March 1-July 15
Helicopter Landing 2	No	Yes, March 1-July 15
Helicopter Landing 3	No	Yes, March 1-July 15
Helicopter Landing 4	No	Yes, March 1-July 15
Rock Pit Development	Yes, March 1-July 15 (Spotted Owl)	Yes, March 1-September 30 (Spotted Owl in AMA)
Road Reconstruction	Not needed if activity will consist of a moving nature and not be stationary. Work at one location exceeding 3 hours duration is seasonally restricted March 1-July 15 (Spotted Owl). All work will occur during dry weather using clean, dry fill materials.	Yes, March 1-September 30 (Spotted Owl in AMA); March 1-July 15 (Spotted Owl in Matrix)

Unit numbers used were those shown on the map in the EA, and not the logging setting map. If units were not broken down into subunits, then the restriction applies to all subunits.

Within the regeneration units 2, 4, and 25, 15% of the unharvested area would remain in no-harvest patches and/or scattered individual trees.

Rock outcrops in units 9, 11, and 25 would be buffered to protect habitat for Pacific fringe-tailed bats.

If large, hollow trees and snags greater than 16" dbh which provide rare habitat for wildlife species such as the sensitive Pacific fringe-tailed bat are found in future field work or during activities associated with this project, the wildlife biologist shall be notified. Protection of these types of trees and snags is recommended and may consist of leaving green trees surrounding this structure.

Hauling on native surface roads should not occur during wet weather.

Road construction, reconstruction and decommissioning shall occur during dry weather using clean dry fill materials.

Planned road closures will benefit wolverines, Pacific fisher, and other wildlife species which need seclusion. Implement road closures as planned, as soon as possible after logging is completed. Closely evaluate whether or not roads need to remain open for post-sale contract work.

SUMMARY OF DISCUSSION

The northern spotted owl is known to occur in the Planning Area and this project may affect, but is not likely to adversely spotted owls. All alternatives are consistent with the Northwest Forest Plan. Formal and informal consultation with the U.S. Fish & Wildlife Service for effects to the northern spotted owl was initiated in 2004 for FY2005/2006 Habitat Modification Projects in the Willamette Province. A Biological Opinion was received on April 4, 2005 [FWS *reference*: 1-7-05-F-0228]. This Biological Opinion concludes the finding of no jeopardy and no adverse modification of critical habitat. This project may affect, but is not likely to adversely affect the northern spotted owl. Seasonal restrictions as shown in the table above will be required to comply with the Biological Opinion.

Stream and riparian protection will protect Cascade torrent salamanders and harlequin ducks, which have potential to be present in the area, as well as their habitat. The project plans will also protect habitat quality for their prey.

NOTE: A Biological Evaluation for fish and plants has been prepared separately.

INTRODUCTION

This analysis addresses the potential effects of Alternatives 1-4 of the Hartz Young Stand Management Project on Threatened, Endangered, or Sensitive (TES) species listed in the U.S. Forest Service Region-6 Sensitive Species List dated July 2004 (Forest Service Manual [FSM] 2672.4), which are documented or suspected to occur on the Willamette National Forest. This determination ensures compliance with the provisions of the Endangered Species Act (ESA) of 1973, Public Law 93-205 (87 Stat. 884), as amended. The ESA requires Federal agencies to ensure that all actions which they "authorize, fund or carry out" are not likely to jeopardize the continued existence of any TES species. Agencies are also required to develop and carry out conservation programs for these species.

Sensitive species on the current Forest Service Sensitive Species List are given the same management consideration as federally listed species, with the exception that consultation with the U.S. Fish & Wildlife Service is not required. All actions must be taken to ensure that management activities do not jeopardize the continued existence of sensitive species or result in an adverse modification of their essential habitat (FSM 2670.3, R-6 Supp.41, 4/87).

PROJECT LOCATION AND DESCRIPTION

The Hartz Planning Area is located on the McKenzie River Ranger District. The predominant forest type within the area is young, mature and old-growth Douglas-fir at the lower elevations, and true firs above 4000 feet. More detailed information about stand types is located in the Hartz Project Integrated Prescription.

The estimated project duration is one to two field seasons, although mitigation and enhancement work may take place up to five years after the logging activity is completed. Alternative 1 is the no action alternative. Alternatives 2-4 propose the following activities. For more information, refer to the Environmental Assessment.

Alternative 2 Forest Treatments

Unit	Acres	Harvest Prescription	Logging System - Temp Roads	Fuels Treatment	Estimated Timber Volume (MBF/CCF)
1	20	Moderate Thin	Skyline/GB	YTA/HP	432860 /
2	26	Regen	Heli/Skyline/GB	BC	642314 /
4	59	Heavy Thin	Helicopter	NT	843700 /
5	39	Heavy Thin	Heli/Skyline	NT/HP	567684 /
6	19	Moderate Thin	Heli/Skyline	NT/HP	125780 /
7	31	Moderate Thin	Shovel/GB	YTA/NT/HP	372000 /
8	38	Heavy Thin	Skyline - 600'	NT/HP	608400 /
9	36	Heavy Thin	Heli/Skyline	NT/HP	759168 /
11	53	Moderate Thin	Skyline/GB	YTA/NT/HP	528145 /
12	115	Heavy Thin	Heli	NT/HP	2729870
15	90	Heavy Thin	Heli	NT/HP	1511820
22	55	Heavy Thin	Skyline/GB -150' - 4000'	NT/HP	563200
23	67	Moderate Thin	Skyline/GB - 1300'	YTA/NT/HP	818003
25	58	Regen	Heli/GB	BC	1104517
Total	**706**		**4000+2050 feet temp rds**		**11607461**

Note on Temp roads for unit 22: 4000' feet is existing "unclassified" road. 150' will be built.

Alternative 2 Road Treatments

Road Number	Existing Condition	Proposed Road Treatment	Description of Associated Maintenance Activites	Miles Affected
1980-225	Open	Close	Install gate at Jct 1980	4.3
1980-unc	Open	Close	Obliterate following haul (temp road)	0.5
1980-500	Closed	Decom. 800'	Haul Route. Close by berm following use. Decom last 800'	0
1985-140	Open	Close	Haul Route. Install gate at Jct 1985	2.6
1985-352	Open	Close	Berm entrance, maintain drainage	0.1
Total				**7.5**

Alternative 3 Forest Treatments

Unit	Acres	Harvest Prescription	Logging System - Temp Roads	Fuels Treatment	Estimated Timber Volume (MBF/CCF)
1	20	Moderate Thin	Skyline/GB	YTA/HP	432860 /
2	26	Heavy Thin	Heli/Skyline/GB	NT/HP/YTA	341666 /
4	59	Heavy Thin	Helicopter	NT	843700 /
5	39	Heavy Thin	Heli/Skyline	NT/HP	567684 /
6	19	Moderate Thin	Heli/Skyline	NT/HP	125780 /
7	31	Moderate Thin	Skyline/GB	YTA/NT/HP	372000 /
8	38	Heavy Thin	Skyline - 600'	NT/HP	608400
9	36	Moderate Thin	Heli/Skyline	NT/HP	474804
11	53	Moderate Thin	Skyline/GB	YTA/NT/HP	528145
12	115	Moderate Thin	Heli	NT/HP	2257335
15	90	Heavy Thin	Heli	NT	1511820
22	55	Heavy Thin	Skyline/GB - 150' - 4000'	NT/HP	563200

Unit	Acres	Harvest Prescription	Logging System - Temp Roads	Fuels Treatment	Estimated Timber Volume (MBF/CCF)
23	67	Moderate Thin	Skyline/GB - 1300'	YTA/NT/HP	818003
Total	**648**		**4000+2050 feet temp rds**		9445397

Note on Temp roads for unit 22: 4000' feet is existing "unclassified" road. 150' will be built.

Alternative 3 Road Treatments

Road Number	Existing Condition	Proposed Road Treatment	Description of Associated Maintenance Activites	Miles Affected
1980-unc	Open	Close	Obliterate following haul (temp road)	0.5
1980-500	Closed	Decom. 800'	Haul Route. Close by berm following use. Decom last 800'	0
1985-140	Open	Close	Haul Route. Install gate at Jct 1985	2.6
1985-352	Open	Close	Berm entrance, maintain drainage	0.1
Total				**3.2**

Alternative 4 Forest Treatments

Unit	Acres	Harvest Prescription	Logging System - Temp Roads	Fuels Treatment	Estimated Timber Volume (MBF/CCF)
1	20	Heavy Thin	Skyline/GB	YTA/HP	634160 /
2	26	Regen	Heli/Skyline/GB	BC	642314 /
4	59	Regen	Helicopter	BC	1803244 /
5	39	Heavy Thin	Heli/Skyline	NT/HP	567684 /
6	19	Moderate Thin	Heli/Skyline	NT/HP	125780
7	31	Moderate Thin	Skyline/GB	YTA/NT/HP	372000
8	38	Heavy Thin	Skyline - 600'	NT/HP	608400
9	36	Heavy Thin	Heli/Skyline	NT/HP	759168
11	53	Heavy Thin	Skyline/GB	YTA/NT/HP	933754

Unit	Acres	Harvest Prescription	Logging System - Temp Roads	Fuels Treatment	Estimated Timber Volume (MBF/CCF)
12	115	Heavy Thin	Heli/Skyline	NT/HP	2729870
15	90	Heavy Thin	Heli	NT/HP	1511820
22	55	Heavy Thin	Skyline/GB - 150' - 4000'	NT/HP	563200
23	67	Heavy Thin	Skyline/GB - 1300'	YTA/NT/HP	1129620
25	58	Regen	Heli/GB	BC	1104517
Total	**706**		**4000+2050 feet temp rds**		**13485531**

Note on Temp roads for unit 22: 4000' feet is existing "unclassified" road. 150' will be built.

Alternative 4 Road Treatments

Road Number	Existing Condition	Proposed Road Treatment	Description of Associated Maintenance Activites	Miles Affected
1980-225	Open	Close	Install gate at Jct 1980	4.3
1980-unc	Open	Close	Obliterate following haul (temp road)	0.5
1980-500	Closed	Decom. 800'	Haul Route. Close by berm following use. Decom last 800'	0
1985-140	Open	Close	Haul Route. Install gate at Jct 1985	2.6
1985-352	Open	Close	Berm entrance, maintain drainage	0.1
Total				**7.5**

Temporary roads would be decommissioned after completion of logging operations. In addition to the proposed logging and road treatments, snag and down wood creation would also occur with Alternatives 2-4

Large down wood: Two to four trees per acre or approximately 100-200 lineal feet/acre of decay class I-II down wood would be created in all units. Pieces should be left as full tree lengths to maximize ecological benefits. Existing down wood pieces greater than 20 feet may be counted towards this total. Trees left as down wood should reflect the size and species mix of the stand. This large down wood will benefit Oregon slender salamander, Baird's shrew, Pacific shrew, California wolverine, and northern spotted owls, if not directly, then by being beneficial to their prey.

Snags: Prescribed green tree snag creation at the rate of 2-7/acre would benefit Pacific fringe-tailed bats, peregrine falcons, and California wolverines which may be present in the area, as well as cavity nesting species, by improving or protecting habitat quality for them or their prey. Snags would be created from trees greater than 14" dbh, depending on the size class within the stands. Larger snags are preferred.

Riparian Reserves and Proposed Hartz Units

Proposed Unit	Stream Class
1	None
2	None
4	II,III,IV
5	II,III,IV
6	II, III, IV
7	None
8	Wetland
9	III,IV
11	None
12	II,III,IV
15	III,IV, Wetland
22	II,IV, Wetland
23	II,III,IV, Wetland
25	III,IV

RISK ASSESSMENT PROCESS

In addition to the following documents, personal knowledge of the area, professional judgment, and other studies were used to assess the risk of a proposed project adversely affecting a Threatened, Endangered, or Sensitive species.

Spotted Owls: "A Conservation Strategy for the Northern Spotted Owl", Interagency Scientific Committee to Address the Conservation of the Northern Spotted Owl, Thomas et al., May 1990 (ISC Report).

Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests, USDA, January 1992.

U.S. Fish & Wildlife Service Formal and Informal Consultation on CY 2005-2006 projects within the Willamette Province which may modify habitats for bald eagles and northern spotted owls [FWS *reference*: 1-7-05-F-0228].

Bald Eagles: Risk Assessment Guidelines, 2673-32--3, 10/89 Supplement to the Regional Guide.

U.S. Department of Interior, Fish and Wildlife Service, 1986. Recovery Plan for the Pacific Bald Eagle. U.S. Fish and Wildlife Service. Portland, Oregon. 160 pp.

American Peregrine Risk Assessment Guidelines, 2673-32--3, 10/89 Supplement. Falcons: Pacific Coast Recovery Plan for the American Peregrine Falcon, USFWS, 1982.

Other Threatened or Sensitive Species: Risk Assessment Guidelines, 2673-32-3 10/89, Supplement to the Regional Guide.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

1. SUMMARY

This Biological Assessment consists of a 6-step process to identify Threatened, Endangered, and Sensitive (TES) wildlife species associated with the project area, and evaluates effects and impacts the project may have on these species. The six steps of the Biological Assessment are as follows:

Prefield Review: Review of existing documented information.

Field Reconnaissance or survey of the project area. For some species, this may include the proposed unit locations. Other species' needs require field reconnaissance of a specific area around unit locations, while others require evaluation of a larger area which could extend outside the Planning Area boundaries.

Conflict determination: Evaluation of the impacts of the project to local populations of TES species.

Analysis of Significance of the project's effects on local and entire populations of TES species.

***Biological Investigation** is conducted if Step 4 cannot be completed due to lack of information.

Conferencing or Informal/Formal Consultation with USFWS is initiated at the appropriate stage as outlined in FSM 2673.2--1, or otherwise arranged through formal channels.

* Step #5 pertains only to federally listed species and will not be shown in Tables 1 and 2 except when applicable.

Table 1: Biological Evaluation process for wildlife species for the Hartz Project.

	Step #1	Step #2	Step #3	Step #4	Step #6
SPECIES	**PREFIELD REVIEW**	**FIELD REVIEW**	**CONFLICT DETERMI-NATION**	**ANALYSIS OF SIGNIFI-CANCE**	**FWS REVIEW**
	Habitat present?	***Habitat surveyed?***	***Conflict?***	***Effects or impacts? Mitigation?***	***Consultation?***
Oregon Slender Salamander	Yes	No	No	Yes. RX3	Not required
Cascade Torrent Salamander	Yes	No	No	Yes. RX2, buffer small waterfall in unit 9	Not required
Foothill Yellow-legged Frog	No	NA	No	No.	Not required
Oregon Spotted Frog	No	NA	No	No.	Not required
Northwestern Pond Turtle	No	NA	No	No.	Not required
Least Bittern	No	NA	No	No.	Not required
Bufflehead	No	NA	No	No.	Not required
Harlequin Duck	Yes	NA	No	No. RX1	Not required
Northern Bald Eagle	No	NA	No	No.	Not required
American Peregrine Falcon	Yes	Completed and will continue	No	No. RX1, RX4	Not required
Yellow Rail	No	NA	No	No.	Not required
Black Swift	Yes	No	No	No. RX2	Not required
Tri-colored Blackbird	No	NA	No	No.	Not required
Northern Spotted Owl	Yes	Completed and will continue	No	May affect, not likely to adversely affect; no jeopardy and no adverse modification of critical habitat. RX1	FY2005/2006 Programmatic Consultation
Baird's Shrew	Yes	No	No	No. RX2, 3	Not required
Pacific Shrew	Yes	No	No	No. RX2, 3	Not required
California Wolverine	Yes	No	No	No. RX3, possible	Not required

	Step #1	Step #2	Step #3	Step #4	Step #6
SPECIES	**PREFIELD REVIEW**	**FIELD REVIEW**	**CONFLICT DETERMI-NATION**	**ANALYSIS OF SIGNIFI-CANCE**	**FWS REVIEW**
	Habitat present?	***Habitat surveyed?***	***Conflict?***	***Effects or impacts? Mitigation?***	***Consultation?***
				benefit with improved elk and small mammal conditions and road closures	
Canada Lynx	No	NA	No	No	Not required
Pacific Fisher	Yes	No	No	No. RX3, possible benefit with road closures	Not required
Pacific Fringe-tailed Bat	Yes	No	No	May impact. RX4, non-harvest buffer around rock outcrops in units 11 and 25	Not required
Mardon Skipper	Yes	No	No	No	Not required
Crater Lake Tightcoil	Yes	No	No	No	Not required

Mitigation Key

RX1 = Seasonal restriction during breeding season

RX2 = No harvest near riparian areas (streams and wetlands)

RX3 = Existing down, large woody material retained. Additional decay class I-II material will be created.

RX4 = Existing snags retained where operationally feasible. Additional class I-II snags will be created.

Other sensitive species on the R-6 List were considered, and it was determined that their habitat needs were outside the character of this sale area.

Note: The "Prefield Review" applies to the entire Planning Area. For spotted owls, an area of at least 1.2 miles outside units of all action alternatives was considered. Effects analyzed were those for alternatives 1 and 2. If the no action alternative was not specifically mentioned, there are no effects associated with that alternative.

DISCUSSION

A discussion of the effects of the proposed project alternatives on TES wildlife species follows. All listed threatened species are discussed below. If it was determined that the habitat needs of sensitive species do not exist in this analysis area (see table above), they are not discussed below.

AMPHIBIANS AND REPTILES

Oregon Slender Salamander (*Batrachoseps wrighti*)

Alternatives 2-4 of the proposed Hartz Project may Oregon slender salamanders. Down wood creation may benefit Oregon slender salamander habitat. There would be no impacts with Alternative 1.

<u>Habitat</u>: This salamander is found under loose bark and moss in mature and second growth Douglas fir forests. It also burrows under rocks or logs of moist hardwood forests within coniferous forest landscapes. During the fall and spring when conditions are moist, the Oregon slender salamander is found near the surface, but it retreats underground in late spring and summer.

<u>Pre-field review</u>: This species is found on the west slope of the Cascades from the Columbia River to Southern Lane County.

<u>Field reconnaissance</u>: Oregon slender salamanders have been documented from Hidden Lake which is within the Hartz Project area. None have been found in Hartz units, however, surveys have not been conducted.

<u>Analysis of effects</u>: Opening of the forest canopy, especially in the regeneration units 2, 4, and 25 (Alternatives 2 and 4) planned for 15% green tree retention may impact habitat quality by accelerating the timeframe in which the ground and outer part of logs dry out. Heavy thinning of units proposed under all alternatives may impact these salamanders more than moderate thinning, however, these impacts are expected to be short-term. Salamanders may retreat underground earlier than before.

Logging and disturbance of existing down woody material may impact individuals of this species. The older down woody material with loose bark will not be removed, so logs which may be used as existing habitat will remain on the ground. Down log creation under Alternatives 2-4 is expected to benefit these salamanders.

<u>Cumulative effects</u>: It is expected that habitat connectivity will continue to allow viable local populations to exist.

<u>Conflict determination/risk assessment</u>: This project is not expected to impact local Oregon Slender Salamander populations.

<u>Recommendations</u>: Leave the prescribed levels of large down woody material. If it is not present after logging, trees should be felled to create the prescribed levels.

<u>Communications with U.S. Fish and Wildlife Service</u>: Not required

Cascade Torrent Salamander (*Rhyacotriton cascadae*)

Alternatives 2-4 of the proposed Hartz Project may impact Cascade torrent salamanders. There would be no impacts with Alternative 1.

<u>Habitat</u>: The Cascade Torrent Salamander can be found under rocks bathed in a constant flow of cold water, in cool rocky streams, lakes and seeps, usually within conifer or alder forests. It is dependent on nearly continuous access to cold water. During wet weather it can be found moving around in forests away from streams.

<u>Pre-field review</u>: This salamander inhabits the Cascade mountains of southern Washington and northern Oregon with a disjunct population in the southern Oregon Cascades.

<u>Field reconnaissance</u>: Cascade Torrent Salamanders have not been found in the Hartz Project Area, however, surveys have not been conducted. It is expected they would inhabit the area.

Analysis of effects: The Hartz Project may impact Cascade Torrent Salamanders by modifying habitat near small streams.

Cumulative effects: It is expected that habitat connectivity will continue to allow viable local populations to exist.

Conflict determination/risk assessment: This project is not expected to impact local Cascade Torrent Salamander populations.

Recommendations: Apply riparian habitat protection as described in the table under "Project Location and Description." Leave the prescribed levels of large down woody material. If it is not present after logging, trees should be felled to create the prescribed levels. Some of this material should be created over or directly adjacent to streams if possible.

The small waterfall adjacent to unit 9 should be buffered as recommended in the EA Table under Special Habitat Areas.

Communications with U.S. Fish and Wildlife Service: Not required

BIRDS

Harlequin duck (*Histrionicus histrionicus*)

Alternatives 2-4 of the proposed Hartz Project would not impact harlequin ducks with the recommended seasonal restriction on unit 23. There would be no impacts with Alternative 1.

Habitat: Harlequin ducks use rivers, streams, and creeks as feeding habitat and commonly nest in bank cavities. Log jams and overhanging vegetation are most important along smaller streams whereas islands and mid-stream boulders are used for security cover on larger rivers (Wallen and Groves 1989). Harlequin ducks feed on aquatic insects, crustaceans, mollusks, tadpoles, and small fish. Macroinvertebrate levels may play a role in determining harlequin duck population densities.

Breeding ducks appear to require clean, fast-moving water, nearby loafing sites (consisting of exposed rocks, logs, or root wads), dense riparian shrubs and/or timber on the banks, and undisturbed drainages (Cassirer and Groves, 1989). A number of authors have suggested that brood rearing areas do not correspond to nesting locations, and that broods move downstream from nesting areas (Wallen 1987; Cassirer and Groves 1989). Broods prefer lower gradient streams not less than 10 m in width, with overhanging vegetation, and plentiful woody material (Cassirer and Groves, 1989).

Several studies have pointed to the need for an absence of human disturbance in harlequin duck breeding habitat (Cassirer and Groves 1989), or observed an adverse impact of human activities on nesting ducks (Wallen 1987, Genter 1992). One study reported 90% of pairs observed within 300m of roads, residences, campgrounds, or trails (Schirato and Sharp 1992) but it is not yet clear whether this pattern only reflects the increased frequency of observers as opposed to an increased frequency of the duck in these areas.

Pre-field review/Field reconnaissance: Harlequin ducks have been seen with broods on the Southfork of the McKenzie River, but not on Quartz Creek nor in the Hartz Planning Area. Suitable habitat exists but the larger Class I and II rivers which are more commonly used are not present in vicinity of the proposed units.

Analysis of effects: Only unit 23 in Alternatives 2-4 is within disturbance distance of harlequin duck nesting habitat. Harlequin ducks are vulnerable to increases in water temperature, fluctuations in water levels, and sedimentation. These physical characteristics determine the aquatic life situation that this duck feeds upon. Existing water quality is expected to be maintained (see also the Water Quality section in the EA).

Cumulative effects: None.

Conflict determination/risk assessment: No impact with seasonal restriction in lower portion of unit 23.

Recommendations: Apply a seasonal restriction between April 1-July 30 in the lower 150 feet of unit 23 near Hardy Creek.

Communications with U.S. Fish and Wildlife Service: Not required

Northern bald eagle (*Haliaeetus leucocephalus*)

Alternatives 2-4 of the proposed Hartz Project would not affect bald eagles. There would be no impacts with Alternative 1.

Habitat: Bald eagles require habitat consisting of scattered old-growth conifers near available fish prey, and sometimes also feed on waterfowl. They are also known as scavengers, and may feed on deer and elk carcasses, well away from large bodies of water. In such instances, the carcasses are in open clearcut units or off roads, as opposed to within timbered stands.

Pre-field review/Field reconnaissance: There have not been any bald eagle sightings in the Hartz Project Area. Quartz Creek, Hardy Creek, and the other creeks in the Planning Area are too narrow to provide suitable bald eagle foraging habitat.

Analysis of effects: No effect

Cumulative effects: None

Conflict determination/risk assessment: No conflict

Recommendations: None

Communications with U.S. Fish and Wildlife Service: Not required

American Peregrine Falcon (*Falco peregrinus anatum*)

Alternatives 2-4 of the Hartz Project, with mitigation measures implemented and as prescribed with green tree retention and snag creation, would negatively impact peregrine falcons. Snag creation activities may benefit their prey base. There would be no impacts with Alternative 1.

Habitat: Peregrine falcon nesting habitat includes sheer cliffs, usually near water, 150 feet (43 meters) or greater in height, with a small cave or overhung ledge large enough to contain three or four full-grown nestlings. The ledge has increased suitability if several holes or ledges are present (USDI Fish and Wildlife Service, 1982; Wilderness Research Institute, 1979). There have been situations however in which peregrines have successfully nested on smaller cliffs. One eyrie was located on a cliff only 75 feet in height. In another unusual situation on the Willamette National Forest, a peregrine nested at the base of a cliff. Peregrine falcons feed almost exclusively on birds, many of which are associated with riparian zones and large bodies of water.

Pre-field review/Field reconnaissance: The following table shows peregrine falcon surveys that have been conducted in the Hartz Project area. Nesting habitat quality ranges from low to excellent.

Hartz Peregrine Falcon Surveys

Survey Site/Nest Potential	Year(s) surveyed/protocol met?	# Surveys in 2004	Adjacent Hartz Units	Recommendations
Dutch Oven Rock	2004N, 2000N, 1999Y	1	None	None

Survey Site/Nest Potential	Year(s) surveyed/protocol met?	# Surveys in 2004	Adjacent Hartz Units	Recommendations
Complex/H	1999Y			
Hardy Cliffs/M	2004Y, 2000Y, 1999Y	2	22	Resurvey every 2 years until sale is completed, i.e. in 2006, 2008, etc.
Hardy Pinnacle/M	Surveyed with Hardy Cliffs	"	"	"
Indian Ridge North/M	2004N	1	7 (west half), 8, 9	Survey to protocol in 2005. Check end of 1985-132 road when snow-free to assess if better observation point exists.
Quartz Creek Pinnacle/L	2004Y	2	None	None
Upper Hardy/L	2004Y, 1999Y	2	None	None
Indian Ridge/L or M	-	0	None	None

Analysis of effects: Alternative 1: There are no expected effects to peregrine falcons with this alternative. Stand structure and composition would continue to change naturally over time as forest succession occurs. In the long term, the peregrine falcon prey base may change in composition in response to different stand structures. Whether this change in prey species composition would affect the peregrine falcon is not known, but it is likely that this species has the flexibility to adapt to natural changes in its environment.

Alternatives 2-4: Risk Assessment Guidelines, 2673-32--3, 10/89 Supplement and the Pacific Coast Recovery Plan for the American Peregrine Falcon, USFWS, 1982 were used to determine effects.

Peregrines opportunistically forage on a variety of bird species which use all seral stages, including early and late. 90-95% of all prey items of peregrines are birds which may use riparian areas (Wahl et al. 1991). Riparian corridors are often favored hunting locations for peregrine falcons, and most nest sites are within 1/4 to 1/2 mile of some form of water.

Planned timber management activities, road treatments, as well as snag and down wood creation will not jeopardize the integrity of nesting habitat in the Hartz Planning Area. With the prescribed green tree retention and snag creation, peregrine prey base habitat will be modified. The creation of more open-structured stands may provide a slightly different prey base in and adjacent to the units proposed for logging, but the overall abundance of prey is not expected to decline. The riparian prescription will provide green tree retention directly adjacent to streams for all thinning units, as well as the proposed regeneration units in Alternatives 2 and 4. This is expected to continue to provide suitable habitat for prey base species which have strong habitat associations with riparian areas.

The planned underburn in unit 25 may change the distribution of birds in the area which could serve as a peregrine falcon preybase. With the resultant green tree mortality approximating 10% of the overstory, populations of wood-boring insects are likely to increase in the underburned stands (Smith, 2000). This will attract birds such as woodpeckers, warblers, and other species, which could provide easier preybase foraging for peregrine falcons in the area.

Cumulative effects: Past logging on federal lands in the Hartz Project area, as well as on adjacent private lands to the north has altered habitat for the preybase of peregrine falcons. The effects of this on peregrine falcons which may use the Hartz Project area is unknown.

A 17-acre prescribed burn of an open, high elevation mid seral age true fir stand is proposed on Indian Ridge which would encourage huckleberry development. This is likely to be beneficial for landbirds of various species and could enhance peregrine falcon foraging opportunities.

Conflict determination/risk assessment: No conflict

Recommendations: Snag creation should be accomplished four to five years after completion of logging activities to provide replacement snag habitat to benefit prey species of peregrines.

Implement a seasonal operating restriction between January 15 and July 15 on the following activities:

Falling trees, ground-based and skyline yarding, burning, snag and log creation, helicopter landing and rockpit development without blasting: Units 7 (west half only), 8, 9, 22.

Helicopter yarding and blasting at rockpit development: Units 7, 8, 9.

These restrictions may be lifted if the areas are determined to be unoccupied, or the birds are non-nesting.

Communications with U.S. Fish and Wildlife Service: Not required

Black Swift (*Cypseloides niger*)

Alternatives 2-4 of the proposed Hartz Project are not expected to impact black swifts or their habitat. There would be no impacts with Alternative 1.

Habitat/Pre-field review: The black swift is a long-distance neotropical migratory bird that breeds in western North America in close association with mountain waterfalls or sea-side cliffs (Knorr 1961, Foerster 1987, Dobkin, 1994). Black swifts have a scattered distribution in western North America and Central America. They breed from southern Alaska south to California and east to Colorado and Utah.

Black swifts nest in cliff faces near or behind waterfalls. In western North America, these situations are usually in deep canyons in wooded areas. The water can vary in degree from a rushing torrent waterfall to a mere trickle (Foerster and Collins 1990). The waterfalls with swifts in East Lane County are 286 feet and about 50 feet tall, at 4,000 feet and 5,700 feet elevation respectively, in a setting of true fir/mountain hemlock and Douglas fir/western hemlock forests (Combs 2001). Critical factors for nest locations in other states appear to be: 1) temperature moderation due to dripping water and little or no direct solar exposure and 2) high humidity (Marin 1997). Usually they nest out of direct sunlight on a protected rock ledge or knob, or in a crevice. The nest shape is a full or half cup, or inverted cone made mostly of moss, but may include seaweed or fern tips. The nest may also be a depression in the mud with no material added (Marin 1997).

The first probable nest site in Oregon was located in 1982 at Salt Creek Falls, East Lane County (Combs 2001). Black swifts have been seen there in subsequent years and it is believed they nest there, but no actual nests, nestlings or fledglings have been seen. In 1998, a new site was located at a waterfall in East Lane County, about 3 miles west-northwest of Diamond Peak. Black swifts are strongly suspected to breed in other locations along the coast, in the Cascades, the Columbia River Gorge, and other canyons and mountain ranges in Eastern Oregon. There have been other breeding season (June – mid-August) records outside of Lane County in Oregon, but none have been nest locations.

There are many other sites in Oregon that qualify as potential breeding habitat.

Field reconnaissance: No Black swifts have been documented in the Hartz Project area. There are several waterfalls, but none of them are very large in size, and it is unlikely that Black Swifts nest there.

Analysis of effects: No potential Black Swift waterfall nesting habitat will be impacted.

Cumulative effects: None Conflict determination/risk assessment: No conflict

Recommendations: The few breeding season records throughout Oregon indicate a need to search for additional nesting sites.

Communications with U.S. Fish and Wildlife Service: Not required

Northern Spotted Owl (*Strix occidentalis caurina*)

Alternative 1 would not affect the northern spotted owl or its' habitat. Alternatives 2-4 of the Hartz Project would decrease spotted owl dispersal habitat quality and quantity in the short-term. Thinning of the Hartz stands may affect, but is not likely to adversely affect the northern spotted owl. None of the proposed thinning stands are located in Critical Habitat or within Late Successional Reserves. In the long-term, dispersal habitat would be of higher quality once the canopy grows back in. Thinned stands would show increased structural diversity which is beneficial to spotted owls and their prey base. Overstory trees would also show increased growth rates which benefits spotted owls in the long-term. No suitable nesting, roosting, and foraging habitat would be affected by Alternatives 2-4. This sale was submitted to the U.S. Fish & Wildlife Service for formal and informal consultation as part of the FY2005/2006 Habitat Modification projects in the Willamette Province. A Biological Opinion was received on April 4, 2005. This project is not likely to jeopardize the northern spotted owl, and there would be no adverse modification of critical habitat.

Habitat: Stands being proposed for thinning in the Hartz Project consist of previously clearcut 35-45 year old plantations, and do not meet the characteristics of northern spotted owl suitable habitat. The late-successional habitat in the Hartz Planning area surrounding proposed thinning stands is suitable spotted owl habitat by varying degrees.

Suitable habitat is defined as nesting, roosting, and foraging habitat.

Dispersal habitat contains foraging and dispersal habitat characteristics.

Suitable spotted owl habitat has been defined in various documents: ISC Report, USFWS Critical Habitat Determination, Memorandum Decision and Injunction for Judge Dwyer's Decision, and the FSEIS. General guidelines for suitable spotted owl habitat are Douglas-fir, Western hemlock, Western red cedar, or Ponderosa pine older than 200 years and having a moderate to high canopy closure of 60-80%. An understory of multi-layered conifers and hardwoods open enough to still allow owls to fly within and beneath it, moderate to high snag densities, and large logs are also found in typical spotted owl habitat. **However, all of the above characteristics do not need to be present for spotted owls to make use of an area, and for habitat to be determined suitable.**

Dispersal habitat typically does not have the large, old-growth nest trees, multi-layered canopy, or amount of large snags and logs.   The minimum canopy closure for dispersal habitat is 40%.

Pre-field review: Spotted owl activity is expected to occur primarily in older timber stands. Spotted owls do occur in the Planning Area, and this project may affect spotted owls. Two activity centers are within 0.5 miles of proposed Hartz units, however, none of these units contain suitable habitat. These activity centers have not been monitored to protocol in recent years.

There are seven activity centers within 1.2 miles of proposed thinning units. Suitable habitat conditions for these pairs are fair, especially in the Quartz Creek drainage where past logging has extensively fragmented habitat. Only two pairs (0863 and 2418) have greater than 40 % of the median home range acres (1182 acres) within 1.2 miles. The U.S. Fish & Wildlife Service determined that reduction of suitable spotted owl habitat below 40% of the median home range (1182 acres) has a notably higher likelihood of leading to disruption of essential breeding, feeding, and sheltering behaviors (USDI, 1990). Two of the pairs affected by this project have suitable nesting, foraging, and roosting habitat levels greater than 40% of the average home range acres. All currently known activity centers have 100-acre late successional reserve cores surrounding them.

Spotted Owl Suitable Habitat within 1.2 mile radius and by Alternative

Pair Number	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4
3026	396	396	396	396
5067	999	999	999	999
2954	910	910	910	910
1414	1133	1133	1133	1133
3022	718	718	718	718
0113	838	838	838	838
0863	1226	1226	1226	1226
2418	1853	1853	1853	1853

<u>Field reconnaissance</u>: Of the seven activity centers, three have been surveyed for spotted owls to protocol standards by the Oregon Cooperative Wildlife Research Unit annually since 1987. Surveys for the remaining four do not currently meet protocol standards, and some pairs have not been located for ten or more years.

<u>Analysis of effects</u>: Loss and fragmentation of suitable spotted owl and other interior forest species habitat in this planning area has had detrimental effects on existing spotted owls and other interior forest-dependent species. Fragmented habitat increases flight distance and energy consumption for foraging, and increases habitat suitability for predatory and competitive owls (Great Horned owls and Barred owls). This may expose spotted owls to a greater likelihood of encountering these more aggressive owls.

The Hartz Project would not modify existing suitable spotted owl habitat, which consists of nesting, roosting, and foraging habitat. Dispersal habitat will be thinned in Alternatives 2-4 as shown in the table below. Dispersal habitat would be downgraded or removed. The following definitions apply to these terms:

- downgraded: dispersal habitat which is moderately thinned and still retains a minimum of 40% average canopy closure
- removed: dispersal habitat which is thinned below 40% canopy closure with a heavy thinning, or regeneration harvest which maintains 15% canopy closure.

Spotted Owl Dispersal Habitat Removed or Downgraded, Shown by Alternative

	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4
Acres removed - 15% of Stand Acres Remaining (regeneration harvest)	0	84	0	143
Acres Removed - <40% canopy closure (heavy thinning)	0	432	307	513
Acres Downgraded - >40% canopy – remains dispersal habitat (moderate thinning)	0	190	341	50

Effects of Alternative 1 (No Action)

Under this alternative, no changes to spotted owl breeding or dispersal habitat would occur. Forest stands in the area would continue to grow following natural successional pathways. Trees would thin out naturally over a span of several decades, and may reach low quality spotted owl foraging habitat suitability in approximately 50 or more years. Due to previous clearcuts and the resulting relatively tight spacing, trees would grow more slowly than if thinning were to occur. Self-thinning would take place over time mostly due to tree competition, some windthrow, and possibly rootrot over time. Habitat conditions for the spotted owl prey base would not be optimal due to a lack of snags. The lack of medium and large down wood would also not provide optimum prey base conditions. Down wood would be provided as tree mortality occurs, but slower than with active management under Alternatives 2-4 in which down wood and snag habitat would be created.

Cumulative Effects: Past logging on both federal and private land in the Quartz and Hardy Creek drainages has removed acres spotted owl habitat. Remaining suitable habitat in both drainages but particularly in the Quartz Creek drainage now highly fragmented, making these stands lower quality. Hundreds of acres of previously logged stands have regrown and are now providing low quality dispersal habitat conditions. Stands which have not been thinned are relatively densely stocked, making flight and dispersal for spotted owls difficult. Future logging on adjacent private lands to the north is expected and will not provide suitable spotted owl habitat due to short rotations. Additional thinning on federal lands is expected in the future. The Northwest Forest Plan designated the adjacent Fall Creek Late Successional Reserve to the west, which will continue to provide improved habitat conditions over time as stands of all age classes continue to develop.

Effects of Alternative 2

No occupied breeding habitat would be altered with this alternative. With this alternative, 622 acres of dispersal habitat would be thinned, resulting in a canopy which would be too open for suitable dispersal habitat. Heavy thinning would occur on 432 acres and moderate thinning on 190 acres. Moderately thinned stands would remain low quality dispersal habitat with residual canopy covers of 40-50%. The quality of habitat should improve with an increase in canopy cover over a relatively short time period.

The heavy thinning would result in canopy cover which would be too open for suitable dispersal habitat, and recovery would be expected to occur in approximately 10 to 15 years. On units with moderate thinning, canopy cover would be expected to recover in 7-8 years. In the long-term, this type of forest thinning would increase plant species diversity and potential use of these forest stands that are not currently considered to be suitable for nesting, roosting, and foraging. Heavily thinned stands would show slightly more vertical layering and slightly increased levels of understory vegetation compared to moderately thinned stands.

Northern flying squirrels, which are the main prey base of spotted owls in the western Cascades, use forest stands of various ages with high levels of snags and large down wood (Carey et al. 1999). Carey (2002) showed that flying squirrels strongly prefer stands with 10 percent or more ground cover of large logs in western Oregon.

Planned snag and log creation in Hartz units would improve future spotted owl habitat conditions. Four dimensional snag creation methods include a variety of treatment heights, diameters, both scattered and clumped distribution, and use of multiple snag creation methods. These thinned stands would reach low quality foraging habitat conditions in approximately 40 years.

Two additional units, or 84 acres, would have a regeneration harvest which would remove dispersal habitat. These areas are expected to regrow back into dispersal habitat in approximately 40 years. Effects are in compliance with Standards and Guidelines from the Willamette National Forest Plan and U.S. Fish and Wildlife Service guidance. All sites at risk from noise disturbance are protected with seasonal restrictions.

Effects of Alternative 3

No occupied breeding habitat would be altered with this alternative. With this alternative, 648 acres of dispersal habitat would be thinned, resulting in a canopy which would be too open for suitable dispersal habitat. Heavy thinning would occur on 307 acres and moderate thinning on 341 acres. Moderately thinned stands would remain low quality dispersal habitat with residual canopy covers of 40-50%. The quality of habitat should improve with an increase in canopy cover over a relatively short time period. The heavy thinnings would result in canopy cover which would be too open for suitable dispersal habitat, and recovery would be expected to occur in approximately 10 to 15 years. On units with moderate thinning, canopy cover would be expected to recover in 7-8 years. In the long-term, this type of forest thinning would increase plant species diversity and potential use of these forest stands that are not currently considered to be suitable for nesting, roosting, and foraging. Heavily thinned stands would show slightly more vertical layering and slightly increased levels of understory vegetation compared to moderately thinned stands.

Planned snag and log creation would also improve future spotted owl habitat conditions. Four dimensional snag creation methods include a variety of treatment heights, diameters, both scattered and clumped distribution, and use of multiple snag creation methods. These thinned stands would reach low quality foraging habitat conditions in approximately 40 years.

Effects are in compliance with Standards and Guidelines from the Willamette National Forest Plan and U.S. Fish and Wildlife Service guidance. All sites at risk from noise disturbance are protected with seasonal restrictions.

Effects of Alternative 4

No occupied breeding habitat would be altered with this alternative. With this alternative, 706 acres of dispersal habitat would be thinned, resulting in a canopy which would be too open for suitable dispersal habitat. This alternative heavily thins more acres than other alternatives, resulting in increased possible short-term negative effects to the northern spotted owl. However, in the long-term, heavy thinning on more acres may benefit future growth of spotted owl habitat because they would show more vertical layering and slightly increased levels of understory vegetation compared to moderately thinned stands. Heavy thinning would occur on 513 acres and moderate thinning on 50 acres. Moderately thinned stands would remain low quality dispersal habitat with residual canopy covers of 40-50%. The quality of dispersal habitat should improve with an increase in canopy cover over a relatively short time period. Canopy recovery in the heavily thinned stands would be expected to take approximately 10-15 years. On units with moderate thinning, canopy cover would be expected to recover in 7-8 years.

Planned snag and log creation would also improve future spotted owl habitat conditions. Four dimensional snag creation methods include a variety of treatment heights, diameters, both scattered and clumped distribution, and use of multiple snag creation methods. These thinned stands would reach low quality foraging habitat conditions in approximately 40 years.

Three additional units, or 143 acres, would have a regeneration harvest which would remove dispersal habitat. These areas are expected to regrow back into dispersal habitat in approximately 40 years. Effects are in compliance with Standards and Guidelines from the Willamette National Forest Plan and U.S. Fish and Wildlife Service guidance. All sites at risk from noise disturbance are protected with seasonal restrictions.

<u>Cumulative effects/Conflict determination/risk assessment</u>: Spotted owl dispersal habitat would be reduced in the short-term in the McKenzie River/Quartz Creek and Southfork McKenzie Watersheds if Alternatives 2-4 are implemented. However, in the long-term, units which are thinned heavily and moderately will provide improved spotted owl dispersal habitat and benefits to their prey base, up until the time when they may be thinned again in approximately 40 more years at 80 years of age. Thinning of dispersal habitat is judged to pose a relatively low risk to spotted owls, compared to thinning or removal of suitable habitat. The overall effects and risk of this project on individual owl pairs is judged to be low. After ten or more years, and especially after several decades, this project would show positive benefits to spotted owls.

Future forest management activities in the Hartz Project area may include thinning of additional 40-year old stands in the Fall Creek LSR to the west, which would have similar effects to spotted owls.

Spotted owl dispersal habitat is generally analyzed at the quarter township level. Adequate dispersal habitat is believed to be provided if at least 50% of capable forest habitat within a quarter township meets the minimum stand diameters of 11" dbh and canopy closure of 40%. The results of this 11-40 analysis are shown in the following table. Of the seven quarter townships which the Hartz Project area falls within, four are currently below the 50% level for dispersal habitat. This level of dispersal habitat is low because past clearcut units have not yet recovered. Many of these stands are expected to grow into dispersal habitat within the next 10 years.

Thinning of Hartz stands would further reduce dispersal habitat levels within two quarter townships for several years until canopy closure grows back in. This timeframe is estimated to be approximately 7-8 years for moderately thinned stands remaining at 40-50% canopy closure, and about 10 years for heavily thinned stands which would remain at 30-40% canopy closure.

Spotted Owl Dispersal Habitat/11-40 Analysis

Quarter Township (Hartz Timber Sale Units)	Total Capable Acres	Alternative 1 (No Action)		Alternative 2		Alternative 3		Alternative 4	
		Dispersal Acres Removed	Percent Meeting 11/40	Dispersal Acres Removed	Percent Meeting 11/40	Dispersal Acres Removed	Percent Meeting 11/40	Dispersal Acres Removed	Percent Meeting 11/40
T18S, R4E, NW (none)	6212	0	60	0	60	0	60	0	60
T18S, R4E, NE (1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 15)	6170	0	**41**	526	**32**	526	**32**	526	**32**
T18S, R4E, SE (none)	5734	0	**45**	0	**45**	0	**45**	0	**45**
T18S, R5E, NW (22, 23, 25)	6588	0	**39**	180	**36**	122	**37**	180	**36**
T18S, R5E, NE (none)	6177	0	79	0	79	0	79	0	79
T18S, R5E, SW (none)	6085	0	52	0	52	0	52	0	52
T18S, R5E, SE (none)	5721	0	**49**	0	**49**	0	**49**	0	**49**

Percentages shown in **bold** do not meet the desired 50% dispersal habitat level.

Recommendations: Implement seasonal restrictions as shown on page 1 of this document. These seasonal restrictions are a mandatory term and condition in the Biological Opinion.

Create the prescribed levels of snags and large down woody material to benefit spotted owl prey. Research indicates that in the Central Cascades of Oregon, northern flying squirrels dominate northern spotted owl diets (Forsman et al. 2004). Northern flying squirrels (*Glaucomys sabrinus*) are secondary cavity nesters, therefore, long-term management for snag habitat will benefit spotted owls indirectly. Providing habitat for primary cavity nesters will benefit flying squirrels (USDI Northern Spotted Owl Draft Recovery Plan 1992).

Communications with U.S. Fish and Wildlife Service: Formal consultation with the U.S. Fish & Wildlife Service for effects to the northern spotted owl was initiated in 2004 for FY2005/2006 Habitat Modification Projects in the Willamette Province. A Biological Opinion was received on April 4, 2005.

U.S. Fish & Wildlife Service Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The 2005/2006 Biological Opinion which applies to this timber sale provides the following terms and conditions (p.79):

1. Monitor and report on the implementation of projects and their adverse effects.

The 2005/2006 Biological Opinion which applies to this timber sale provides the following conservation recommendations (p. 80):

> Minimize the rate of harvest of suitable spotted owl habitat within the Matrix and critical habitat outside of LSRs which do not currently have sufficient owl habitat.
>
> Defer timber harvest within 0.7 miles of active spotted owl nest sites between March 1 and September 30 to allow adult owls and their young to successfully utilize this area for breeding, feeding, and sheltering prior to juvenile dispersal.
>
> Facilitate the development of late-successional habitat by maintaining maximum numbers of Class 1 and Class 2 logs, and sufficient numbers of standing snags in various size classes.

MAMMALS

Baird's Shrew (*Sorex bairdii permiliensis)*

The proposed Hartz Project is not expected to impact Baird's shrew or its' habitat.

Habitat: This species of shrew has been found in traps set in an open Douglas-fir forested area with numerous rotting logs (Verts and Carraway, 1998). More specific habitat requirements are lacking. They are active diurnally.

Pre-field review: Baird's Shrew is endemic to Oregon (Verts and Carraway, 1998). This species occurs in the Coast Range from Portland south to Lane County. It also occurs along the west slope of the Cascade Range from the Columbia River south to central Lane County.

Field reconnaissance: No locations of Baird's Shrew are known from the Hartz Project area. Habitat for Baird's Shrew is abundant.

Analysis of effects: No impact.

Cumulative effects: None

Conflict determination/risk assessment: No conflict

Recommendations: Leave large down woody material as prescribed. If it is not present after logging is completed, trees should be felled until the prescription has been met.

Communications with U.S. Fish and Wildlife Service: Not required

Pacific Shrew (*Sorex pacificus cascadensis*)

The proposed Hartz Project is not expected to impact the Pacific shrew or its' habitat.

Habitat: This species of shrew is often found in moist forested areas with fallen decaying logs and brushy vegetation (Verts and Carraway 1998)(Ingles 1965).

Pre-field review: This species of shrew is endemic to Oregon (Verts and Carraway 1998). It is distributed as two distinct populations: one in the Coast Range from Cascade Head, Tillamook Co., south to Coos Bay, and the other in the Cascade Range from northeastern Linn Co. to southern Jackson Co. Pacific shrews appear to be adapted for capturing, killing, and eviscerating hard-bodied insects (Verts and Carraway 1998). Internal organs of insects composed 28.6% by volume of the diet (Verts and Carraway 1998). Other prey items are unidentified insect larvae, slugs and snails, beetle larvae, and unidentified invertebrates. Numerous dead specimens of the insect *Omus audouini* (Coleoptera) were considered to have been cached by Pacific shrews.

Field reconnaissance: No locations of the Pacific Shrew are known from the Hartz Project area. Habitat for this shrew occurs in abundance. Analysis of effects: No impact.

Cumulative effects: None Conflict determination/risk assessment: No conflict

Recommendations: Leave large down woody material as prescribed. If it is not present after logging is completed, trees should be felled until the prescription has been met.

Communications with U.S. Fish and Wildlife Service: Not required

California wolverine (*Gulo gulo luteus*)

It is undetermined if any of the activities in Alternatives 2-4 of the Hartz Project would have adverse impacts on wolverine, since it is presently unknown if wolverines are using the area. Creation of snags and large down wood habitat elements may benefit wolverine and their prey. There would be no impacts with Alternative 1.

Habitat: The wolverine has been designated one of North America's rarest mammals and least known carnivores (Banci 1994). They have been described as solitary, secretive animals that are usually found in areas remote from humans and human developments (Banci 1994). The most important habitat element for wolverines seems to be the absence of human activity or development (Hash 1987), lack of road access or extensive habitat modification (Banci 1994). High elevation wilderness areas appear to be preferred in summer, which also acts to effectively separate wolverines and humans in many areas. In winter, wolverines may move to lower elevation "nonwilderness" areas which are snowbound with very limited human activity. A study in Montana found that wolverines appear to select true fir (*Abies*) cover types throughout the year, especially during summer. Although all exposures were used, easterly and southerly areas received the majority of consistent use. 70% of wolverine habitat use occurred in large expanses of scattered mature timber while the remaining were in ecotonal areas. These were small timber pockets, and rocky, broken areas of timbered benches. Wolverines made little use of young, thick timber and open clear-cuts (Hornocker and Hash 1981). However, heavy use was found in openings which support good winter populations of big game animals, the principle source of carrion which makes up much of the wolverine's diet (Marshall 1988). Another study found that wolverines commonly crossed areas with sparse overstory such as burned areas or meadows (Copeland 1996). In addition to carrion, wolverines also opportunistically feed on small prey, including marmots, snowshoe hares, various rodents, insects, insect larvae, eggs and berries (Marshall 1988).

Natal dens have been associated with snow-covered tree roots, log jams, or rocks and boulders (Hash 1987)(Copeland 1996). Habitats that provide the appropriate structures, such as large cavities, large down wood, and old beaver lodges, likely will provide suitable den site habitat (Banci 1994). It is believed that wolverines are extremely sensitive to human disturbance during the denning period.

Pre-field review: Other than trapping, wolverines were likely heavily impacted by the extensive wolf eradication programs early in the 20th century (Zielinski et al. 1996). In Oregon, the wolverine was long thought to have been extirpated (Bailey 1936), but in 1965 a large male was killed on Three-Fingered Jack in Linn Co. (Kebbe 1966). After this report, a series of wolverine sightings or their tracks in the 1960s and early 1970s were reported secondhand with an additional report from Broken Top Mountain in Deschutes Co. in 1969 (Oregon State Game Commission 1970). And even as recently as 1990, a wolverine was found as a roadkill on Interstate 84 near Starvation Creek State Park in the Columbia River Gorge (The Oregonian 1990). Historically, wolverines were occasionally taken by trappers in the Cascades. Because one of the individuals taken was a female (Oregon State Game Commission 1970), the possibility of a self-maintaining population of wolverines in Oregon cannot be discounted, but it seems more likely that those occasionally seen or killed in the state were dispersers from populations further north. At the present time, there is general agreement that wolverines do not occur in high population densities anywhere in the Cascades (Marshall 1988), but even under near-optimal habitat conditions, low densities of wolverine populations are characteristic of the species (Verts and Carraway 1998; Banci 1994). With low population densities, even minimal trapping may have impacted their population disproportionately.

Several wolverines have been sighted on the McKenzie River Ranger District. The nearest sighting was reported about ten miles southeast of the Hartz Project Area in 1991 at Frissel Crossing Campground. The Hartz Project Area is relatively secluded and does not receive a high amount of road use, except during the fall hunting season. It is suspected to have moderate suitability for wolverines.

Due to their extreme rarity in the Oregon Cascades, no wolverine studies have been conducted and little information about the distribution and habitat needs of wolverines in the Oregon Cascades is available. Recovery of wolverine in Oregon will likely be dependent on population augmentation (USDA Forest Service 1994).

Field reconnaissance: Winter track surveys in the snow appear to be the most efficient method for detection of wolverines and other furbearers. However, because of the wetness of the snow on the west side of the Cascade Mountains, the use of snowmobiles to survey large areas for wolverine tracks is difficult to impossible in most years until late winter/early spring when the snow hardens to support snowmobiles. Because wolverines are suspected to be so rare in the Oregon Cascades, it appears that any survey method would be extremely time-consuming and inefficient. Aerial wolverine surveys were conducted each spring between 1998-2001 by Region 6 of the Forest Service and the Oregon Department of Fish and Wildlife in the highest potential habitat, which includes some of the Willamette National Forest. One possible wolverine den was found, but a summer follow-up could not verify presence. Other possible wolverine tracks that were groundchecked were not positive.

The Quartz Creek elk emphasis area provides important elk and deer habitat, and thus would provide possible wolverine foraging habitat opportunities. However, this area has a fairly high road density and does not provide the preferred habitat seclusion. The remainder of the Hartz Project Area also provides elk and deer habitat, but it is considered to be of lower habitat quality.

Analysis of effects: The edge created between a clearcut and remaining timber is not typical of naturally created edges. Retention of green trees and creation of snags and logs after logging results in improved hiding cover habitat for wolverine prey such as rodents. The regeneration units (2, 4, and 25) in Alternatives 2 and 4 would leave 15% green tree retention. This may be too open for wolverines to travel through and would also provide a lower number of rodent prey species and individuals.

Since wolverines scavenge on big game carrion, measures which improve big game habitat characteristics, such as road closures, would also benefit wolverines. All new temporary roads which are constructed for this project will be closed after logging, but there will be a short-term impact to wolverines due to increased use. Road reconstruction may encourage more use by forest visitors and this effect will be relatively long-term and may impact wolverines. An improvement in elk and deer forage by opening the forest canopy, especially in the three regeneration units, may benefit wolverines slightly.

Cumulative effects: The regeneration units 2, 4, and 25 are planned for prescribed fire treatments in openings after logging. This may provide improved habitat conditions for small mammals after burning (Smith 2000), which could benefit wolverines indirectly.

Wolverines appear to be extremely wide-ranging, and no topographical barriers such as mountain ranges, rivers, reservoirs, highways, or valleys appear to limit their movements. For these reasons, Hornocker and Hash (1981) conclude that wolverine populations should be treated as regional rather than local.

Whether the habitat in the Hartz Project Area is essential for recovery of wolverine populations is unknown.

Conflict determination/risk assessment: Possible conflict with short-term increased roadbuilding; possible benefit with improved elk forage conditions. Low risk.

Recommendations: Monitor and provide down log habitat as described in the prescription. Implement road closures as planned, as soon as possible after logging is completed. The full range of information necessary for the management and conservation of the wolverine in Oregon is not available (Zielinski et. al. 1996).

Communications with U.S. Fish and Wildlife Service: Not required

North American Lynx (*Felis lynx canadensis*)

The proposed Hartz Project is not expected to affect the North American Lynx or its' habitat.

Habitat: The distribution and abundance of lynx appears to be tied to that of the snowshoe hare. Snowshoe hares are the primary food for the lynx in North America, but they also feed on mice, squirrels, grouse, and ptarmigan, especially during the summer months (Koehler and Aubrey 1994, Slugh and Mowat 1996, Mowat et al. 1996).

Stand age, tree species composition, stem density, and stem heights found in lynx foraging habitat has been described in many studies in North America and are summarized as follows (Koehler and Aubrey 1994): 1. Stand age: early successional forests, younger-aged stands of lodgepole pine (in Washington), 2. Tree species composition: densely stocked conifer stands with tree and shrub stems ranging less than 2.5 cm through 8.9 cm dbh, and with 6,000 through 31,667 stems/ha were found to be important for hares in Washington, Alaska, Nova Scotia, Maine, and Utah, and 3. Stem height greater than 1 meter was found important for winter hare and lynx foraging habitat in Minnesota and Nova Scotia. During snow-free periods, however, stem height is not a critical factor.

Lynx denning and travel habitat has also been described in many studies (Koehler and Aubrey 1994). Lynx females select dense, mature forest habitats that contain large woody material to provide security and thermal cover for kittens. In North Central Washington, lynx den in stands greater than or equal to 200 years old with Engelmann spruce-subalpine fir-lodgepole pine overstories with N-NE aspects. Other important features of denning sites are minimal human disturbance, proximity to foraging habitat (early successional forests), and stands that are at least 1 hectare in size. Travel corridors between den sites are important to permit females to move kittens to areas where prey are more abundant or to avoid disturbance. Clearcuts > 100 meters wide may create barriers to lynx movements. In general, suitable travel cover consists of coniferous or deciduous vegetation greater than 2 meters in height with a closed canopy that is adjacent to foraging habitat.

Lynx are not known to use habitat below 4000 feet elevation because bobcats effectively compete with them at lower elevations.

Pre-field review: In North American, the lynx occurs primarily in boreal forests of Alaska and Canada, but its' range extends south into the northern portions of western mountains where environmental conditions at high elevations support boreal forest habitats similar to those found in northern regions (Koehler and Aubrey 1994). Lynx have been found in Oregon, but historical records indicate that it has always been rare, and only a few specimens are known from high elevations of the Cascades and Wallowa Mountains. Oregon clearly represents the southern margin of suitable lynx habitat along the Pacific Coast. There is only one lynx sighting from the McKenzie River Ranger District which is located approximately three miles northwest of the Hartz Project area.

Field reconnaissance: Lynx habitat does not occur in the Hartz Project area.

Analysis of effects: The low and moderate elevations of the Hartz project area do not provide suitable lynx habitat, so this project will not affect lynx.

Cumulative effects: No effect

Conflict determination: No conflict

Recommendations: None.

Communications with U.S. Fish and Wildlife Service: Not required.

Pacific Fisher (*Martes pennanti*)

None of the alternatives of the proposed Hartz Project would impact the Pacific fisher or its' habitat.

Habitat: This species inhabits widespread, continuous-canopy forests at relatively low elevations, and is most abundant in mountainous regions. It is less abundant in foothill regions. Fishers occupy a wide variety of densely forested habitats at low to mid-elevations (100-1800m). Typical habitats include subalpine Pacific fir (26%), western hemlock (54%), and Sitka spruce (20%). Aubry and Houstan suggest that habitat for Fishers can be enhanced by minimizing forest fragmentation, both in remaining old growth and second growth; maintaining a high degree of forest floor structural diversity in intensively managed plantations; preserving large snags and live trees with dead tops; maintaining continuous canopies in riparian areas; and protecting swamps and other forest wetlands.

Pre-field review: Pacific Fishers inhabit the boreal forest region in the southern half of Canada with extensions into the United States in the Rocky Mountains, Cascade, Coast, and Sierra Nevada Ranges. Of the three specimens on deposit in systematic collections, two are from Lane County. One sighting of medium confidence has occurred on the McKenzie River Ranger District in the French Pete drainage. No Pacific Fishers have ever been documented in the Hartz Project area.

Field reconnaissance: Habitat for Pacific Fishers exists in the Hartz Project area to varying degrees. The highest quality habitat with the largest expanse of unfragmented and unroaded forest is in the uninventoried roadless area <1000 acres in the Quartz Creek drainage.

Analysis of effects: Logging the regeneration units in Alternatives 2 and 4 is unlikely to impact Pacific Fisher because green leave tree retention would provide future hiding cover. Moderate and heavy thinning proposed for most units is also unlikely to impact Pacific Fisher because the remaining canopy is expected to provide adequate cover. Down wood creation may benefit may impact this species by improving habitat for their prey base.

Cumulative effects: None

Conflict determination/risk assessment: It is unknown if there is a conflict to local fisher populations because so little is known about their occurrence in this area. Low risk.

Recommendations: Create down log habitat as described in the prescription. Implement road closures as planned, as soon as possible after logging is completed.

Communications with U.S. Fish and Wildlife Service: Not required

Pacific Fringe-tailed Bat (*Myotis thysanodes vespertinu*)

Caves and larger rock outcrops located in units of Alternatives 2-4 would have no-harvest buffers and additional buffer of higher canopy retention as described in the EA. Other smaller rock outcrops used by this bat species may however be impacted due to decreased canopy closure. There would be no impact under Alternative 1.

Habitat: This bat species is found in a wide variety of habitats throughout its' range, but it seems to prefer forested or riparian areas. These bats are thought to forage by picking up food items from shrubs or off the ground. They consume beetles, moths, harvestmen, crickets, craneflies, and spiders. Females form maternity colonies of up to several hundred individuals in caves, mines, and buildings (Csuti 1997). This species is migratory and there are only two winter records from Oregon. These bats are very sensitive to disturbance.

Pre-field review: Pacific Fringe-tailed Bats range from western North America, from south-central British Columbia south through the western U.S. to southern Mexico. Most Oregon records for this species are from the western Cascades. No records are known from the Trapper Project area.

Field reconnaissance: Rock outcrops which may provide suitable roosting habitat for Pacific Fringe-tailed Bats were found in units 11 and 25. Suitable foraging habitat for these bats is present throughout the entire area.

Analysis of effects: The non-harvest and higher canopy closure recommended around rock outcrops in units 11 and 25 is expected to adequately protect bat habitat. However, smaller rock outcrops in units which may be used by these bats may have a changed microclimate for several years, and thus individuals of this species may be impacted.

Cumulative effects: None

Conflict determination/risk assessment: No conflict

Recommendations: Units 11 and 25 should have non-harvest buffers around the rock outcrops as recommended in the EA for Special Habitat Area protection.

Communications with U.S. Fish and Wildlife Service: Not required

INVERTEBRATES

Mardon Skipper (*Batrachoseps wrighti*)

Habitat: This butterfly is found in prairie and meadow habitat in Oregon and Washington. The butterfly larvae feed on Idaho fescue. Adult butterflies nectar from flowers of a variety of species (Opler 1999).

Pre-field review: This species has not been found on the Willamette National Forest, however, protocol surveys have been very limited.

Field reconnaissance: No Mardon Skippers have been found in the Hartz Project area.

Analysis of effects: No meadow habitat is being impacted with the Hartz Project, and no impacts to this species are expected.

Cumulative effects: A proposed 17-acre burn on Indian Ridge within the Hartz Project area within the next five years may modify Mardon Skipper habitat.

Conflict determination/risk assessment: This project is not expected to impact Mardon Skipper or its' habitat.

Recommendations: None

Communications with U.S. Fish and Wildlife Service: Not required

Crater Lake Tightcoil (*Pristiloma arcticum crateris*)

Habitat: This snail has been found in perennially moist forest situations in mature conifer forests and among rushes, mosses and other surface vegetation or under rocks and woody material within 10 meters of open water in wetlands, springs, seeps and riparian areas (Gowan 1999).

Pre-field review: This species has been found on federal lands in Oregon, but has not been documented on the Willamette National Forest.

Field reconnaissance: No Crater Lake tightcoil snails have been found in the Hartz Project area. However, only limited surveys have been conducted.

Analysis of effects: Species management strategies include:

Maintaining shading to minimize temperature and humidity fluctuations on and within the ground

Maintain natural understory vegetation and a layer of uncompacted organic litter and material on the ground

Maintain existing logs and other woody material

Avoid burning within occupied habitat

Cumulative effects: It is expected that habitat connectivity will continue to allow viable local populations to exist.

Conflict determination/risk assessment: This project is not expected to impact local Crater Lake tightcoil populations.

Recommendations: Leave the prescribed levels of large down woody material. If it is not present after logging, trees should be felled to create the prescribed levels.

Communications with U.S. Fish and Wildlife Service: Not required

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ATTACHMENT 1: LEGEND FOR ANIMAL LIST

Occurrence on Willamette National Forest:

S = Suspected

D = Documented

Oregon State Status:

SE=State listed as Endangered

ST=State listed as Threatened

Sensitive=State listed as Sensitive

S1=Critically imperiled

Federal Status:

T = Threatened

E = Endangered

C=Candidate for listing as Threatened or Endangered

SC=Species of Concern

ATTACHMENT 2: REGIONAL FORESTER'S WILDLIFE SENSITIVE SPECIES LIST

FROM R-6 SENSITIVE ANIMAL LIST FOR THE WILLAMETTE NF (revised July 2004)

SPECIES	OCCURENCE ON WNF	OREGON STATE STATUS	FEDERAL STATUS
AMPHIBIANS AND REPTILES			
Oregon Slender Salamander *Batrachoseps wrighti*	D	Sensitive	None
Cascade Torrent Salamander *Rhyacotriton cascadae*	D	Sensitive	None
Foothill Yellow-legged Frog *Rana boylii*		Sensitive	SC
Oregon Spotted Frog *Rana pretiosa*	D	Sensitive	C
Northwestern Pond Turtle *Clemmys marmorata marmorata*	D	Sensitive	SC
BIRDS			
Northern bald eagle *Haliaetus leucocephalus*	D	ST	T
Northern spotted owl *Strix occidentalis caurina*	D	ST	T
American peregrine falcon *Falco peregrinus anatum*	D	SE	None, delisted in 2000
Least Bittern *Ixobrychus exilis*	D	Sensitive	SC
Bufflehead *Bucephala albeola*	D	Sensitive	None
Harlequin Duck *Histrionicus histrionicus*	D	Sensitive	SC

SPECIES	OCCURENCE ON WNF	OREGON STATE STATUS	FEDERAL STATUS
Yellow Rail *Coturnicops noveboracensis*	D	Sensitive	None
Black Swift *Cypseloides niger*	S	Sensitive	None
Tri-colored Blackbird *Agelaius tricolor*	S	Sensitive	None
MAMMALS			
North American lynx *Felis lynx canadensis*	S	None	T
Baird's Shrew *Sorex bairdii permiliensis*	S	None	None
Pacific Shrew *Sorex pacificus cascadensis*	S	None	None
California Wolverine *Gulo gulo luteus*	D	ST	SC
Pacific Fisher *Martes pennanti*	D	Sensitive	SC
Pacific Fringe-tailed Bat *Myotis thysanodes vespertinu*	D	Sensitive	SC
Townsend's Big-eared Bat *Corynorhinus townsendii*	D	Sensitive	SC
INVERTEBRATES			
Mardon Skipper *Polites mardon*	S	None	C
Crater Lake Tightcoil *Pristiloma arcticum crateris*	S	S1	None

Appendix D –Biological Evaluation, Botany

Appendix D

United States Department of Agriculture | Forest Service | Willamette National Forest
Sweet Home Ranger District | 3225 Highway 20
Sweet Home, OR 97386
Tel (541) 367-5168
FAX (541) 367-5506_

File Code: 2670 **Date:** February 3, 2005
Route To:

Subject: Botanical Biological Evaluation for Hartz Young Stand Management Project

To: Rita Mustatia/Project Files

Introduction

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

A. Species listed or proposed to be listed as endangered (E) or threatened (T) by the U.S. Fish and Wildlife Service (FWS).

B. Species listed as sensitive (S) by the USDA Forest Service, Region 6. There are 70 species listed on the Regional Forester's Sensitive Botanical Species List that are documented or suspected to occur on the Willamette National Forest (Attachment 1).

The Record of Decision (ROD) to remove or modify the Survey and Manage mitigation measure standards and guidelines (USDI and USDA, 2004) directed review and inclusion of former Survey and Manage species in the Special Status Species Program. The ROD further directs the Forest to conduct pre-project clearances for these species prior to habitat-disturbing activities. Assumptions were made that "if pre-project surveys were not practical under Survey and Manage Standards and Guidelines (most Category B and D species), then field surveys are not likely to occur for Special Status Species either" (p. 6). Therefore, the ROD directs us that habitat evaluation for presence of suitable or potential habitat and habitat examinations may suffice for pre-project clearances for species where single year surveys are impractical (for the Willamette this means fungi).

To comply with the 2004 ROD, a new Regional Forester's Sensitive Plant list was issued in August 2004. This list includes both vascular plant species from the 1999 Regional Forester's Sensitive Plant list and non-vascular former Survey and Manage species that meet the criteria for sensitive species. The latter list includes fungi, bryophytes, and lichens. These species are split into those that are surveyable in a single field season (Table 1a) and those deemed non-surveyable (Table 1b).

Project Location and Description

This project proposes the harvest of approximately 706 acres, reforestation of 143 acres, building approximately 2050 feet of temporary road, and the closure of approximately 7.5 miles of road in the Quartz Creek and Hardy Creek watersheds. The planning area consists of 19,031 acres. Land allocations are: 5a – Special Interest Areas, 6c – Wild and Scenic River – S Fork

McKenzie, 9c – Wildlife Habitat-Marten, 9d – Wildlife Habitat-Special Areas, 11a - Scenic-Modification Middleground, 11c – Scenic-Partial Retention Middleground, 14a – General Forest, 16b – Late Successional Reserves, and 16b – 100-acre Late Successional Reserves. Units proposed for treatment are located in T.7S, R.4E, Section 31; T.17S, R.5E, Section 31; T.18S. R.4E, Sections 1-6, 8-15, 22-24, 26, and 27; T.18S, R.5E, Sections 3-11, 14-23, and 16-30; Willamette Meridian; Lane County, Oregon.

The no-action and three action alternatives have been identified. Alternative 1 would result in no action, Alternative 2 will result in the harvest of approximately 706 acres in 14 units. Alternative 3 will result in the harvest of approximately 648 acres in 13 units. Alternative 4 will result in the harvest of approximately 706 acres in 14 units.

Several special habitats, potential habitat for sensitive plant and animal species, occur within the project area. These special habitats include springs in Units 1 and 22; ponds in Units 8, 9, and 22; rock outcrops in Units 11 and 25; moist rock garden in Unit 12; wetlands in Units 8, 22, and 23; and talus slope in Unit 23.

Biological Evaluation Process

Under the suggested procedure for conducting a biological evaluation as describe in a memo issued August 17, 1995 by the Regional Foresters of Regions 1, 4, and 6, the Biological Evaluation is a seven step process to evaluate possible effects to Proposed, Endangered, Threatened, and Sensitive (PETS) species. The seven steps are as follows:

1. Review of existing documented information.
2. Field reconnaissance of project area.
3. Determination of effects of proposed actions on PETS species.
4. Determination of irreversible or irretrievable commitment of resources (required for listed and proposed species only).
5. Determination of conclusions on effects.
6. Recommendations for removing, avoiding, or compensating adverse effects.
7. Documentation of consultation with other agencies, references, and contributors.

Evaluation of effects for each species may be complete at the end of step #1 or may extend through step #7, depending on project details.

Evaluation and Survey of the Planning Area

A prefield review was performed for the Hartz Young Stand Management Project area in the summer of 2004 in order to determine the presence of known sites or habitat for PETS species. Using the 2004 Willamette National Forest list of potential PETS species (compiled from current USFWS listings, Oregon Natural Heritage Program listings, Oregon Department of Agriculture listings, and the Regional Forester's sensitive species list), maps of known sensitive plant populations were checked for previously reported sites and aerial photos and topographical maps were scrutinized for potential habitat. The ISMS database was queried to determine if any sensitive species previously categorized as Survey and Manage occur in the project area.
In areas where pre-field review identified potential habitat, field reconnaissance was done in accordance with established protocols and appropriate level of detail (see attachment 2). Surveys

were conducted by Cryptogam Research Associates and Noel Bacheller during the summer of 2004. An intuitive controlled survey of all units was conducted for vascular plants, lichens, and bryophytes (Table 1). Two extant population of *Ophioglossum pusillium*, adders tongue, occur within the project area but are located one half mile from proposed units and would not be affected by project activities.

Surveys were not conducted for fungi because single pre-disturbance surveys for these species have been deemend impractical (USDA, 1998; USDA, 2000; USDA, 2004). All fungi except *Bridgeoporus nobilissimus*, which is a perennial conk, were formerly Category B Survey and Manage Species (rare but pre-disturbance surveys impractical). According to the 2004 ROD To Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines, "if pre-disturbance surveys are not practical under the Survey and Manage Standards and Guidelines…then Field surveys are not likely to occur for special status (sensitive) species either.'" (Pg. 6).

In general, the fungi species on the Willamette National Forest sensitive species list that have come from survey and manage are limited in distribution and their habitats are poorly understood (ie there is very general habitat characteristics listed in the literature). Therefore, I have choosen to list the majority of fungi as having potential habitat within the project area.

Tables 1a and 1b displays the results of pre-field review, the habitat surveyed (if applicable), and the results of the surveys.

Table 1a: Summary of Evaluation Process for PETS Plant Species in Hartz Young Stand Management Project

Species	Prefield Review	Field Recon.	Species Presence
Agoseris elata	habitat not present		
Arabis hastatula	habitat present	Rock outcrops	Not found
Arnica viscosa	habitat not present		
Asplenium septentrionale	habitat present	Cliffs and talus slopes	Not found
Aster gormanii	habitat present	Rock outcrops	Not found
Botrychium minganense	habitat present	Cedar forested wetlands	Not found
Botrychium montanum	habitat present	Cedar forested wetlands	Not found
Botrychium pumicola	habitat not present		
Bridgeoporus nobilissimus	habitat present	Nobel fir stumps	Not found
Calamagrostis breweri	habitat not present		
Carex livida	habitat present	swamps	Not found
Carex scirpoidea var. *stenochlaena*	habitat present	Wet rock gardens	Not found
Species	**Prefield Review**	**Field Recon.**	**Species Presence**
Castilleja rupicola	habitat present	Rock outcrops	Yes

Chaenotheca subroscida	habitat present	Old conifer boles	Not found
Cimicifuga elata	habitat present	Moist woods	Not found
Coptis trifolia	habitat present	Moist woods	Not found
Corydalis aqua-gelidae	habitat present	riparian	Not found
Dermatocarpon luridum	habitat present	riparian	Not found
Eucephalis(Aster) vialis	habitat present	Dry rock gardens	Not found
Frasera umpquaensis	habitat not present		
Gentiana newberryi	habitat not present		
Hypogymnia duplicata	habitat present	Moist woods	Not found
Iliamna latibracteata	habitat present	Moist forest/ riaprian	Not found
Leptogium burnetiae var. hirsutum	habitat present	forest	Not found
Leptogium cyanescens	habitat present	Forest/big leaf maple	Yes
Lewisia columbiana var. *columbiana*	habitat present	Dry rock garden	Yes
Lobaria linita	habitat present	Moist woods	Not found
Lupinus sulphureus var. kincaidii	habitat not present		
Lycopodiella inundata	habitat not present		
Lycopodium complanatum	habitat present	Moist woods	Not found
Montia howellii	habitat not present		
Nephroma occultum	habitat present	moist woods	Not found
Ophioglossum pusillum	habitat present	Pond edges/ boggymeadow	Not found
Pannaria rubiginosa	habitat present	forest	Not found
Pellaea andromedaefolia	habitat present	Rock outcrops	Not found
Peltigera neckeri	habitat present	forest	Not found
Peltigera pacifica	habitat present	forest	Yes
Pilophorus nigricaulis	habitat present	Moist rock gardens	Not found
Polystichum californicum	habitat present	cliffs	Not found
Potentilla villosa	habitat present	Talus slopes	Not found
Pseudocyphellaria rainierensis	habitat present	Moist forest	Yes
Ramalina pollinaria	habitat present	swamps	Not found
Rhizomnium nudum	habitat present	Moist woods	Not found
Romanzoffia thompsonii	habitat present	Moist rock gardens	Not found
Species	**Prefield Review**	**Field Recon.**	**Species Presence**

Scheuchzeria palustris var. *americana*	habitat not present		
Schistostega pennata	habitat present	Moist woods/ tipup mounds	Not found
Scirpus subterminalis	habitat present	ponds	Not found
Sisyrinchium sarmentosum	habitat present	Mesic meadows	Not found
Tetraphis geniculata	habitat present	Moist woods	Not found
Tholurna disimilis	habitat not present		
Usnea longissima	habitat present	riparian	Not found
Utricularia minor	habitat present	ponds	Not found
Wolffia borealis	habitat present	ponds	Not found
Wolffia columbiana	habitat present	ponds	Not found

Table 1b: Summary of evaluation process for PETS Fungi Species in Hartz Young Stand Management Project for Species deemed Unsurveyable

Group	Species	Prefield Review/Rationale
Mycorrhizal Fungi	*Boletus pulcherrimus*	Habitat present
	Cortinarius barlowensis	Habitat present
	Gomphus kaufmanii	Habitat present
	Leucogaster citrinus	Habitat present
	Phaeocollybia attenuata	Habitat present
	Phaeocollybia dissiliens	Habitat present
	Phaeocollybia pseudofestiva	Habitat present
	Paheocolybia sipei	Habitat present
	Ramaria amyloidea	Habitat present
	Ramaria aurantiisiccesens	Habitat present
	Ramaria gelatiniaurantia	Habitat present
	Ramaria largentii	Habitat present
Saprophytic on Litter Fungi	*Cudonia monticola*	Habitat present
	Mycena monticola	Habitat present
	Sowerbyella rhenana	No habitat: Older Conifer Forests
Saprophytic on Wood	*Gyromitra californica*	Habitat present
Parasitic Fungi	*Cordyceps capitata*	Habitat present

The sensitive vascular plant *Lewisia columbiana* var. *columbiana* was located in a moist rock garden in the northern portion of Unit 12. *Castilleja rupicola,* a sensitive vascular plant, was located in the southern portion of Unit 25 on rock outcrops, though, much of this population is located outside the unit. The sensitive lichen *Peltigera pacifica* occurs along the southeast boundary of Unit 1. *Pseudocyphellaria rainierensis*, another sensitive lichen occurs in multiple locations along the eastern and southern boundaries of Unit 12.

Potential Effects on PETS Species
Potential effects are documented in this Biological Evaluation in accordance with the formats put forth for listed species in the 1986 Endangered Species Act regulations (50 CFR Part 402) and the March 1998 USFWS/NMFS Endangered Species Consultation Handbook; and for sensitive species, in the Forest Service Manual section 2670 and in the May 15 and June 11, 1992 Associated Chief/RF 2670 letters on this topic. The suggestion to use this format was also included in the memo issued August 17, 1995 by the Regional Foresters of Regions 1, 4, and 6. Attachment 2 gives details on the effects categories described in this memo. Table 2 shows conclusions for effects of proposed actions on sensitive species with respect to each alternative in the Environmental Assessment. More information on potential project effects on PETS species is found in the Environment Assessment for the project. Some effects information is also listed in the "Discussion of PETS Species" section below.

The fungi impacts are described in terms of fungus functional group (mycorrhizal, saprophytic on litter, saprophytic on wood, and parasitic). Since the parasitic *Cordyceps* is dependent on a mycorrhizal fungus for its survival, effects for parasitic fungi will be lumped with mycorrhizal.

Direct and Indirect Effects
Alternative 1
This alternative would have no direct or indirect impact on sensitive plants, lichens, bryophytes, or fungi. There would be no ground disturbance or temporary increase in fuels. The project area fuel model predicts low intensity burns that travel fast through the canopy due to the closed canopy of these stands. Because there is little ground vegetation present, severe heat damage to the soils during a wildfire is not predicted.

Alternative 2, 3, and 4
These alternatives would have no direct or indirect impact on sensitive plants, lichens, or bryophytes. All known occurrences will be protected with a no disturbance buffer. See Table 3. This buffer applies to all harvest activities, ground disturbing activities, and broadcast burning. Special habitats will also be buffered from harvest and ground disturbing activities. See Table 4. Trees harvested near the protection buffers will be felled away from the buffer.

An 85 foot no disturbance buffer will be placed around *Lewisia columbiana* var. *columbiana* and *Castilleja rupicola*. These species grow on open rocky areas, this buffer will protect the plants and their habitat during harvest activities. The sensitive lichens *Peltigera pacifica* and *Pseudocyphellaria rainierensis* will receive a 120 foot no disturbance buffer. The buffer will maintain most of the microclimate characteristics of the sites (Wessell, 2004 unpublished Powerpoint).

Fuel loads would be temporarily increased around the sensitive plant population in Unit 12 because no fuel treatments are proposed for that location. This may lead to a temporary increase in the risk of a wildfire causing damage to some of the plants in the population. After approximately three years, biological processes would break down the fuel, greatly reducing the risk of fire.

Alternatives 2 and 4 would include ground based harvesting on 144 acres and Alternative 3 would have 28 acres of ground based harvesting. All three alternatives propose 2050 feet of temporary road construction. The ground disturbance and tree harvest associated with these alternatives may impact, but will not cause a trend toward listing (MIIH) for all fungus groups. The impacts may include short term adverse effects on mycorrhizal or saprophytic fungi. The direct effects would be disruption of the mycelial network or substrate (wood, liter) where machinery used to harvest and build the road would churn up the soil. There may also be some localized direct effects to mycelia or wood/litter substrate from pile burning or broadcast burning.

The proposed tree harvest may indirectly affect mycorrhizal fungi by removing trees that may be their host. However, many potential host trees would remain in thinned units, as these units would retain approximately 45-80 trees per acre and silvicultural prescriptions would maintain tree diversity. Alternative 2 proposes 84 acres of regeneration harvest, Alternative 4 proposes 143 acres, and Alternative 3 proposes none. Units that would be regeneration harvested would retain 15% of the acres in Green Tree Retention areas that would contain potential habitat for fungi. The remaining acres would be replanted with Douglas fir, western hemlock, sugar pine, and western white pine, that will provide potential habitat for fungi in the future.

Late Successional Reserves and a Botanical Special Interest Area are located within the project area and account for 25% (5,842 acres) of the Hartz Young Stand Management Project area. These areas are potential habitat for fungi species and are not proposed for any treatments in this project.

Cumulative Effects
Common to All Alternatives
There would be no direct or indirect effects to known populations of sensitive botanical species or their associated special habitats with any of the alternatives proposed. Therefore, there would be no cumulative effects of sensitive botanical species or their associated special habitats. There are no reasonably foreseeable activities in the project area that would effect sensitive fungi species, therefore there would be no cumulative effects for sensitive fungi species.

Determinations
It is my determination that selection of any of the alternatives will have no impact on sensitive lichens, bryophytes, or vascular plants and their associated special habitats because these species and there associated special habitats will have a no-disturbance buffer to protect them from the proposed project activities. It is also my determination that selection of any of the action alternatives may impact but will not lead to a trend toward listing for any of the sensitive fungi species with the potential to occur in the project area.

In the event that a sensitive plant population is discovered after the timber sale is sold, Contract Clauses C9.52 and C6.25 will be enforced and project modifications may result.

Prepared by:__/s/Susan Fritts ___________________ Date:__3 February 2005___
Susan Fritts, District Botanist
McKenzie River Ranger District

Table 2: Summary of Conclusion of Effects

Species	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Arabis hastatula	NI	NI	NI	NI
Asplenium septentrionale	NI	NI	NI	NI
Aster gormanii	NI	NI	NI	NI
Boletus pulcherrimus	NI	MIIH	MIIH	MIIH
Botrychium minganense	NI	NI	NI	NI
Botrychium montanum	NI	NI	NI	NI
Bridgeoporus nobilissimus	NI	NI	NI	NI
Carex livida	NI	NI	NI	NI
Carex scirpoidea var. *stenochlaena*	NI	NI	NI	NI
Castilleja rupicola	NI	NI	NI	NI
Chaenotheca subroscida	NI	NI	NI	NI
Cimicifuga elata	NI	NI	NI	NI
Coptis trifolia	NI	NI	NI	NI
Cordyceps capitata	NI	MIIH	MIIH	MIIH
Cortinarius barlowensis	NI	MIIH	MIIH	MIIH
Corydalis aqua-gelidae	NI	NI	NI	NI
Cudonia monticola	NI	MIIH	MIIH	MIIH
Dermatocarpon luridum	NI	NI	NI	NI
Eucephalis(Aster) vialis	NI	NI	NI	NI
Gomphus kaufmanii	NI	MIIH	MIIH	MIIH
Gyromitra californica	NI	MIIH	MIIH	MIIH
Hypogymnia duplicata	NI	NI	NI	NI
Iliamna latibracteata	NI	NI	NI	NI
Leptogium burnetiae var. hirsutum	NI	NI	NI	NI
Leptogium cyanescens	NI	NI	NI	NI
Leucogaster citrinus	NI	MIIH	MIIH	MIIH
Lewisia columbiana var. *columbiana*	NI	NI	NI	NI
Lobaria linita	NI	NI	NI	NI
Lycopodium complanatum	NI	NI	NI	NI
Mycena monticola	NI	NI	NI	NI
Nephroma occultum	NI	NI	NI	NI
Ophioglossum pusillum	NI	NI	NI	NI
Pannaria rubiginosa	NI	NI	NI	NI
Pellaea andromedaefolia	NI	NI	NI	NI
Peltigera neckeri	NI	NI	NI	NI
Peltigera pacifica	NI	NI	NI	NI
Phaecollybia attenuata	NI	MIIH	MIIH	MIIH
Phaeocollybia dissiliens	NI	MIIH	MIIH	MIIH

Phaeocollybia pseudofestiva	NI	MIIH	MIIH	MIIH
Phaeocollybia sipei	NI	MIIH	MIIH	MIIH
Pilophorus nigricaulis	NI	NI	NI	NI
Polystichum californicum	NI	NI	NI	NI
Potentilla villosa	NI	NI	NI	NI
Pseudocyphellaria rainierensis	NI	NI	NI	NI
Ramalina pollinaria	NI	NI	NI	NI
Ramaria amyloidea	NI	MIIH	MIIH	MIIH
Ramaria aurantiisiccescens	NI	MIIH	MIIH	MIIH
Ramaria largentii	NI	MIIH	MIIH	MIIH
Rhizomnium nudum	NI	NI	NI	NI
Romanzoffia thompsonii	NI	NI	NI	NI
Schistostega pennata	NI	NI	NI	NI
Scirpus subterminalis	NI	NI	NI	NI
Sisyrinchium sarmentosum	NI	NI	NI	NI
Tetraphis geniculata	NI	NI	NI	NI
Usnea longissima	NI	NI	NI	NI
Utricularia minor	NI	NI	NI	NI
Wolffia borealis	NI	NI	NI	NI
Wolffia columbiana	NI	NI	NI	NI

Key to Abbreviations in Table 2 (See attachment 4).
NI = No Impact

MIIH = May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Loss of Viability for the Population or Species

WOFV* = Will Impact Individuals or Habitat with a Consequence That the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability for the Population or Species

BI = Beneficial Impact

* Considered a trigger for a significant action in NEPA

Table 3: Sensitive Botanical Species and Prescribed Protection Buffers

Unit	Species	Mitigation
1	*Peltigera pacifica*	120 foot no disturbance buffer
12	*Lewisia columbiana var. columbiana*	85 foot no disturbance buffer
12	*Pseudocyphellaria rainierensis*	120 foot no disturbance buffer, stop at road
25	*Castilleja rupicola*	85 foot no disturbance buffer

Table 4: Special Habitats and Prescribed Protection Buffers

Unit	Habitat	New Mitigation
1	Seep/Spring	30' NC buffer
8	Pond, seasonal	30' NC buffer and retain a minimum 50% canopy closure for the remainder of the 150' riparian reserve
8	Pond	30' NC buffer and retain a minimum 50% canopy closure for the remainder of the 150' riparian reserve
8	Shrub wetland	30' NC buffer and retain a minimum 50% canopy closure for the remainder of the 150' riparian reserve
9	Pond, seasonal	30' NC buffer and retain a minimum 50% canopy closure for the remainder of the 150' riparian reserve
11	Rock outcrop	50' NC buffer and retain a minimum 50% canopy closure of 100' to the north and east, and for 200' to the west and south
12	Cliff/moist rock garden	50' NC buffer and retain a minimum
22	Seep/spring	30' NC buffer
22	Willow wetland	30' NC buffer and retain a minimum 50% canopy closure for the remainder of the 150' riparian reserve
23	Cedar swamp/ wetland	30' NC buffer and retain a minimum 50% canopy closure for the remainder of the 150' riparian reserve
23	Talus	No equipment allowed on talus
25	Rock outcrop/ cliffs	75' NC buffer and retain a minimum 40% canopy closure for an additional 200 feet.

Discussion of PETS Species
This section of the Biological Evaluation addresses only those botanical species for which suitable habitat is present or for which sites were found, as presented in Table 1. Surveys were conducted using the intuitive-controlled method. Suitable habitat for 58 sensitive botanical species occurs in the Hartz Young Stand Management Project area. Four sensitive botanical populations were located during field reconnaissance.

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

Cliff paintbrush (*Castilleja rupicola*)
Status: Oregon Heritage- List 2; Federal Species of Concern;
R-6 Sensitive

A. Range and Habitat
Cliff paintbrush grows on perpendicular cliffs and rocky slopes at 4000-7000 feet elevation along the range of the Cascade Mountains from central Oregon to southern British Columbia It flowers from June to August.

B. Pre-field Review
Suitable habitat does exist within the Hartz planning area.

C. Field Reconnaissance
A level B survey was completed. Surveys were conducted in the summer of 2001.

D. Analysis of Effects
Evidence of this species was found in Unit 25. The population is mostly located outside the unit. Portions that are within the unit will receive an 85 foot no disturbance buffer to protect the plants and their habitat from project activities. Therefore no effects are anticipated.

Columbia Lewisia (*Lewisia columbiana* var. *columbiana*)
Status: Oregon Heritage- List 2; R-6 Sensitive

A. Range and Habitat
Columbia lewisia is found mostly in the Cascade Range of Oregon and Washington, and in the mountains of Idaho. It grows on exposed gravelly and rocky slopes or rock crevices, and blooms from May to August. Two populations are known from the Middle Fork Ranger District on the Willamette National Forest.

B. Pre-field Review
Suitable habitat does exist within the Hartz planning area.

C. Field Reconnaissance
A level B survey was completed. Surveys were conducted in the summer of 2004.

D. Analysis of Effects
Evidence of this species was found in the northen portion of Unit 12. This site will receive an 85 foot no disturbance buffer to protect the plants and their habitat from project activities. No long-term effects are anticipated. There may be a short-term impact on the population because fuels will not be treated in this area of the unit. The build up of fuels increases the possbility of a wildfire spreading through the populations and damaging plants. This is only a short term impact because within in three years biological processes will have reduced the fuels to a non-hazardous level.

Adder's Tongue (*Ophioglossum pusillum*)
Status: Oregon Heritage-List 2; R-6 Sensitive

A. Range and Habitat
Adder's tongue is a plant with circumboreal distribution; it is found on the Siuslaw NF and McKenzie. Middle Fork and Sweet Home RDs of the Willamette. It grows in wet meadows and along pond edges, often close to and covered by the canopy or a shrub layer, from the coast to middle elevations. The adder's tongue is recognizable from June through September.

B. Pre-field Review
Suitable habitat does exist within the Hartz planning area.

C. Field Reconnaissance
A level B survey was completed. Surveys were conducted in the summer of 2004.

D. Analysis of Effects
Evidence of this species was found in the project area, but not within the proposed units. Project activities will not affect the plants or there habitat, therefore no effects are anticipated.

Peltigera pacifica
Status: Oregon Heritage-No status; R-6 Sensitive

A. Range and Habitat
This foliose lichen species is found from coastal Alaska to Oregon, mainly in the western Cascades. On the Willamette, it has been documented on Detroit, McKenzie River and Sweet Home RDs. Found on soil, moss, rocks, logs, tree bases. Found in low elevation moist forests. This species is recognizable throughout the growing season.

B. Pre-field Review
Suitable habitat does exist within the Hartz planning area.

C. Field Reconnaissance
A level B survey was completed. Surveys were conducted in the summer of 2004.

D. Analysis of Effects
Evidence of this species was found in Unit 1. This site will receive a 120 foot no distrubance buffer to maintain microclimate characteristics and protect the habitat and lichen from project activities. Therefore no effects are anticipated.

Pseudocyphellaria rainierensis
Status: Oregon Heritage- List 4; R-6 Sensitive

A. Range and Habitat
This foliose lichen is found from southern British Columbia to Oregon, in the western Cascades. On the Willamette NF it is documented on all Ranger Districts on the Forest but most prominent north of highway 126. The lichen grows on the bark and wood of conifers, often overgrowing moss mats. It is found in moist old growth forests and riparian areas at low to mid elevations. Forests are usually dominated by Douglas fir and western hemlock in the lower to mid-canopy layer. This species is recognizable throughout the growing season.

B. Pre-field Review
Suitable habitat does exist within the Hartz planning area.

C. Field Reconnaissance
A level B survey was completed. Surveys were conducted in the summer of 2004.

D. Analysis of Effects
Evidence of this species was found in Unit 12 along the Southern and Eastern edges of the unit. Locations of this lichen will receive a 120 foot no disturbance buffer. If this buffer intersects a road the buffer will end at the road. The buffer will maintain the microclimate characterisitcs and protect the habitat and lichen from proejct activities. Therefore no effects are anticipated.

ATTACHMENT 1: **Regional Forester's Sensitive Botanical Species List for the Willamette National Forest (Revised 2004).** Species of federal, state and local importance are included on the R-6 list.

Species	**Occurrence on WNF**	**ONHP Status**	**State Status**	**Federal Status**	**Habitat Types**
Agoseris elata	S	2			MM,DM
Arabis hastatula	D	1		SofC	RO
Arnica viscosa	S	2			RS
Asplenium septentrionale	S	2			RO
Aster gormanii	D	1			RS
Boletus pulcherrimus	D	1			CF
Botrychium minganense	D	2			RZ,CF
Botrychium montanum	D	2			RZ,CF
Botrychium pumicola	S	1	LT		HV
Bridgeoporus nobilissimus	D	1			CF
Calamagrostis breweri	D	2			MM,RZ
Carex livida	S	2			WM
Carex scirpoidea var. stenochlaena	D	2			RO
Castilleja rupicola	D	2			RO
Chaenotheca subroscida	D	3			CF
Cimicifuga elata	D	1	C		CF
Coptis trifolia	S	2			WM,CF
Cordyceps capitata	D	unlisted			CF
Cortinarius barlowensis	D	2			CF
Corydalis aqua-gelidae	D	1	C		RZ,CF
Cudonia monticola	D	not listed			CF
Dermatocarpon luridum	S	3			RZ on rock
Eucephalis (Aster) vialis	S	1	LT	SofC	CF
Frasera umpquaensis	D	1	C		MM
Gentiana newberryi	D	2			MM
Gomphus kaufmanii	D	3			CF
Gyromitra californica	D	2			CF
Hypogymnia duplicata	S	3			CF
Iliamna latibracteata	S	2			CF,RZ
Leptogium burnetiae var. hirsutum	S	3			CF
Leptogium cyanescens	D	3			CF
Leucogaster citrinus	D	3			CF
Lewisia columbiana var. *columbiana*	D	2			RS
Lobaria linita	D	2			RO
Lupinus sulphureus var. kincaidii	S	1	LT	LT	MM, DM
Lycopodiella inundata	D	2			WM
Lycopodium complanatum	D	2			CF

Species	Occurrence on WNF	ONHP Status	State Status	Federal Status	Habitat Types
Montia howellii	D	4	C		RZ
Mycena monticola	D	not listed			CF
Nephroma occultum	D	4			CF
Ophioglossum pusillum	D	2			WM
Pannaria rubiginosa	D	2			CF
Pellaea andromedaefolia	S	2			RO
Peltigera neckeri	D	not listed			CF
Peltigers pacifica	D	not listed			CF
Phaeocollybia attenuata	D	4			CF
P. dissiliens	D	3			CF
P. pseudofestiva	D	3			CF
P. sipei	D	3			CF
Pilophorus nigricaulis	D	2			RO
Polystichum californicum	D	2			RO
Potentilla villosa	D	2			RS, RO
Pseudocyphellaria rainierensis	D	4			CF,RZ
Ramalina pollinaria	D	2			CF, RZ
Ramaria amyloidea	D	2			CF
R. aurantiisiccescens	D	4			CF
R. largentii	D	3			CF
Rhizomnium nudum	D	2			CF
Romanzoffia thompsonii	D	1			RS
Scheuchzeria palustris var. americana	D	2			WM
Schistostega pennata	D	2			CF
Scirpus subterminalis	D	1			SW
Sisyrinchium sarmentosum	S	1	C	SofC	MM,DM
Sowerbyella rhenana	D	3			CF
Tetraphis geniculata	S	2			CF
Tholurna disimilis	D	2			CF
Usnea longissima	D	3			CF,RZ
Utricularia minor	D	2			SW
Wolffia borealis	S	2			SW
Wolffia columbiana	S	2			SW

Occurrence on Willamette National Forest:
- S = Suspected
- D = Documented

Oregon Natural Heritage Program (ORNHP):
- 1 = Taxa threatened or endangered throughout range.
- 2 = Taxa threatened or endangered in Oregon but more common or stable elsewhere.
- 3 = Species for which more information is needed before status can be determined, but which may be threatened or endangered (Review).
- 4 = Species of concern not currently threatened or endangered (Watch).

Oregon State Status:
- LT = Threatened
- LE = Endangered
- C = Candidate

Federal Status: These plant species were originally published as CANDIDATE THREATENED (CT) in the Smithsonian Report, **Federal Register**, July 1, 1975, or as PROPOSED ENDANGERED (PE) in a later report, **Federal Register**, June 16, 1976. The latest **Federal Register** consulted was dated September 30, 1993. Updated listings appear periodically in the Notice of Review (USFWS); the status of several species is catagorized as follows:
- LE = Listed as an Endangered Species
- LT = Listed as a Threatened Species
- PE = Proposed as an Endangered Species
- PT = Proposed as a Threatened Species
- C = Candidate for Listing as Threatened or Endangered
- SofC = Species of Concern; taxa for which additional information is needed to support proposal to list under the ESA.

Habitat Types:

MM = Mesic meadows	RS = Rocky slopes, scree
WM = Wet meadows	RO = Rock outcrops, cliffs
DM = Dry meadows	DW = Dry open woods
RZ = Riparian zones, floodplains	HV = High volcanic areas
CF = Coniferous forest	SW = Standing water

ATTACHMENT 2:
Conclusions Of Effects For Use In Biological Evaluations and Assessments
USDA Forest Service - Regions 1, 4, and 6
August, 1995

Listed Species:

1. No Effect
   Occurs when a project or activity will not have any "effect", on a listed species, or critical habitat.

2. May Affect - Likely to Adversely Affect (LAA)
   If the determination in the biological assessment is that the project May Affect - Likely to Adversely Affect a listed species or critical habitat, formal consultation must be initiated (50 CFR 402.12). Formal consultation must be requested in writing through the Forest Supervisor (FSM 2670.44) to the appropriate FWS Field Supervisor, or NOAA Fisheries office.

3. May Affect - Not Likely to Adversely Affect (NLAA)
   If it is determined in the biological assessment that there are "effects" to a listed species or critical habitat, but that those effects are not likely to adversely affect listed species or critical habitat, then written concurrence by the FWS or NOAA Fisheries is required to conclude informal consultation (50 CFR 402.13).

4. Beneficial Effect
   Written concurrence is also required from the FWS or NOAA Fisheries if a beneficial effect determination is made.
   Requests for written concurrence must be initiated in writing from the Forest Supervisor to the State Field Supervisor (FWS or NOAA).

Proposed Species:

Whenever serious adverse effects are predicted for a proposed species or proposed critical habitat, conferencing is required with the FWS or NOAA Fisheries.

1. No Effect
   When there are "no effects" to proposed species, conferencing is not required with FWS or NOAA.

2. Not Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat
   This conclusion is used where there are effects or cumulative effects, but where such effects would not have the consequence of losing key populations or adversely affecting "proposed critical habitat". No conferencing is required with FWS or NOAA if this conclusion is made. However, for any proposed activity that would receive a "Likely To

Adversely Affect" conclusion if the species were to be listed, conferencing may be initiated.

3. Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat

This conclusion must be determined if there are significant effects that could jeopardize the continued existence of the species, result in adverse modification or destruction of proposed critical habitat, and/or result in irreversible or irretrievable commitments of resources that could foreclose options to avoid jeopardy, should the species be listed. If this is the conclusion, conferencing with FWS or NMFS is required.

Sensitive Species:

1. No Impact (NI)

A determination of "No Impact" for sensitive species occurs when a project or activity will have no environmental effects on habitat, individuals, a population or a species.

2. May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (MIIH)

Activities or actions that have effects that are immeasurable, minor or are consistent with Conservation Strategies would receive this conclusion. For populations that are small - or vulnerable - each individual may be important for short and long-term viability.

3. Will Impact Individuals or Habitat With a Consequence That the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (WIFV)

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

1. Contributing to a trend toward Federal listing (C-1 or C-2 species)
2. Results in a significantly increased risk of loss of viability for a species
3. Results in a significantly increased risk of loss of viability for a significant population (stock)

4. Beneficial Impact (BI)

Projects or activities that are designed to benefit, or that measurably benefit a sensitive species should receive this conclusion.

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Appendix E – Elk Emphasis Area Analysis

Appendix E

Habitat Effectiveness Ratings for Hartz Emphasis Areas

February 2005

The following tables provide a comparison of the effects of each alternative within each Elk Emphasis Area.

Upper Quartz

HE Value	Alt 1	Alt 2	Alt 3	Alt 4
HEc	0.58	0.59	0.59	0.59
Hef	*0.23***	*0.16***	*0.14***	*0.16***
HEs	0.59	0.68	0.68	0.68
HEr	0.35**	0.37**	0.37**	0.37**
HEl	0.41*	0.39*	0.38*	0.39*

Hardy

HE Value	Alt 1	Alt 2	Alt 3	Alt 4
Hec	0.58	0.58	0.58	0.58
Hef	*0.55*	*0.45*	*0.44*	*0.45*
HEs	0.57	0.70	0.67	0.70
HEr	0.38**	0.44	0.39**	*0.44*
Hel	0.51	0.53	0.51	0.53

Starr

HE Value	Alt 1	Alt 2	Alt 3	Alt 4
Hec	0.49	0.49	0.49	0.49
Hef	0.46	0.46	0.46	0.46
HEs	0.62	0.62	0.62	0.62
HEr	0.43	0.43	0.43	0.43
HEl	0.49*	0.49*	0.49*	0.49*

* Below the forest plan threshold value of 0.4 for moderate emphasis areas
** Below the forest plan threshold value of 0.5 for moderate emphasis areas

Appendix F – SHPO Letter of Concurrence

Project Review for Heritage Resources under the Terms of the 2004 Programmatic Agreement among the USFS R6, ACHP, and SHPO
June 2004

Forest:	**Willamette**
Ranger District:	**McKenzie River**
County:	**Lane**
Undertaking/Project Name	**Hartz Yound Stand Management Project**
USGS Quads:	**Harvey Mountain, Cougar Reservoir, Oregon (both 1997)**

By signing this document, the Forest Specialist certifies that for this project the Forest complies with Section 106 of the National Historic Preservation Act, under the terms of the 2004 Programmatic Agreement (PA) for the State of Oregon. This form shall be kept on file as supporting documentation

	Stipulation III (A) 1	Undertaking meets the criteria listed in Appendix A of the PA
	Date:	Inspection, monitoring, or other identification will be submitted to the Forest Specialist.
	Stipulation III(A)2	Undertaking meets the criteria listed in Appendix B of the PA.
	Date:	Inspection, monitoring, or other identification will be submitted to the Forest Specialist.
	Stipulation III(A)3	Undertaking meets the criteria listed in Appendix C (Exempt/Non-undertaking).
x	Stipulation III (B)1	Undertaking meets the criteria in the PA for a No Historic Properties Affected determination.
	Stipulation III(B)2	Undertaking meets the criteria in the PA for a Historic Properties Avoided determination.
	Stipulation III(B)3	The Forest has notified interested Tribes and persons, as appropriate, of the findings and made the findings available to the public.
	Stipulation III(B)5 Date:	No Adverse Effect (No Historic Properties Affected). The Forest finds that there are historic properties but the undertaking will have no effect on them as defined by 36 CFR 800.16(i). SHPO review period (30-day) required.
	Stipulation III(B)6 Date:	Historic Properties Affected: The Forest Service shall consult according to 36 CFR 800.5.

Cathy Lindberg	4-14-05
Forest Specialist	**Date**

For SHPO USE: For Historic Properties Adversely Affected, please indicate your opinion of our determination by marking the appropriate box below, sign and return this form to the Forest.

	I concur with No Historic Properties Affected	
	I do not concur, because in my opinion	
	Date Received	
	SHPO Bibliographic Number:	

Appendix G – Soils Specialist Report

I. COVER INFORMATION

Reply To: 2550 Soil Management
2520 Watershed Protection and Management

Subject: SOIL AND WATERSHED REPORT
Hartz Young Stand Management Project

To: District Ranger, McKenzie River Ranger District
ATTN: Rita Mustatia, Silviculturist and Team Leader

By: Douglas C. Shank, District Geologist

Date: January 24, 2005

II. INTRODUCTION

A. Summary of Purpose and Need for Project

The District Ranger of the McKenzie River Ranger District of the Willamette National Forest has determined that a need exists to manage forested stands within the Hardy and Quartz Creek drainages for the purpose of:

1) Reducing current stocking levels to lessen competition for nutrients, sunlight, and growing space;

2) Improving the growth and vigor of the remaining trees resulting in healthier stands of trees that are more resistant to insects and disease and to reduce future losses from fire;

3) Accelerating the attainment of late-successional stand characteristics (larger diameter trees) in the riparian reserves and to enhance the development of habitat diversity for wildlife on both matrix and riparian lands;

4) Thinning the smaller diameter, suppressed trees before they die for use as commercial wood products and to reduce long term fuel buildup and fire risk;

B. Proposed Action & Connected Actions

The District Ranger for the McKenzie River Ranger District of the Willamette National Forest proposes to implement the following actions during the next five years on approximately 700 acres in various management allocations and includes the following proposed actions. Implementation of these actions would result in the sale of approximately 11 to 12 MMBF of commercial wood products such as saw logs.

1) Commercial thinning about 620 acres and regeneration harvest of about 80 acres.

2) Thin selected portions of riparian reserves that are within, or adjacent to the proposed thinning stands. This will help develop late successional characteristics in riparian areas where fire exclusion has created more stems and where the development of late successional characteristics may be delayed. Thinning would take place outside of the wet area of the riparian reserve and outside of the portion contributing to channel bank stability.

The proposed action also includes the following connected actions:

1. Construct approximately 0.4 mile of temporary road to access harvest areas and reopen about 0.8 miles of existing unclassified road way as temporary road. After implementation, decommission these roads by scarification, seeding, and re-establishing natural drainage patterns;

2. Reconstruct approximately 30 miles of existing roads to provide better access to harvest units.

3. Construct, reconstruct, or modify landings for helicopters, skylines, and ground based yarding systems;

4. Treat slash created by the harvest activities in areas where there is a high risk of fire starts by hand piling and burning slash; and by broadcast or underburning, as appropriate.

C. REGULATORY FRAMEWORK

1. Laws and Regulations -- 36 C.F.R. 219.14(a) directs the Forest Service to classify lands under their jurisdiction as not suited for timber production if they fall into any of four categories:

A. Non-forest;
b. Irreversible soil or watershed damage (from NFMA 6(g)(3)(E)(i));
c. No assurance of reforestation within five years;
d. Legislatively or administratively withdrawn.

This report considers the first three categories of land. On the Willamette National Forest these areas are defined by landtype, which will explained in much greater detail in the Procedures and Methodology Section, further along.

2. Regional Guidelines -- Forest Service Manual R-6 Supplement No. 2500.98-1 (Title 2520 – Watershed Protection and Management) clarifies direction for planning and implementing activities in areas where soil quality standards are exceeded from prior activities; redefines soil displacement; provides guidance for managing soil organic matter and moisture regimes. In addition, the USDA FS Pacific Northwest Region handbook on General Water Quality Best Management Practices (November, 1988) provides a guide on practices which are applicable in conducting land management activities to achieve water quality standards to ensure compliance with the Clean Water Act, as amended, and Oregon Administrative Rules.

3. Forest Plan Direction – Chapter IV of the Willamette Forest Plan states the Forest-wide Standards and Guidelines for a variety of resources and activities. Soil and Water Quality protection are addressed in the section from FW-079 to FW-114. Based on direction in the Forest Wide Standards and Guides, FW-079 and FW-080 and BMP T-1, T-2 and T-3, the following activities were performed as part of the planning process: A. verifying the present SRI land type boundaries; determining the location of unsuited and unmanageable landtypes; prescribing slash treatment and suspension objectives for the possible units; and evaluating potential watershed impacts from management.

D. Procedures and Methodology

On numerous days throughout the 2004 field season, I conducted a field reconnaissance of potential harvest units and surrounding areas for a planned timber sale in order to help implement Willamette National Forest program direction. Those dates include April 13, June 7 and 23, July 1, 6, and 28, September 1, 3, 4, and 20, and November 9, 2004.

1) Field investigation standards

A major portion of this aspect of the field investigation was directed at distinguishing the various identifiable landtype components within the study area and mapping them on the photo overlays. Some of the landtype analysis referenced in this report was originally conducted for previous watershed analysis or timber sale planning activities. Much of that earlier work (essentially within the South Fork McKenzie) was reevaluated and updated with this project. The information was then transferred to registered overlays in order to represent the data on a standard map base. Too large to be included with this report at a meaningful scale, a complete copy of the remapped SRI landtypes for this particular project area is on file at the Sweet Home Ranger District. In general, the field investigation confirmed some of the original 1973 SRI designations and much of the previously mapped work. However, considerable refinement and subdivision of the various boundaries were noted because of the in depth field reconnaissance with this project. Many of the landtypes have several components that were not separated initially because of the mapping scale that was utilized. My field investigation of landtypes and their specific attributes formed the basis for the site-specific recommendations and mitigations that follow in this report.

2. Description and discussion of landtypes

a. Unsuited and unmanageable landtypes have been delineated within the project area as part of the landtype mapping process (FW-180). Unsuited and unmanageable landtypes occur in two basic categories - those acres that are un-regenerable and those where harvest will cause irreversible impacts. Those landtypes which are considered to have regeneration difficulties (BMP T-20) could include 1, 2, 3, 4, 5, 6, 7, 62, 210, 310, 610, and 710 or combinations of these landtypes. Almost all have numerous rock outcrops and cliffs, shallow gravelly soils with rock fragment content generally greater than 70%, and talus. Landtypes 6 and 7 are wet and dry meadows, respectively, and most areas of Landtype 6 are considered "wetlands" (BMP T-17 and W-3). All are currently considered noncommercial forest land or non-reforestable in the five-year time frame. Officially, 210, 310, and 610 are defined as marginally reforestable at least to extensive levels on easterly and northerly aspects, and non-reforestable in the five-year time frame on southerly and westerly aspects. However, almost no successful timber management has ever occurred on any aspect related to these specific landtypes on the McKenzie River Ranger District. Consequently, the north and east aspects of 210, 310, and 610 are considered unmanageable (no sufficient assurance of regeneration within the five year time frame) land in this report.

b. Landtypes considered unsuited because harvest will result in irreversible resource damage are primarily those that are actively unstable or potentially highly unstable (FW-105, BMP T-6). They could include the primary Landtypes 25 and 35, and the complexes of 255 (25 plus 35), 256, and 356. Landtypes 256 and 356 have actively unstable areas very closely associated and generally in direct contact with stream riparian areas or stream courses. These areas all commonly display slump type topography and include such features as tension cracks, bare soil scarps, leaning and fallen trees, sags and depressions, seeps, and disrupted drainages. Failure depths are such that root strength probably has little affect. However, the instability problem can be aggravated by timber harvest, as removing the trees tends to raise ground water levels due to the loss of evapotranspiration. This in turn reduces the soil strength and can cause increased or renewed instability. Other landtype complexes that contain elements of 25 or 35, such as 251 which is prone to debris chute, need to be evaluated on a case-by-case basis as management activities are proposed.

c. Landtype complexes, such as 441-644 have elements of both (or all) landtypes that were either not differentiable at the photo scale, or sufficient field time was not available to distinguish the various components.

d. The remaining landtypes are adequately discussed in the Soils Resource Inventory (Legard and Meyer, 1973). This document, first developed in 1973 and updated in 1990, was made to provide some basic soil, bedrock and landform information for management interpretations in order to assist forest land managers in applying multiple use principles. The 1973 text and descriptions are used here. A copy is on file at the McKenzie River Ranger District in the Plans section.

III. EXISTING CONDTION

The Soils and Geology Report for the South Fork Watershed Analysis, dated September 8, 1994, discusses in great detail the existing condition of the areas investigated in this report for Units 22, 23, and 25. Please refer to that document for more information.

Units 1 through 15 are located within the Quartz and Indian Creek drainages. Located entirely within the Western Cascades physiographic region, this study area west of Indian Creek, is composed of older Tertiary (Tu of Walker and Duncan) lava flows, tuff and intrusive rocks. More specifically, undivided Miocene and Oligocene tuffaceous sedimentary rocks, basalt flows and tuffs form the foundation of the basin. Radiometric potassium/argon dates on parts of this formation are mostly 32 to 17 million years old. Most of this strata was previously assigned to the Little Butte Sequence (Walker and Duncan, 1989). East of Indian Creek, younger flows and clastic rocks (Tfc of Walker and Duncan) of Miocene age (around 17 to 10 million years ago) predominate. These rocks include andesite flows, lahars, and volcanic conglomerates (Walker and Duncan, 1989).

The surface expression of these rock formations has been extensively modified by erosion since late Miocene time, especially from Pleistocene through Holocene with glacial activity. At the higher elevations, particularly from Indian Ridge west to Sardine Butte at the headwaters of Indian and Quartz Creeks, lie the remains of one or more Pleistocene glaciations. Cirque basins, hanging valleys, and assorted morainal deposits all reside on the landscape, but most have been extensively altered by stream erosion.

On some Willamette National Forest Districts, the materials of the Little Butte Series weather to form deep colluvial and residual soils that give rise to unstable soils with both rotational and translational failures common. However, within this analysis area the Little Butte (Tu of Walker and Duncan) has been altered by susequent low grade metamorphism and mineralization to form rock materials that are resistant to failure. Consequently, slope instability is not a concern for almost all of this terrain. Stream down cutting of the volcanic formations that comprise the Western Cascades has been the principal slope forming process active in this area. The principal sediment delivery system in operation is the down slope movement of the soil mantel by creep or colluvial mechanisms. This process is accelerated during large-scale fire events.

IV. AFFECTED ENVIRONMENT

Numerous figures in the project file indicate the size and location of the Hartz analysis area, the general topography, and existing transportation system. For the soils resource, analysis is best conducted on a unit-by-unit basis. Unit location maps are also present. Because of their size, the updated Soil Resource Inventory maps were not included with this report.

V. ISSUES and CONCERNS

A. KEY ISSUES

Key issues are those that will drive alternative formulation. Given that, no soils or geology issues exist for the proposed action. All action alternatives will contain the same soil protection measures.

B. CONCERNS

1) Fire is a natural ecological component of the Cascade Range ecosystem. Fire recurrence intervals of 100 to 200 years are apparent in the natural system, with shorter intervals recorded in some critical high lightning areas. The actual thinning or harvest of these units is not as much concern for long term soil productivity as the concomitant slash accumulation and the potential for wild fire. On the other hand, NO ACTION IS NOT considered beneficial for long-term soil productivity either. Overstocked stands will rapidly see density increase, growth slow, and mortality rise. Fuel accumulations from blow down, snow down, and bug kill provide an ever-increasing amount of fuel loading. Activities, which reduce stocking levels, improve stand vigor, and eliminate excessive fuel loading are favored.

2) Slope instability is also a natural ecological component of the Cascade Range ecosystem, and failure recurrence intervals of 50 to 150 years are apparent in the natural system, primarily in conjunction with large storm events. Slope failures carry large wood and rock to stream systems. This material is needed to both create suitable structure for sediment storage and provide the gravels required for fish habitat. On the other hand, numerous failures, without the

associated boulder or log structure, can overload a system with sediment and remove or destroy functioning habitat.

3) Excessive soil compaction from heavy, mechanized equipment used during logging can decrease soil productivity by restricting root growth, reduce rainfall infiltration rates, and channeling run off.

VI. DIRECT and INDIRECT EFFECTS

The major short term impacts to soil productivity from harvest activity, as discussed in the Willamette National Forest Final Environmental Impact Statement (FEIS 1990), include displacement, compaction, nutrient loss, and instability. In most situations, preventing soil impacts is the most effective and feasible way of ensuring long-term soil productivity. The following sections discuss in more detail (1) how the proposed action may effect the soil resource or (2) mitigations that can be utilized to avoid potentially undesirable effects.

A. No Action Alternative

Stands will continue to develop. Many stands currently have little understory vegetation because of the lack of sunlight to the forest floor. Intermediate and suppressed trees would slowly be removed from the stand through mortality and decay. Overstocked stands will rapidly see density increase, growth slow, and mortality rise. In areas of heavy stocking, stands would stagnate. Fuel accumulations from blow down, snow down, and bug kill would contribute to an increasing fuel load. In general, plant diversity would diminish as well as soil biota because of the lack of sunlight. In areas already compacted or disturbed by the initial entries, the soil building process will continue to return the soil to near preharvest conditions. Short-term impacts from harvest, such as soil disturbance and slash accumulation, would not occur.

B. All Action Alternatives (NOTE: As was stated previously, all action alternatives have the same soil protection measures, as described on a unit-by-unit basis.)

A. DISPLACEMENT:

The logging suspension requirement for a proposed unit is mandated in the LMRP to protect the soil from excessive disturbance or displacement (FW-107 and BMP T-12). The area near tail trees and landings is generally excluded from this suspension constraint. Unless otherwise stated or mitigated, all designated streams require full suspension or yarding away from the stream course during the yarding process (MA-15-27). To adequately protect the soil resource, the primary yarding objective for all units will either be skyline with partial suspension or a ground based system with designated skid roads, or some combination of the two, depending on side slope. Helicopter yarding may be proposed to minimize an expansion of the transportation system that would be required for skyline operations. However, the full suspension provided by the helicopter is not required to meet adequate soil protection measures.

Ground based yarding systems, primarily tractor, could be utilized in portions of Units 1, 2, 7, 11, 22, 23 and 25. For these units, ground based yarding systems may be employed on those acres in each unit where slopes are gentle enough (30% or less, unless otherwise waived) for ground-based systems. In addition, small areas generally from 0.1 to 1 acre in size and generally along flatter ridges, adjacent to roads or near skyline landings, could be harvested with a ground-based system, primarily to minimize additional spur road and landing construction. All areas where ground based yarding might occur, are well away from active drainages, or skid roads will cross ephemeral swales only during dry periods and at right angles. All ground based yarding will require LTSR (Located Tractor Skid Road), and/or line pulling and directional falling, as appropriate.

In conclusion, disturbance from yarding will be well within the Regional standard and significant adverse impacts are not anticipated. With appropriate suspension during logging, 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 stream courses will minimize or eliminate off-site erosion.

B. COMPACTION:

The major source of compaction (and also much disturbance) is ground based skidding equipment. Unrestricted tractor yarding and tractor piling are not considered an option on those landtypes where side slopes are gentle enough (generally less that 30%) to support tractor usage (BMP T-9 and VM-1, and FW-107). The silty nature of the fine-grained soils, and evidence that significant soil moisture is available most of the year indicate that any type of unrestricted tractor yarding and piling (even low ground pressure) would lead to unacceptable soil compaction and/or disturbance. Restricted tractor yarding from predesignated skid roads (LTSR) is considered an option if the adversely affected area is less than 20% of the activity area (BMP T-11). With tractor yarding, skid roads are predesignated, approved in advance of use by the Timber Sale Officer and generally 150 to 200 feet apart. With a processor/forwarder system the skid roads are usually only about 50 to 60 feet apart, but the number of trips for each individual road are substantially less than with skidding.

Monitoring has shown that when designated skid roads are properly utilized in conjunction with line pulling and directional falling, compaction from ground-based tractor operations generally remains at about 9 to 13%. Skyline operations in thinning units with small wood and intermediate supports usually impacts less than 1% of the unit area. As was previously stated, ground based yarding systems could be utilized in portions of Units 1, 2, 7, 11, 22, 23 and 25. Ground based yarding systems may be employed on those acres in each unit where slopes are gentle enough (30% or less, unless otherwise waived) for ground-based systems.

Residual compaction from the original harvest of these plantations needs to be considered. In many cases, the original units were cable yarded, though suspension may have been limited. Often ground-based systems were utilized, especially on the flatter ground. These units were harvested prior to the establishment of Regional guidelines of acceptable amounts of compaction (20% of the activity area). Compaction may have once exceeded the Regional guidelines when these units were originally logged. However, with the establishment of regeneration and brush, little evidence now remains of that previous yarding activity. Some compaction has been ameliorated with the subsequent bioturbation and freeze/thaw. Transects in a few of the flatter areas indicated primary skid roads and landings now occupy about 8 to 11% of the flatter terrain in a given unit. These evident skid roads and landings will be reutilized in those units that had ground based logging previously. In many units, little new spur road will be required. Reducing the effective weight of the tractors and reducing the number of trips over a piece of ground are other means to reduce the risk of soil compaction and displacement. Yarding over frozen ground, or over a deep, solid snow pack (24 inches of dense snow **or equivalent**) also reduces soil disturbance and compaction (BMP VM-4). As a mitigating measure, at the completion of harvest activities, some subsoiling is proposed in order to reduce compaction at heavily used haul roads, spur truck roads, and landings. Skyline (or helicopter) landings are primarily planned at old existing landings, road turnouts, and road junctions.

In summary, with the use of designated skid roads, 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% value in any unit and is not cumulatively significant.

C. NUTRIENT LOSS:

Duff Retention is the percent of effective ground cover (generally considered the duff and litter layer and based on the existing pre-management condition) that needs to remain after cessation of management activities (FW-084 and FW-085) in order to minimize nutrient loss, and to protect against erosion (BMP T-2 and F-3). In most cases since fire is a natural component of the West Cascades ecology, broadcast burning appears to be an acceptable slash treatment alternative, but non-burning options should also be considered (FW-250 and FW-251). Another aspect of long term nutrient availability and ectomycorrhizal formation is the amount of larger woody material retained on site. Management activities will be planned to maintain enough large woody debris (dead and down) to provide for a healthy forest ecosystem and ensure adequate nutrient cycling (FW-085). At this time, site specific needs will be considered commensurate with wildlife objectives as outlined in FW-212a and FW-213a (as amended). In most instances, PUM yarding is not recommended in order to provide for the retention of additional woody debris to further minimize sloughing and raveling on the steeper slopes (FW-084), and to provide for added nutrient recycling (FW-085) and wildlife habitat (FW-212a). Grapple piling (on the gentler slopes), the minor spot burning of concentrations, or hand pile and burn may be another options to evaluate. This will have to be considered on a case-by-case basis in conjunction with silvicultural and slash treatment objectives.

In summary, duff retention objectives will be provided on a unit-by-unit basis in the unit summary table. Concentrations of larger down logs that were produced with the initial harvest should be left undisturbed as much as possible. Consequently, with the retention of adequate duff and woody debris, potential adverse impacts to long-term soil productivity are not anticipated.

D. INSTABILITY:

The Hartz project area, located in the Western Cascades physiographic province, is divided into two relatively different geomorphic terrains. The side west of Indian Ridge within Indian and Quartz Creeks, lies on either steep, stable, shallow-soiled sideslopes of eroded Tertiary volcanic strata composed mainly of tuffs and breccias, glacially formed benches in volcanic strata, or a relatively gently sloping sequence of stable stream terraces that likely evolved during Pleistocene glaciation and subsequent outwash. Neither debris chute type slope instability nor slump type rotational failures have been active agents in the down slope movement of soil in this part of the analysis area. The side east of Indian Ridge within Hardy Creek displays both debris chute and large scale, slump type, earth flow terrain, as well as glacially formed benches and steep, ice-eroded side slopes on volcanic strata. This stabilized earth flow terrain has generally not shown any movement, except for a few localized areas, for many hundreds to thousands of years. The debris chute activity is confined to several localized sites throughout the basin.

The 1996 storm brought few changes to the landscape on either side of Indian Ridge. No failures were observed in any proposed unit. One small failure of about one half acre, located just outside the northwest boundary of Unit 15, reactivated with the 1996 event. This site is outside the boundary of Unit 15, and the harvest of this unit has no effect on this instability. East of the east boundary of Unit 22, within the old growth buffer between the plantation and the Creek, lie several small areas of active slump type or debris chute prone terrain. Failure depths are such that root strength plays some role in longer-term stability. No harvest is planned in this area, and thinning within Unit 22 will not likely have any effect to these unstable areas.

In general, thinning promotes tree growth. Crowns increase in size and roots systems expand. Evapotranspiration amounts increase. These factors all lead to increased slope stability. Thinning should emphasize the retention of a well-distributed stand of larger trees, both conifer and hardwood. Field review of previously thinned units in the past several years on similar landtypes has shown no increase in either slope instability or erosion in either uplands or riparian reserves. Thinning within or through riparian reserves improves long-term slope stability as stand conditions change for the better through release and increased tree growth along the channel. These larger trees better provide the stream the opportunity to withstand the assaults of wind, storms and floods over time. The proposed regeneration Units 2 and 25 are located on stable landtypes. Thousands of acres of regeneration harvest have occurred on similar terrain in the past with no adverse effects.

In summary, slope instability within either the proposed thinning or regeneration harvest units is not considered likely. Potential adverse off-site effects from the harvest are not anticipated, and the potential for significant adverse cumulative effect is quite low.

E. TRANSPORTATION SYSTEM

Some units have proposed temporary roads to access suitable landing sites which provide landings for all major logging systems, ground based, skyline, and helicopter. In all cases, these temporary roads are located on gentle stable sideslopes in common material. No full bench construction is required and 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 will 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 will maintain slope stability, will produce little or no off site erosion, and will provide opportunity to rehabilitate old road courses. Units 9 and 12 are located within uninventoried, unroaded areas, as identified in the 1998 Willamette National Forest Road analysis. “Undisturbed soil” has been mentioned as a value found in unroaded areas. Both these units are for the most part, located on a steep, shallow-soiled landtype (201) formed on volcanic terrain. Because of the steep side slopes, initial harvest of these units was done with skyline systems. The proposal for this entry is also with skyline or helicopter. Disturbance or compaction from these systems is quite low, on the order of 1% or so. The initial broadcast burning of these units would have duplicated a forest fire of moderate intensity and duration. Little slash treatment is proposed with this entry. Consequently from the soils perspective, most of the management activity in the last several decades is similar to natural events, and the soil has been relatively “undisturbed.”

VII. INDIRECT AND CUMULATIVE EFFECTS ASSESSMENT

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, unit-by-unit basis. The major soils concerns - compaction, nutrient loss, displacement and instability - are most effectively reviewed, for both short and long-term effects, at the site level. With proper project implementation, as specified by my recommendations, unacceptable cumulative effects on the soils resource are not anticipated from any of the action alternatives (BMP W-5). Consequently, the utilization of soil protection measures and best management practices as defined in this report, will generally preclude the need for additional cumulative effects analysis. Deviations from the standards and guidelines would be the primary trigger for a cumulative effects review, and no deviations are planned.

VIII. SOIL PROTECTION MEASURES by unit and common to all action alternatives

The following table discusses mitigations that will be necessary on a unit-by-unit basis. The information and recommendations were developed based on direction in the Forest Wide Standards and Guides (primarily FW-079, FW-090 and FW-179) to maintain or enhance soil productivity and stability. This data table addresses suspension requirements and duff retention objectives, as well as pertinent specific comments for particular units (where necessary).

Unit	**SRI**	**Suspension**	**Duff Retention(%)**	**Comments**
1	201-214, 443, 55	Partial, some ground	50-70	Yardng system determined by side slope.
2	55, 201, 212, 231	Partial, some ground	50-70	Yarding system determined by side slope.
4	201,204, 212	Partial	60-80	Rocky areas along the north east boundary.
5	201, 204	Partial	60-80	Rocky areas along the NE, N, and NW boundaries.
6	201	Partial	60-80	
7	55, 214, 443	Partial, ground	40-60	Yardng system determined by side slope.
8	44, 55, 214	Partial, ground	40-60	Yardng system determined by side slope.
9	201	Partial	60-80	Yarding depends on sideslope.
11	201, 231, 233	Partial, some gound	50-70	Yardng system determined by side slope.
12	201, 204, 162, 234-236	Partial	60-80	Rocky areas along east boundary.
15	201, 204, 212	Partial	60-80	Rocky areas west of Rd. 2618 and along south bndry.

22	13	Ground, partial	40-60	Yardng system determined by side slope.
23	13, 44, 606	Partial, ground	50-70	Yardng system determined by side slope. Rocky unsuited area along SE boundary.
25	55-164, 203, 204	Partial, some ground	60-80	Yarding depends on sideslope. Rocky and/or unsuited areas SW, S, and SE boundary.

On many units, helicopter yarding may be required contractually to reduce the need for an expanded transportation system. This is desirable because it minimizes soil disturbance, but it is not required for adequate soil protection.

Prescriptions for soil protection, watershed considerations and riparian needs of the sub-basin take into account past and predicted future land management activities. The soils mitigation measures, as well as the streamside management zones, are designed to provide a level of riparian habitat protection and erosion control that is consistent with the standards and guidelines of the Willamette National Forest's Land and Resource Management Plan (1990). On site sedimentation is anticipated to be within National Forest and Oregon State Guidelines. All prescriptions or mitigation measures discussed in this report are designed to meet or exceed the requirements outlined in the General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988). Standard contract language should provide for sufficient erosion control measures during timber sale operations (BMP T-13). Revegetation of areas disturbed by harvest activities (such as landings, temporary roads, and equipment storage areas) is required with an appropriate grass seed mix (BMP T-14, T-15, and T-16).

Other applicable Standards and Guides and/or Best Management Practices may exist which were not directly referenced in this document. Their exclusion does not indicate that they were overlooked or are inapplicable. As project development proceeds, appropriate constraints or mitigations may be added or changed in order to better meet the intent of adequate resource protection or enhancement as directed in the 1990 Willamette National Forest Land and Resource Management Plan and Final Environmental Impact Statement. As the proposed project is initiated, it will be monitored to evaluate implementation efficiency, prescription adequacy, and to update sale area rehabilitation needs or protection.

IX. MONITORING REQUIREMENTS

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

X. IDENTIFICATION OF IRREVERSIBLE OR IRRETRIEVABLE RESOURCES

No irreversible and /or irretrievable use of the soils or geology resource is anticipated, beyond that which has been previously identified in the Willamette National Forest Land and Resource Management Plan, as amended.

XI. REFERENCES

Legard, Harold A. and Meyer, LeRoy C., 1973: Willamette National Forest Soil Resource Inventory, Pacific Northwest Region, 167 p.

Walker, George W. and Duncan, Robert A., 1989, Geologic Map of the Salem 1° by 2° Quadrangle, Western Oregon: Miscellaneous Investigations Series Map I-1893, U. S. Geological Survey, 1989.

XII. CONSULTATION WITH OTHERS

1) Dan Fleming, Logging systems, McKenzie River Ranger District

2) Dave Kretzing, Hydrologist, McKenzie River Ranger District

DOUGLAS C. SHANK

District Geologist

McKenzie River Ranger District

Appendix H – Past Timber Sales

Appendix H

Past Timber Harvest

Quartz Creek Watershed

Sale Name	Acres	Active Year(s)
Cane Creek TBV	176	1988
Dennis	2	1992-1993
Elkshead	26	1998
Ennis	82	1988-1989
Fawnbuck	68	1985
Fever	7	1987
Homer Hanky	19	1991
Look Up	57	1989-1990
Lytle	151	1988-1991
Sardine Boundry	82	1991-1994
Sinne	80	1989
Stagecoach	6	1987
TOTAL	756	

South Fork McKenzie River/ Hardy Creek/ Rebel Creek Watersheds

Sale Name	Acres	Active Year(s)
BWA SHE	54	1985
Crazy L	12	1989
GreenH	38	1986-1989
Hardy C	32	1985
Hardy S	28	1992
Hardy Salvage	52	1996
Hardy T	187	1993-1996
Hardy Thin	99	1997
Loonsta	1	1985
Lowell	4	1993-1995
Rookie	30	1985
S.Side EL	47	1997-1998
Starr	18	1987
Starr/T	38	1997-1999
Starrbr	102	1991-1992
Think Thin	7	1999
Yahoo	146	1985-1986
TOTAL	895	