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Environmental Assessment

Matheny Complex Thinning

Pacific Ranger District, Olympic National Forest

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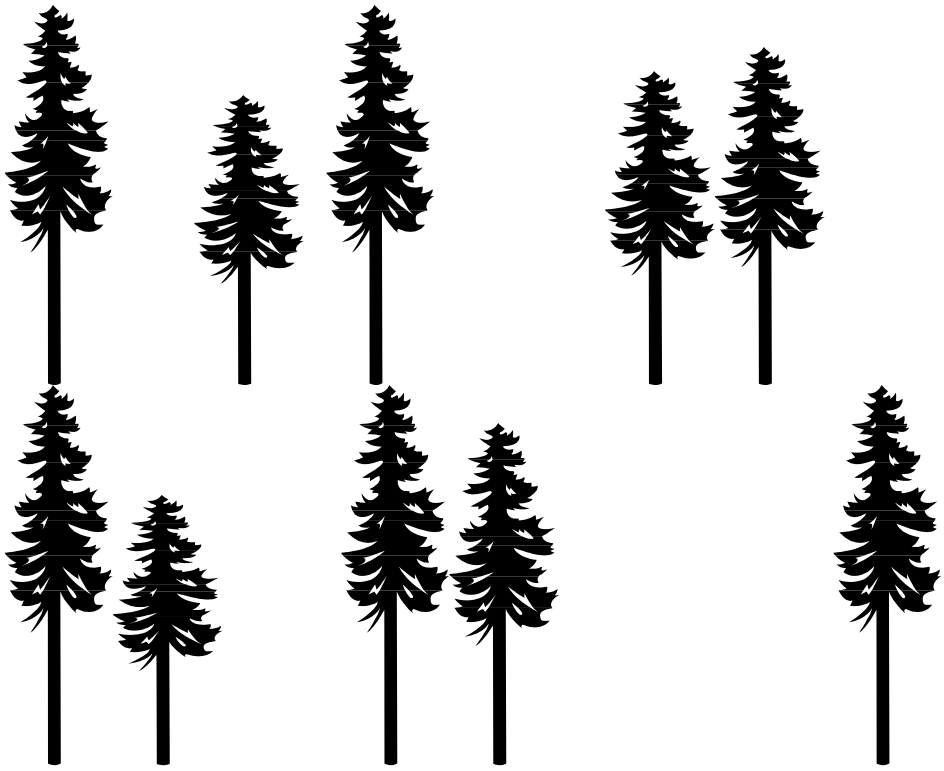

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Matheny Complex Thinning Environmental Assessment

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SUMMARY

What Action is Proposed?

Land managers for the Olympic National Forest propose to commercially thin approximately 700 acres of 40- to 50-year-old plantations in the Matheny Creek watershed (tributary to the Queets River). The thinning prescription and measures recommended to reduce adverse impacts follow ecosystem management policies and scientific recommendations. The project has the potential to produce nearly 8 million board feet of timber.

Some road development would be required to efficiently access the stands. The EA also considers the effects of construction of up to two miles of temporary roads (these would be obliterated after the project is completed); reconstruction of up to two miles of closed system roads (most of these would be maintained for the project, then stormproofed and again closed once the project is completed, up to one-half mile of currently closed system road would be decommissioned as per the district Access and Travel Management Plan); and reconstruction of up to four miles of abandoned roads (these would be obliterated after the project is completed).

Site-specific design features and mitigation measures would reduce the risk of adverse effects. A monitoring and adaptive management plan is included to ensure that environmental standards and objectives are met.

Why Here? Why Now?

The 1996 Quinault Late-Successional Reserve (LSR) Assessment recommended variable density thinning[1] within second growth stands (regenerated clear cuts) comprised of conifers 6 to 20 inches in diameter that are over-dense and lack diversity. Stand conditions within about 1,000 acres of 40- to 50-year-old regenerated clear cuts (plantations) in the western portion of Matheny Creek watershed (the project area) currently meet these criteria[2].

The purpose of the thinning is to reduce forest stand density and increase forest stand complexity and hasten the development of desired late-successional habitat elements such as large trees, multi-storied canopies, snags, coarse woody debris, and canopy gaps. These elements are lacking in the stands.

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[1] Variable density thinning means selective cutting that leaves trees in a pattern that mimics natural stand diversity.

[2] Not all stands that meet treatment criteria are proposed for thinning at this time. About 300 acres that meet treatment criteria would be too expensive or environmentally risky to access (see Chapter 2 for more information in Alternatives Considered but Eliminated from Detailed Study).

What Alternatives Are Considered to Meet The Need?

The Environmental Assessment considers three alternatives in detail; two that would reduce forest stand density and increase forest stand complexity (Alternatives 2 and 6) and one that would not (Alternative 0, No Action).

Alternative 0 would not treat any identified stands. Alternative 2 would treat about 506 acres. Alternative 6 would treat about 707 acres.

The alternatives vary in the amount of road work proposed to access the stands to be thinned. Alternative 0 includes no road work. Alternative 2 relies on the existing road system to access the treatment areas. Alternative 6 would approve limited new (temporary) road development (about two miles of temporary roads would be constructed and about four miles of abandoned roads would be reconstructed. Temporary and reconstructed abandoned roads would be obliterated once the project was completed).

What If the Need Is Not Met?

If the need is not met, i.e., no action is taken, treatment within about 1,000 acres of over-dense, 40- to 50-year-old plantations would be deferred. Tree-to-tree competition would result in crown recession (low crown ratios) and loss of growth and vigor. Trees would become more susceptible to insects and root diseases. Height/diameter ratios would increase and could approach 100, where trees are at risk of bending over or breaking under otherwise benign wind loads.

Over time, opportunities for thinning will be reduced or eliminated. Without treatment, the stands would slowly pass through successional phases via natural processes. Opportunities to create or hasten development of desired stand conditions would be lost over time.

In addition, opportunities to improve watershed conditions, either through a timber sale or service contract, or future Knudsen-Vandenburg (KV) funded project, would be deferred or lost.

What Are the Effects of the Action Alternatives?

Treatment of about 506 acres in Alternative 2 would move individual stands toward their desired condition. This would result in a 51% effectiveness rating, meaning that about half of the stands that meet treatment-need criteria would be treated. Treatment of 707 acres in Alternative 6 would move more individual stands and a greater proportion of the watershed toward the desired condition. This would result in a 71% effectiveness rating. [3]

Alternative 2 has the potential to produce about 5.5 million board feet of timber. Alternative 6 has the potential to produce 7.7 million board feet of timber.

[3] Within both action alternatives, some acreage that meets treatment-need criteria would not be treated because the stands are too expensive or environmentally risky to access.

Potential short-term, nonsignificant adverse effects to soils and water quality may occur from road work and other ground disturbance from the project. However, these effects are characterized as "low" and are more than offset by long-term benefits from the project. Similarly, the project has the potential to disturb individual plants, animals, or their habitats during operations, but would improve habitat conditions over the long term.

Both action alternatives contribute to meeting desirable late-successional and riparian reserve conditions within treated areas.

What Factors Will Be Considered in the Decision?

The Olympic National Forest Supervisor is the decision-maker for this project. The Forest Supervisor will select either No Action or an action alternative, based on which alternative best responds to the purpose and need for action and resolves key issues.

Cost-effectiveness is an important part of the decision. Appropriated funding for LSR thinning in this area is not likely, thus the thinning needs to pay for itself.

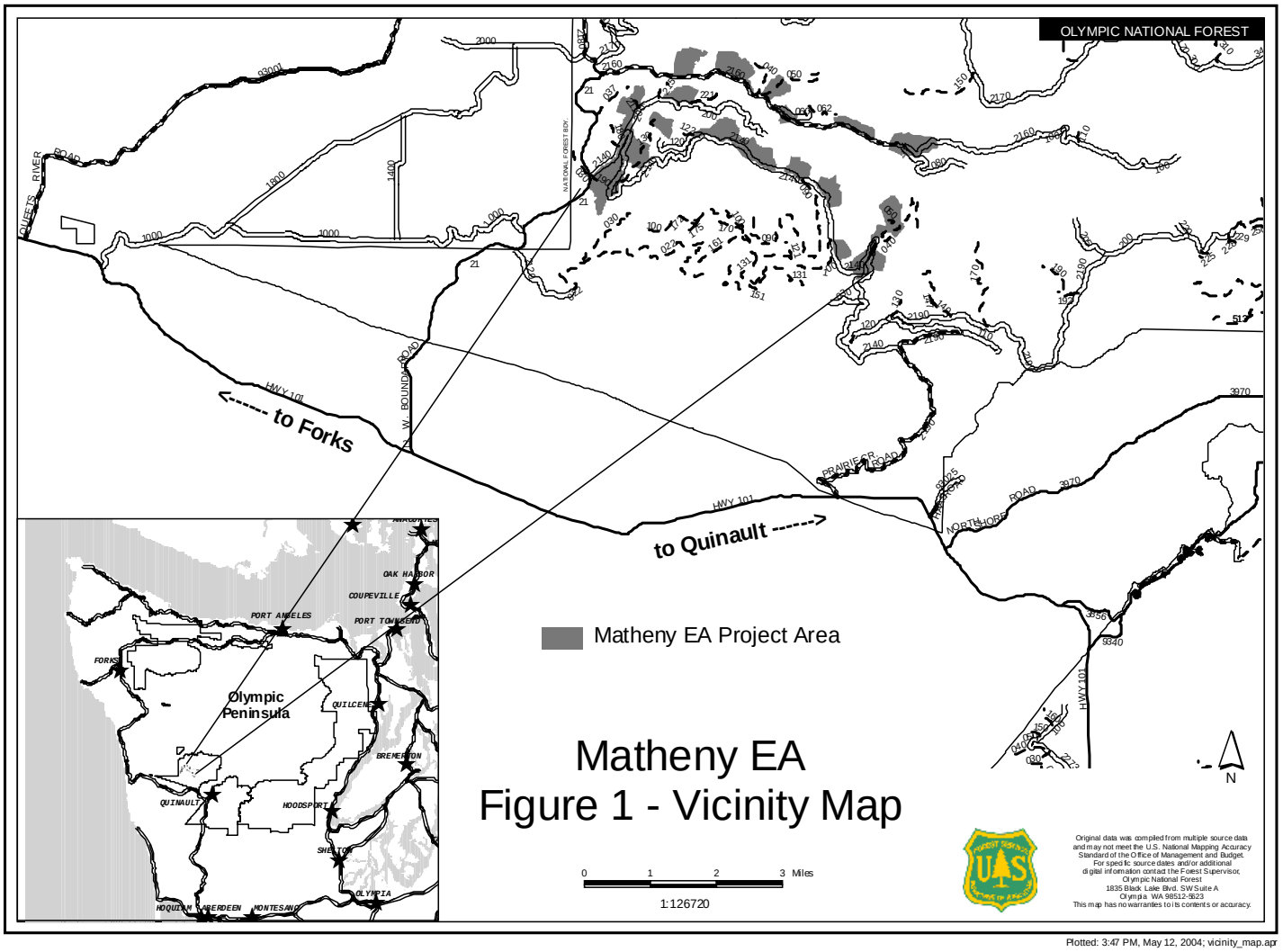

Figure 1. Vicinity Map

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

Introduction

Land managers for the Olympic National Forest propose to reduce forest stand density and increase forest stand complexity through commercial thinning within the western portion of Matheny Creek watershed (see Figure 1). The legal description of the project area is:

Township 24N, Range 10W, Sections 15-22, 27, 28, 33

Township 24N, Range 11W, Sections 13, 23, 24, 26

The project is designed to meet the objectives of the Olympic National Forest Land and Resource Management Plan (LRMP; USDA 1990), as amended by the Northwest Forest Plan (USDA/USDI 1994b; NWFP)[4]. Specifically, guidance within the Quinault Late Successional Reserve Assessment (USDA 1996) and the Matheny Creek Watershed Analysis (USDA 1995) drove the design and analysis of this project.

The project area lies within the 24,000-acre Matheny Creek watershed (Matheny Creek is a tributary of the Queets River). A very small portion of the project area is in the Salmon River drainage. This area is included because particular treatment areas in the Salmon River drainage are most efficiently accessed from the Matheny Creek road system.

The Forest Service prepared this Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EA estimates the direct, indirect, and cumulative environmental effects that could result from the proposed action and its alternatives. Supporting documentation may be found in the project file located at the Pacific Ranger District Office in Forks, Washington.

The document is organized into four chapters:

- *Chapter 1 - Purpose of and Need for Action:* This chapter describes the reasons the project is needed and applicable management direction. This chapter also explains how the Forest Service informed the public, other agencies, and the Quinault Indian Nation about the proposal, and identified issues based on their response.
- *Chapter 2 - Alternatives, Including the Proposed Action:* This chapter describes the process used to develop alternatives for achieving the purpose and need. It summarizes and compares the environmental consequences associated with each alternative, including No Action.

[4] The Northwest Forest Plan (NWFP) is formally known as the "Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl."

- *Chapter 3 - Environmental Consequences:* This chapter describes the environmental effects of implementing the proposed action and other alternatives. The existing condition is described first, followed by the effects of the No Action alternative. The No Action alternative provides context for the evaluation and comparison of action alternatives.
- *Chapter 4 - Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the EA.

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

Relevant Management Direction

This Environmental Assessment is tiered to the Final Environmental Impact Statement for the 1990 Olympic National Forest Land and Resource Management Plan (Forest Plan) (USDA 1990a, USDA 1990b). It also incorporates by reference the Matheny Creek Watershed Analysis and the Quinault Late Successional Reserve Assessment. Primary guidance for this project comes from the Olympic National Forest LRMP (USDA 1990), as amended by the NWFP (USDA/USDI 1994b). The 1990 LRMP allocated the project areas to E1 Timber Management, and F2 Riparian Areas. The NWFP allocated most of the Matheny Creek watershed (including the entire project area) to Late-Successional Reserve (LSR), and overlaid a system of Riparian Reserves within the LSR. All of these allocations are associated with Standards and Guidelines (S&Gs) that direct forest management. Environmental policies and laws (including but not limited to the Clean Water Act, the Clean Air Act, the Endangered Species Act, and the National Forest Management Act) are addressed at the project level by compliance with S&Gs.

The NWFP requires that LSRs be "managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth-related species including the northern spotted owl. These reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem (NWFP ROD, p. C-11)."

The NWFP also requires preparation of a LSR Assessment before habitat manipulation activities are designed and implemented within that allocation. The Quinault LSR Assessment (North and South), including recommendations for achieving LSR objectives, was approved in 1996. The Matheny Complex Thinning Project was developed following these recommendations:

- Thinning can be used to promote the development of late-successional characteristics in the competitive exclusion phase by accelerating tree growth for the development of large trees, snags, and coarse woody debris, emphasizing retention of minor species overlooked by past management practices, and by providing opportunities to augment the numbers of snags and ground coverage of coarse woody debris.

- Variable density thinning can enhance spatial diversity by leaving some areas unthinned while creating gaps in the canopy in others (p. VI-8). Such thinning can produce large diameter trees more quickly and can encourage understory reinitiation of shade-tolerant species. This could move the forest toward the objective of being multi-layered and structurally diverse.
- The objective within stands to be treated would be to open them to a degree sufficient to promote understory development and residual tree growth, while still retaining enough overstory to support late-successional functions and maintain dispersal habitat for northern spotted owl. This can be achieved by (p. VI-9):
    - maintaining or accelerating the growth of residual trees
    - promoting development of understory vegetation
    - maintaining forty to sixty percent canopy closure for northern spotted owl dispersal
    - maintaining or enhancing species, structural, and spatial diversity
    - providing for short- and long-term snags and coarse woody debris
    - thinning from below and removing suppressed and intermediate class trees that lack crown development
- The priorities for enhancing snag and wildlife tree availability are to:
    - retain existing wildlife trees and snags (subject to operational safety considerations where these are a factor)
    - create new wildlife trees and snags from existing healthy stock
    - grow young trees to sufficient size to become usable wildlife tree and snag habitat

The NWFP also includes the Aquatic Conservation Strategy (ACS). The ACS is intended to restore and maintain the ecological health of watersheds and aquatic ecosystems. The NWFP requires that watershed analysis be conducted to make recommendations for achieving the ACS objectives at the watershed scale. The Matheny Creek Watershed Analysis[5] included the following watershed-specific recommendations; these directly influenced the analysis and design of this project:

- Increase Large Woody Debris recruitment rates for aquatic habitat (p. E-9).
- Reduce habitat fragmentation in the downstream portions of mainstem Matheny Creek. Include the mitigation of edge effects on ecological old-growth stands through plantings of trees, thinning to promote growth, etc. (p. E-9).
- Improve horizontal and vertical diversity in coniferous forest stands in the mainstem Matheny, South Fork, Hook Branch, and Middle Fork Matheny Creek (p. E-10).

[5] One unit proposed for treatment in this project is accessed from the Matheny Creek road system, but lies slightly within the Salmon River watershed. The Salmon River Watershed Analysis, completed in 1995, included findings and recommendations similar to Matheny Creek.

- Strategic stand thinning and gap creation could be employed in the early- and mid-seral stages to promote late-seral characteristics and short-term forage (p. E-10).
- Enhance and maintain hardwoods with emphasis on riparian zones and mesic plant association groups with hardwood potential. Use plantings, thinning, and harvest prescriptions to establish hardwoods or reduce competition from conifers (p. E-10).
- Use silvicultural treatments to accelerate development of late-seral multi-storied stands for wildlife habitat enhancement in lower mainstem (p. E-11).

Purpose and Need for Action

Approximately 2,500 acres of 40- to 50-year-old plantations exist within the Matheny Creek watershed. Approximately 1,000 acres of over-dense plantations in the western part of Matheny Creek watershed are considered for treatment in this project. Basal areas within these stands are in the range of 280 to 360 square feet per acre and hemlock relative density[6] ranges from around 50 percent to 80 percent and greater (Flewelling, Wiley, and Drew 1980). Douglas-fir relative density ranges from 70 percent to 100 percent and greater (Curtis 1982). Crown closure is estimated at 90 percent or more.

Understory vegetation is generally sparse in these stands and stand diversity is declining. There are numerous small snags, 6 to 10 inches diameter at breast height (DBH), but few larger snags. Coarse woody debris levels (CWD) are generally in the range of 8 to 12 percent cover by ocular estimates.

Conifer growth is slowing in the stands, given the current conditions. Growing space is fully occupied; as trees compete for the available space, sunlight and nutrients, their live crown ratios become smaller, their vigor declines, their height/diameter ratios increase and they become more susceptible to wind, insects, and root diseases.

The desired relative density for hemlock is approximately 35 percent. The desired density of all species is about 120 to 180 trees per acre, ranging between 60 and 90 percent crown closure.[7]

This project responds to the need for improved habitat for species dependent on late-successional forests within the Matheny Creek watershed. The purpose of this project is to accomplish the thinning in a manner that follows recommendations within the Matheny Creek Watershed Analysis and Quinault LSR Assessment, complies with all applicable Standards and Guidelines, and is cost-effective.

[6] Relative density is an expression of the current density of each dominant species in proportion to the carrying capacity for that species on a given site. If the relative density is greater than desired, growth is slowed and trees become more susceptible to density-related pathogens.

[7] Crown closure is an expression of the proportion of forested to open areas as seen from above the tree tops.

Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to commercial thin approximately 707 acres within the project area. Of these, 120 acres would be yarded using ground-based systems. Skyline systems would be used on the remaining acreage. An estimated 7.7 million board feet of timber would be removed in this alternative. Fuels created by thinning would be left in the units to contribute to nutrient cycling and the soil organic layer. About 212 acres would be treated within Riparian Reserves.

This proposal would utilize the existing 32-mile road system that serves the project area. About 2.1 miles of currently closed road would be opened to access units that would otherwise be too costly to thin. These roads would be closed again once they were no longer needed for the project. Road 2160-050 (0.4 mi.) would be returned to Maintenance Level 1, while roads 2140-130 (1.4 mi.) and 2140-211 (0.3 mi.) would be decommissioned as part of the project in accordance with the Olympic National Forest ATM.

Approximately 2.0 miles of temporary roads would be developed. These would be obliterated and rehabilitated after use. The temporary roads are intended to increase the efficiency and reduce the impacts of the operation within six stands proposed for thinning. The road segments lie entirely within the six stands. Most are on ridgetops or cross dry, upper slopes. No perennial stream crossings are associated with temporary road segments (road segments within two units may cross minor, intermittent streams). The roads provide opportunities for lower impact, parallel skyline yarding corridors, increase opportunities for ground-based logging, and reduce the average yarding costs. The temporary roads would be relatively narrow and no older trees would be cut for the roads.

In addition, about 3.8 miles of existing abandoned roads would be reconstructed to access treatment areas. As with temporary roads, the reconstructed abandoned roads would be obliterated once they were no longer needed for the project. A total of ten drainage crossings are associated with the 5.9 miles of closed or abandoned roads to be used to access project treatment areas.

The proposed action would treat stands on both sides (north and south) of Matheny Creek. Each side is accessed via a different road system, so the two sides would likely be implemented as two separate projects (Matheny South and Matheny North).

Figure 4 shows the stands that would be thinned, along with an estimate of the new temporary roads to be constructed and the closed system roads/abandoned (non-system) roads that would be reconstructed.

Decision Framework

The Olympic National Forest Supervisor is the decision-maker for this project. The Forest Supervisor will select either No Action or an action alternative, based on which alternative best responds to the purpose and need for action and resolves relevant issues.

Public Involvement

The proposal was first listed in the Schedule of Proposed Actions from October 1998 through July 2001, and then was removed. Listing resumed in October 2003. The proposal was provided to the public, tribal governments and other agencies for comment during scoping in February 1999.

Four key issues were identified during scoping. The interdisciplinary team (IDT) focused its analysis on these key issues. The alternatives were developed to highlight trade-offs between the environmental benefits of thinning, and the monetary and non-monetary costs and risks associated with accessing and removing the timber.

ISSUE 1: Potential for Accelerated Erosion, Sediment Delivery, and Loss of Soil Productivity, and Effects on Fisheries

Thinning, yarding, road development and log hauling within the Matheny Complex Thinning Project have the potential to accelerate erosion (surface and mass wasting) and deliver sediment to area stream courses and downstream aquatic habitats. These activities also have the potential to reduce soil productivity by creating detrimental soil conditions (compaction, displacement, and puddling). Most of the public comments focused on the potential adverse effects of road construction, reconstruction, and use.

To respond to this issue, the IDT developed design features and mitigation measures to reduce potential for adverse impacts. Areas prone to slope instability and/or high surface erosion potential were dismissed from consideration. No-cut buffers were established within a portion of the Riparian Reserves to reduce potential for sediment delivery into stream courses. Road construction and reconstruction that might have undesirable impacts were dismissed from consideration. In addition, several Knudsen-Vanderburg opportunities have been identified so that watershed improvement projects may be funded by timber sale proceeds.

The IDT developed Alternative 2 to avoid all potential impacts from temporary construction. Under Alternative 2, road reconstruction is also limited to routes with the least potential for adverse effects. Alternative 6 includes some limited temporary road construction.

The alternatives will be compared based on:

I. Length of currently closed system roads (also referred to as maintenance level 1) and abandoned roads reconstructed

II. Length of temporary roads constructed

III. Road construction and reconstruction and an indicator of potential accelerated erosion, sediment delivery, and loss of soil productivity

IV. Potential percentage of stand in a detrimental soil condition due to logging activities (road construction, landings, skid trails, etc).

V. Effects on fisheries

ISSUE 2: Effects of Thinning on Stand Development Meeting LSR Objectives.

Some people questioned whether thinning would really meet LSR objectives. As expressed by Northwest Ecosystem Alliance, "Although enhancing the speed of growth of individual trees is one worthy goal of LSR management, it should not be the overriding objective," and by Olympic Forest Coalition, "To the extent that biomass accumulation is stunted through resource extraction, the more simplified the stand will be, which is contrary to LSR principles."

To respond to this issue, the IDT developed design features and mitigation measures to follow recommendations in the Quinault North and South Late-Successional Reserve Assessment (LSR Assessment). These objectives are broader than "enhancing the speed of growth of individual trees." For instance, increasing structural and species diversity (complexity) of these stands is an objective, as is increasing the biomass of the shrub and herbaceous vegetation layer. In addition, the IDT developed Alternative 6 to treat the most possible acreage, given management direction for all resources.

The alternatives will be compared based on:

VI. Acres treated

VII. Effectiveness Ranking based on percentage of identified acres treated

ISSUE 3: Economic Viability

Economic viability at the project scale is part of the purpose and need and is compared among alternatives. The current system of open roads within the Matheny Creek watershed does not provide full access for all stand development thinning needs in the watershed. Temporary road construction and closed or abandoned road reconstruction would allow for increased economically viable thinning opportunities.

To respond to this issue, the alternatives were refined to eliminate operational methods (such as helicopter yarding) that have costs that exceed the potential wood products value.

The alternatives will be compared based on:

VIII. Cost-to-benefit estimate

IX. Present Net Value

ISSUE 4: Effects on Threatened, Endangered, Sensitive and Management Indicator Species

Several fish, wildlife, and plant species of interest live (or have habitat) within the Matheny Creek watershed. Thinning and road work have the potential to affect some of these species or their habitats.

To respond to this issue, the IDT developed design features and incorporated mitigation measures to adhere to the Terms and Conditions set forth within the August 2003 Programmatic Biological Opinion, as amended in October 2004 (USDI 2004), as well as the Forest Plan (USDA 1990), as amended by the Northwest Forest Plan (USDA/USDI 1994b). All action alternatives comply with applicable management direction regarding these species.

The alternatives will be compared based on:

X. "Effect" findings for Threatened or Endangered species (or species proposed for listing)

XI. "Impact" findings for Sensitive species

XII. Effects on Management Indicator Species (MIS)

CHAPTER 2 - ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives considered for the Matheny Complex Thinning Project. Some alternatives were considered during the planning process, but dismissed from detailed study in this EA. The "Alternative Development" section provides rationale for the dismissal of these alternatives. The "Alternatives Considered in Detail" section provides maps and information about No Action and two action alternatives. The action alternatives share many common elements that are described. The effects of the alternatives are displayed in a comparative matrix at the end of the chapter. All acreages and road lengths are estimates that would be refined once a NEPA decision is made about the project.

Alternative Development Process

The Matheny Complex Thinning Project team employed an interdisciplinary approach throughout the planning and analysis process. Relationships between the existing and desired watershed conditions were evaluated in the LSR Assessment and Watershed Analysis, resulting in recommendations for treatment. Stands in the watershed were evaluated for treatment based on these recommendations; commercial thinning was proposed in over-dense second-growth plantations with trees large enough to support a timber sale (between 6 and 20 inches diameter).

Approximately 1,550 acres were originally considered for treatment (see 1999 Matheny Scoping Letter). Riparian and other sensitive areas were identified and design features and mitigation measures (including no-treatment buffers) were developed to conserve these areas (see Table 1). About 200 acres of incised draws, landslide features, and other potentially unstable areas were removed from consideration to meet Riparian Reserve Standards and Guidelines. Another 350 acres were removed from consideration because the optimum treatment timing is at least 10 years from now, based on LSR prescription criteria.

Figure 2 displays the 1,550 acres originally considered for treatment and indicates the portions of this area initially removed from consideration due to riparian or treatment timing concerns. The area remaining for consideration (approximately 1,000 acres) represents the treatment area of Alternative 5.

The alternatives vary in the amount and nature of road development and acres treated. The trade-offs between benefits of thinning and risks of roads needed to efficiently access the stands are addressed throughout the EA.

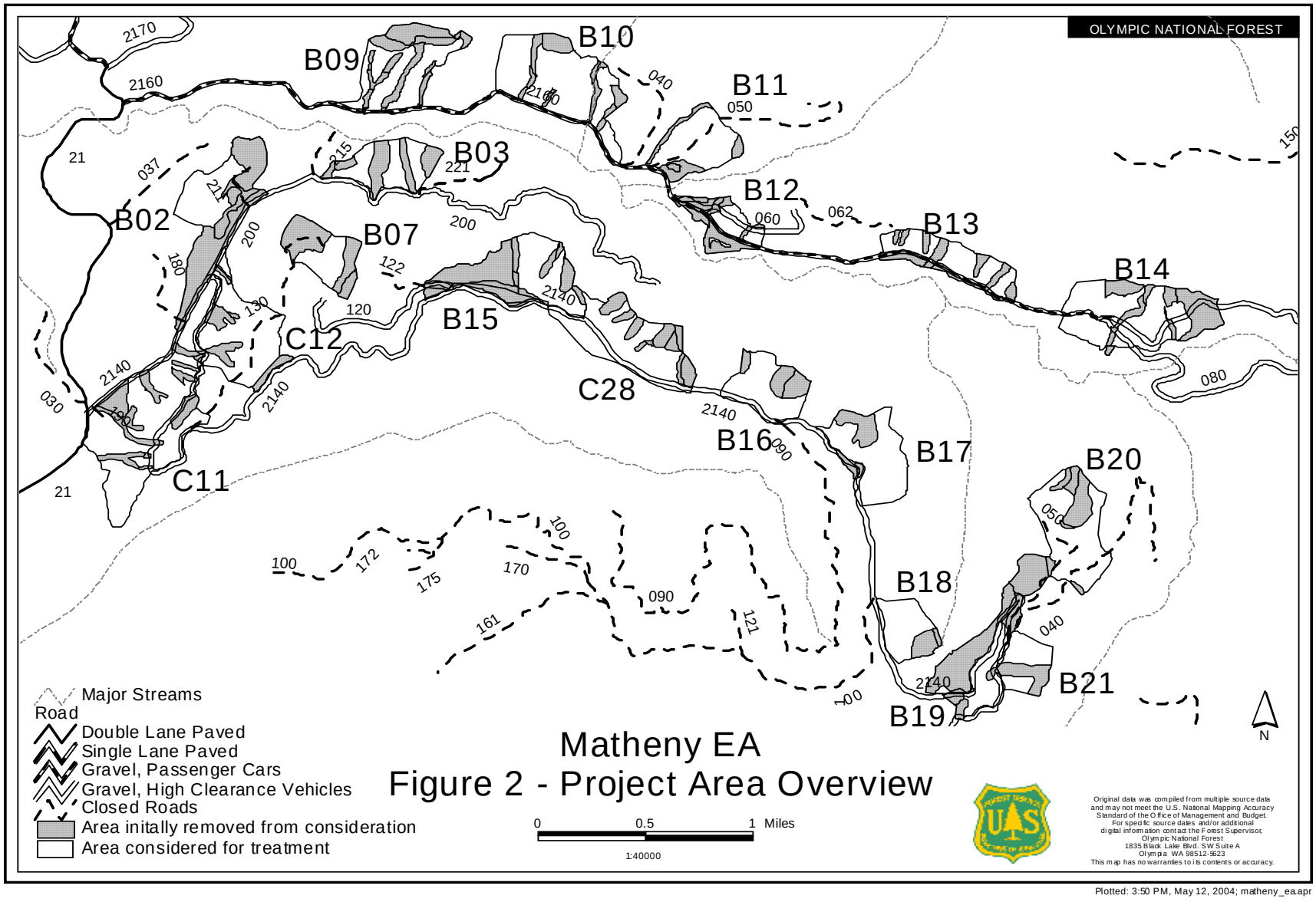

Figure 2. Project Area Overview (The entire project area is within the Late Successional Reserve land allocation.)

Road development includes reconstruction of closed system roads[8]; 2) reconstruction of abandoned (non-system) roads[9]; and 3) construction of temporary roads.[10] The planning record identifies six action alternatives:

- Alternative 1-Helicopter Yarding Only with No Non-System Road Development
- Alternative 2- No Non-System Road Development
- Alternative 3- No New Temporary Roads, Includes Reconstruction of Some Abandoned (Non-system) Roads
- Alternative 4- Includes Some Temporary (Non-system) Roads
- Alternative 5 – Includes All Temporary Roads Needed to Access 1,000 acres
- Alternative 6 – Moderate New Non-System Road Development

Alternatives 2 and 6 were carried forward for analysis. Alternative 1 was dismissed from detailed study because the costs of helicopter yarding were prohibitive for the project. Cost-effectiveness is one of the elements of the purpose and need. Helicopter yarding costs would have far exceeded the value of the trees removed. Other alternatives that are less costly provide adequate design features and mitigation measures to reduce potential for adverse effects.

Alternative 5 would have developed all roads needed to efficiently access all stands meeting treatment criteria (approximately 1,000 acres within the project area). The IDT found that Alternative 5 had the potential to degrade watershed conditions (and thus violate Riparian Reserve Standards and Guidelines) due to the risk of adverse effects from some of the roads. Therefore, Alternative 5 was dismissed from further study. Alternative 6 includes some new road development that the IDT determined was not likely to result in serious adverse effects.

Alternatives 3 and 4 varied incrementally between Alternative 2 and Alternative 6. Alternative 2 does not include any road development outside the current system road network. Alternatives 3 and 4 would have reconstructed some abandoned roads and constructed temporary roads respectively. Preliminary analysis indicated that these incremental differences would not result in much difference in effects. Alternatives 2 and 6 represent the minimum and maximum ways to meet the purpose and need, including complying with all applicable environmental standards. The Responsible Official determined that detailed analysis of these two action alternatives would provide sufficient information for understanding the effects of the project and therefore dismissed the mid-range alternatives 3 and 4. The action alternatives considered in detail (Alternative 2 and Alternative 6) share common objectives, design features and mitigation measures, and monitoring and adaptive management plans.

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[8] Closed system roads are roads that are not currently open for vehicle traffic but are retained on the system for intermittent use. Reconstructed system roads would be closed after project use.

[9] Abandoned roads are those that once existed but are not currently maintained and are not considered system roads; these would be improved for use, and closed (obliterated) upon project completion. Some of these roads are currently sediment sources to Matheny Creek – the net result of the proposed road work would be positive for the watershed.

[10] Temporary roads are short spurs developed for project use and closed (obliterated) upon project completion.

The two action alternatives provide two distinct approaches to meeting the purpose and need that highlight trade-offs between short-term risks and long-term benefits.

Alternatives Considered In Detail

Alternative 0 – No Action

Under the No Action alternative, current management plans would continue to guide management of the project area but no stand development thinning would occur. Ongoing implementation of the Access and Travel Management Plan would be expected, but opportunities to accomplish some work in conjunction with a timber sale would be forgone.

Alternative 2

Alternative 2 would approve commercial thinning on approximately 506 acres within the project area. Of these, 87 acres would be yarded using ground-based systems. Skyline systems would be used on the remaining acreage. An estimated 5.5 million board feet of timber would be removed in this alternative. Alternative 2 treats all stands accessible with the existing road system. About 167 acres would be treated within Riparian Reserves.

Fuels created by thinning would be left on site to contribute to nutrient cycling and the soil organic layer. Timber felling will be directed away from roads and landings resulting in few tops and branches being left within 30 to 50 feet, thus roadside piling and burning will not be necessary. Most limbs will be removed within the cutting units, and the small amount of branches yarded into landings will be yarded back into the units and scattered. Fuel loadings of small sized material is expected to be low, and this material is expected to decay fairly rapidly. As a consequence, underburning will not be needed. .

Alternative 2 would utilize the existing 32-mile road system that accesses the project area. This consists primarily of the road 2100, 2140, 2160, and 2190 haul routes. No temporary or permanent roads would be developed under Alternative 2, except for short logging landing extensions to allow equipment to get off the road surface for yarding and loading. Short landing extensions would be allowed where necessary to control and reduce runoff and sedimentation.

About 1.4 miles of currently closed system road (Maintenance Level 1) would be opened to access units that would otherwise be too costly to thin. No drainage crossings are associated with the closed roads to be opened. These roads would be closed again once they were no longer needed for the project (see elements common to both action alternatives). Roads 2140-130 (0.7 mi.) and 2160-050 (0.4 mi.) would be returned to Maintenance Level 1, while road 2140-211 (0.3 mi.) would be decommissioned as part of the project in accordance with the Olympic National Forest Access and Travel Management Plan (ATM). Alternative 2 would treat stands on both sides (north and south) of Matheny Creek. Each side is accessed via a different road system, so the two sides would likely be implemented as two separate projects. These would likely be called "Matheny South" and "Matheny North". Figure 3 shows the stands that would be thinned in Alternative 2, along with the closed system roads that would be reconstructed. Table 3 displays the specifics of the alternatives in terms of acreage north and south, logging systems that would be utilized, road development proposed, and volume expected. Table 4 summarizes and compares the effects of the alternatives.

Alternative 6 (Proposed Action)

Alternative 6 would approve commercial thinning on approximately 707 acres within the project area. Of these, 120 acres would be yarded using ground-based systems. Skyline systems would be used on the remaining acreage. An estimated 7.7 million board feet of timber would be removed in this alternative. About 212 acres would be treated within Riparian Reserves.

Timber felling will be directed away from roads and landings resulting in few tops and branches being left within 30 to 50 feet, thus roadside piling and burning will not be necessary. Most limbs will be removed within the cutting units, and the small amount of branches yarded into landings will be yarded back into the units and scattered. Fuel loadings of small sized material is expected to be low, and this material is expected to decay fairly rapidly. As a consequence, underburning will not be needed.

Alternative 6 would utilize the existing 32-mile road system that serves the project area. About 2.1 miles of currently closed road would be opened to access units that would otherwise be too costly to thin. These roads would be closed again once they were no longer needed for the project. Road 2160-050 (0.4 mi.) would be returned to Maintenance Level 1, while roads 2140-130 (1.4 mi.) and 2140-211 (0.3 mi.) would be decommissioned as part of the project in accordance with the Olympic National Forest ATM.

Approximately 2.0 miles of temporary roads would be developed under Alternative 6. These would be obliterated and rehabilitated after use. The temporary roads are intended to increase the efficiency and reduce the impacts of the operation within six stands proposed for thinning. The road segments lie entirely within the six stands. Most are on ridgetops or cross dry, upper slopes. No perennial stream crossings are associated with temporary road segments (road segments within two units may cross minor, intermittent streams). The roads provide opportunities for lower impact, parallel skyline yarding corridors, increase opportunities for ground-based logging, and reduce the average yarding costs. The temporary roads would be relatively narrow and no older trees would be cut for the roads.

In addition, about 3.8 miles of existing abandoned roads would be reconstructed to access treatment areas. As with temporary roads, the reconstructed abandoned roads would be obliterated once they were no longer needed for the project. A total of ten drainage crossings are associated with the 5.9 miles of closed or abandoned roads to be used to access project treatment areas.

Alternative 6 would treat stands on both sides (north and south) of Matheny Creek. Each side is accessed via a different road system, so the two sides would likely be implemented as two separate projects (Matheny South and Matheny North).

Figure 4 shows the stands that would be thinned in Alternative 6, along with an estimate of the new temporary roads to be constructed and the closed system roads/abandoned (non-system) roads that would be reconstructed in this alternative.

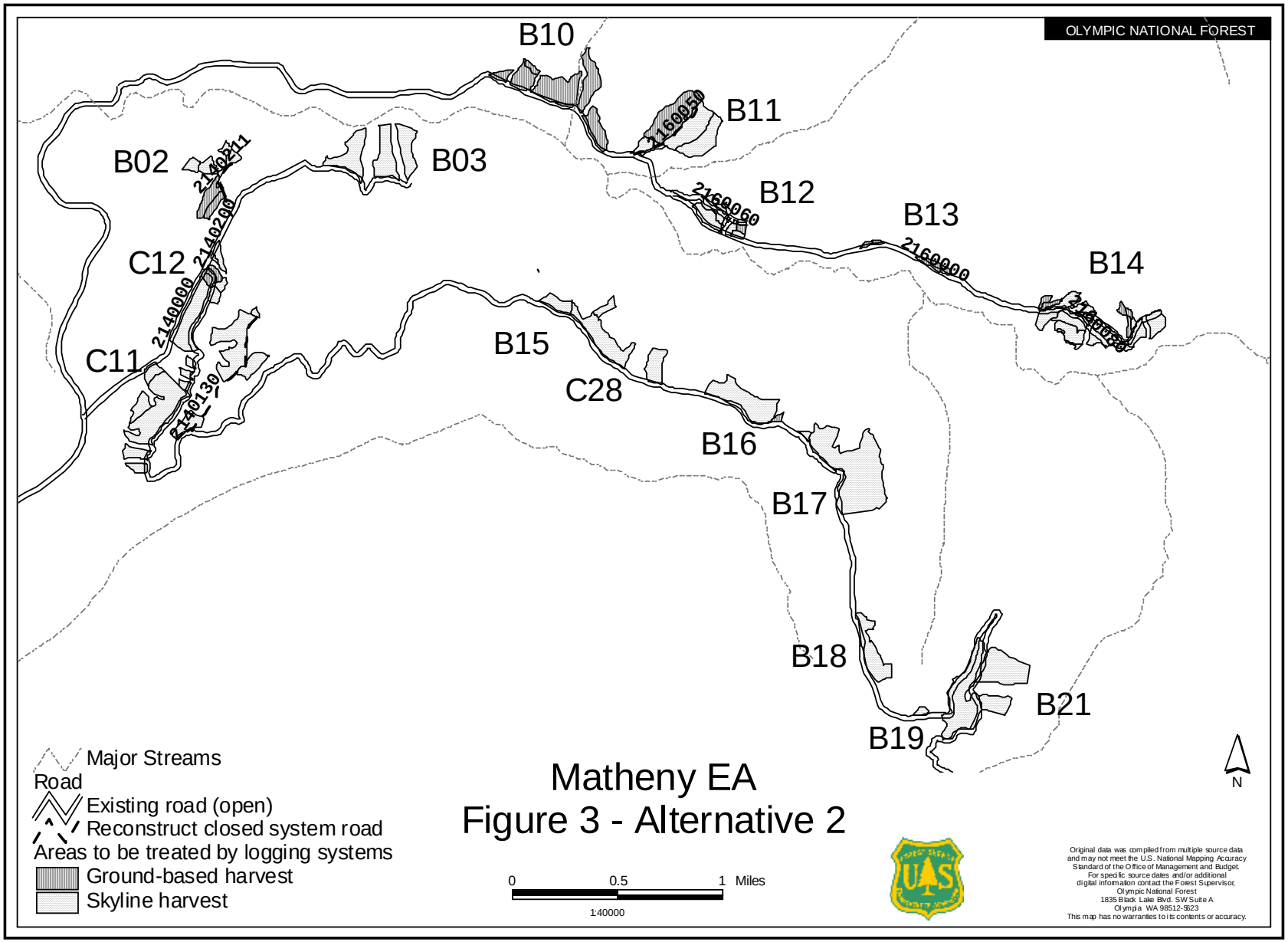

Figure 3. Alternative 2 Map

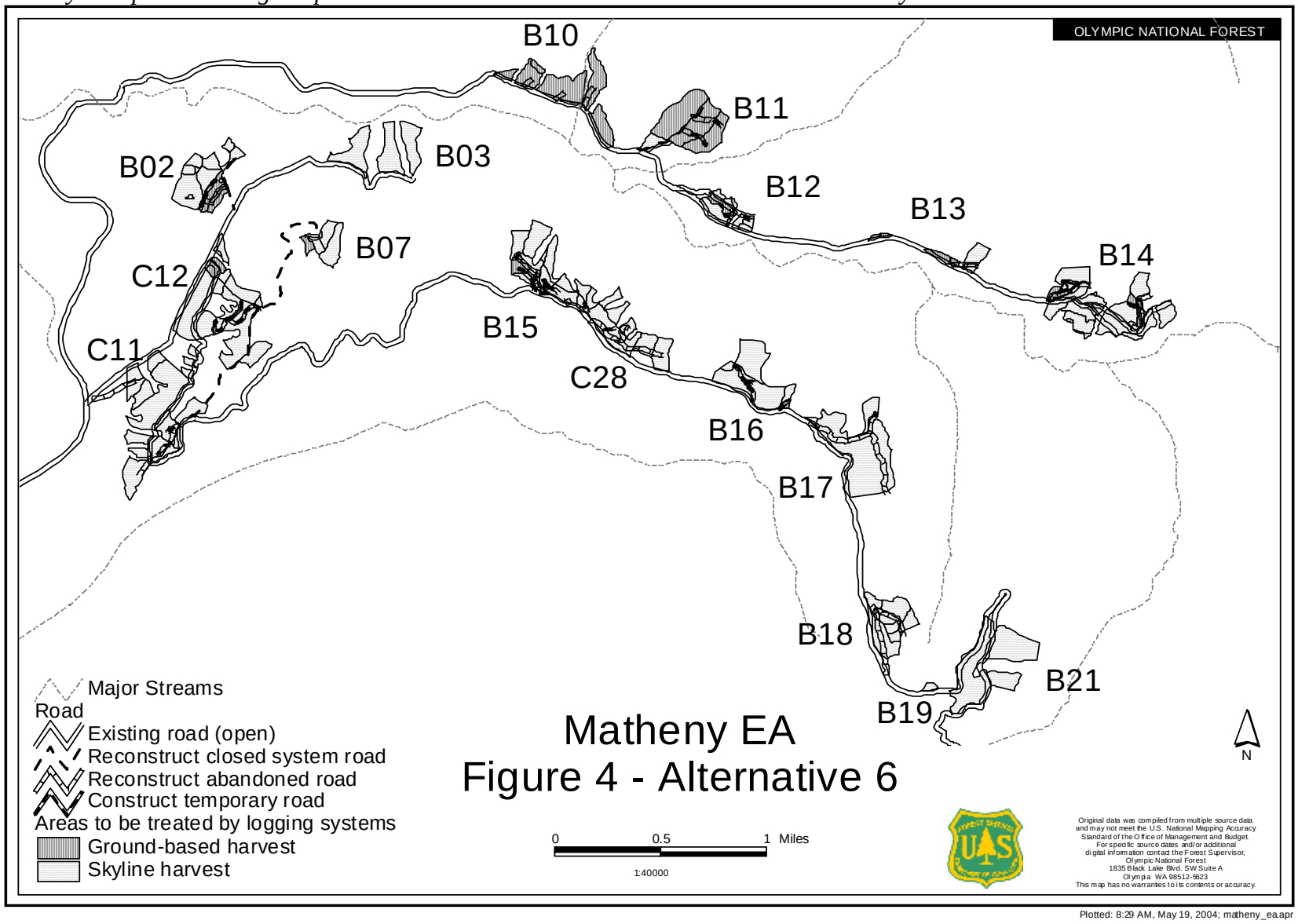

Figure 4. Alternative 6 Map

Elements Common to Both Action Alternatives

This section describes design features and mitigation measures and monitoring and adaptive management requirements that are part of both action alternatives (Tables 1 and 2). In addition, the timber sale(s) proposed have the potential to fund watershed enhancement projects within the sale area boundary through Knudsen – Vandenburg Act (KV) authorities and/or forest stewardship contract authorities. Watershed enhancement projects that may be funded as a result of either action alternative are also briefly discussed in this section.

Design Features and Mitigation Measures

Table 1 displays design features and mitigation measures and their objectives for a variety of resource areas. These features are built into both action alternatives. In general, these measures are intended to reduce the intensity of potential effects to comply with environmental standards. Not all of the measures apply to all activities that could be approved under the alternatives; measures would be applied as appropriate and refined with further field investigation and project development.

Table 1. Design Features and Mitigation Measures Common to Action Alternatives

Design Feature/ Mitigation Measure	Objective	Comments
Botany Measures		
Avoid disturbance of Quinault Fawn Lily. Do not thin units or sections of units (see final decision), use parallel skyline corridors, especially during blooming season, in nearby areas.	Ensure suspected rare, local endemic species (Quinault Fawn Lily) is protected.	The Quinault fawn lily is located in Units B-18, B-19 and B-21. See final recommendations in decision document.
Fisheries		
Restrict in-stream disturbance to the dry period of the year (July 1- Sept. 30). Meet conditions of Washington Dept. of Fish and Wildlife HPA (hydraulic permit approval) for in-stream culvert placement and removal.	Reduce potential impact to fish.	--
Noxious Weeds		

Design Feature/ Mitigation Measure	Objective	Comments
Wash equipment before it enters National Forest. Use weed free straw in erosion control. When revegetating sites, use native species or seed mixes with species that are not persistent.	Eliminate spread of noxious weeds.	Contract provision C6.35.
Riparian Reserves		
Establish no-treatment buffers, (including at the slope breaks of channel inner gorges, headwalls, or potentially unstable slopes or 33 feet from the edge of riparian or wetland vegetation (whichever is greater). In addition, at least one row of trees (one crown-width) will be left unthinned between the treatment area and defined stream channels and wetlands.	Avoid adverse effects to wetlands and riparian areas	Contract provision 2.35 # Option 1.
Roads		

Design Feature/ Mitigation Measure	Objective	Comments
-Locate, design, construct, maintain, and use roads in a manner that minimizes disruption to natural hydrologic flow paths and sediment delivery. Design appropriate drainage for each road site. -Minimize road-related activities that divert stream flow and interrupt surface or subsurface flow paths. -Outslope roads where beneficial and feasible. -Route road drainage away from potentially unstable channels and hill slopes. -Obliterate temporary roads after last entry by purchaser which includes seeding exposed mineral soils, culvert removal, water bars and cross drains, and installation of cross ditches. Outsloping and fully recontouring of road prism in identified sensitive and riparian areas may also be prescribed. -Make contract agreements about construction, use, and maintenance of temporary roads during the life of the project (including annual erosion control measures like seeding and cross-drains in place before the rainy season for roads within riparian reserves). -Seed temporary road cuts and fills as necessary for erosion control. -Prohibit sidecasting of loose material in riparian reserves during construction or maintenance activities. - Identify potential unstable geology for temporary road and abandoned road re-construction. - Use short landing extensions to reduce and control potential run-off.	Reduce risk of adverse effects from construction and use of temporary roads and reconstruction of closed and abandoned roads.	Add Contract Provision C 5.1 (Option 1 - 07/2001) Temporary Road and Landing Construction Add Contract Provision C6.6 Erosion Control and Soil Treatment
Designate rock sources; conform to Forest Service pit management plans and reclamation guidelines.	--	--
Minimize haul-delivered sediment in wet seasons by applying road best management practices (rock check dams, straw bale dams, silt fences). Apply erosion control treatments as needed.	Reduce impacts on water quality and fish by minimizing sediment from haul.	--
Soil and Water		
Leave unmerchantable portions of cut trees in units. Within ground-based yarding units, place slash from landing on skid roads.	Reduce risk of erosion, compaction and runoff and other adverse soil conditions. Provide wildlife habitat.	Add Contract Provision C6.42 #
Seed and scarify landing areas except on bearing surface of system roads.	Reduce risk of mass failure, restore site productivity	Add Contract Provision C6.6 #

Design Feature/ Mitigation Measure	Objective	Comments
Directionally fall trees away from streams. If a tree ends up in a stream, leave it.	Maintain properly functioning stream habitats.	Add contract Provisions B6.42 # and C 6.41 #
-Keep ground-based skid trails 110 feet apart, center-to-center.[11] Existing skid trails should be used where possible. -Ground skidding equipment should be kept 66 feet back from streams and wetlands. -Skid trails should be blocked at road junctions, water barred or scarified as necessary, and otherwise be made impassable for motor vehicles and ATVs. -Coarse woody debris that is moved for skidding should be returned to its former position where feasible. -Where soil is displaced by skidding operations, it should be pulled back into the skid trail location when operations are completed. Where skid trail rutting depth equals or exceeds 10 inches, they should be scarified or "fluffed up" to approximate the original soil contour.	Do not exceed 20% of treatment area in adverse soil conditions following treatment (Olympic National Forest Land and Resource Management Plan, p. IV-52).	Add Contract Provision C6.42 # Yarding/Skidding Requirements
Require one-end suspension for skyline and ground based inhaul. Avoid yarding across streams. Locate skyline corridors to use natural openings in riparian areas. If yarding across streams is necessary, logs must be fully suspended over creeks and the immediate slope above creeks to the break in topography or end of riparian vegetation.	Avoid adverse soil conditions and minimize disturbance to streams and riparian areas.	Contract Provision 6.42#
Vegetation/Habitat		

[11] Processors may be allowed to make one crossing between skid trails and occasional "pokes" off the skid trail using existing openings between trees.

Design Feature/ Mitigation Measure	Objective	Comments
Retain approximately120-180 trees per acre larger than 7 inches after thinning, resulting in 60-90 percent canopy cover (resulting stand relative density in hemlock would be about 0.35). Variable thin from below leaving variability in tree diameters. Thinning would focus on trees between 6 and 20 inches DBH[12]	-increase variability and biological diversity -increase average tree diameter -reduce proportion of hemlock to other species (Douglas-fir, Pacific silver fir, Sitka spruce) in hemlock-dominated stands. -reduce stand density -add structural and spatial complexity -maintain or increase crown and branch size and diameter growth of individual trees -introduce an understory of shrubs, herbs, and seedlings/saplings.	This density represents a mid-level of thinning between maximizing stand growth and yield (0.40) and maximizing individual tree growth (0.30). For thinning, a cut-tree diameter limit of 20 inches DBH would be in effect.
Do not discriminate against defective trees such as double tops, trees with fading crowns or bleeding boles, crooks, heart rots, or ants.	Retain defect and potential cavity or nesting trees and other similar features of structural diversity.	--

[12] Incidental felling of trees over 20 inches DBH may occur for safety or to facilitate operations (i.e., clearing roads or skyline corridors). Felled trees over 20 inches DBH will remain on site if possible.

Design Feature/ Mitigation Measure	Objective	Comments
Retain western redcedar and leave an unthinned buffer 33 feet around cedars 6 inches DBH and larger. Retain Pacific yew, cascara, willows, vine maple and other minor hardwoods. Groups of five or more alders would be left unthinned for mollusk and neo-tropical migrant bird habitat when located outside of existing skid trails that will be used for this treatment. Otherwise alder would be thinned along with the stand within which it may be located. In addition, leave a 10' unthinned buffer around vine maple clumps (generally large, established clumps of 5 stems or more as opposed to small, single stems).	-increase species variability, -retain neo-tropical bird and mollusk habitat -maintain biological diversity -maintain unthinned skip areas	Unthinned skip areas provide refugia for small plants and soil/litter layer animals that may be sensitive to thinning operations.
Retain all snags except where they may need to be felled for safety considerations. If felled, they are to remain on-site as CWD or used in a manner that benefits late-successional species. Retain all live trees within a radius equal to the height of snags (up to a 40-foot radius) greater than 17 inches DBH and 12 feet tall. Retain coarse woody debris exceeding 6 inches in diameter.[13] Potential blowdown may be used to provide down woody material. Block temporary roads and skid trails to retain coarse woody debris that might otherwise be removed for firewood. Keep big, old stumps intact wherever possible – avoid uprooting.	--Maintain existing snags -provide for worker safety -contribute to coarse woody debris recruitment -maintain or increase coarse woody debris levels.	--

[13] Large woody material may be moved for access, but should not be removed from the forest. Snags may be felled for safety; however "treatment skips" are intended to reduce the number of snags to be felled for safety.

Design Feature/ Mitigation Measure	Objective	Comments
Restrict logging operations during the bark slippage period March 1 to July 30. A standard of at most 5% of stems exceeding 16 sq. in. of damage and 7% total stems damaged should be in effect during all operations. Retain all damaged trees on site; apply tree-saver paint as needed.	Prevent scarring and damage to residual trees. Increase incentive to avoid logging damage to residuals. Retain damaged trees as future habitat components.	Damage can be defined as loss of bark, exposing or breaking the cambium layer of the stem or roots. Douglas-fir can withstand careful yarding during bark slippage, whereas hemlock is more prone to logging damage. Operations can be allowed to proceed during bark slippage as long as the mitigation standards are met.
Limit skyline corridors to 12 feet in width. Include guy trees as part of the thinning prescription.	Reduce impacts to residual stand.	Tail trees that are damaged during operations would contribute to coarse woody debris on site.
Place treatment "skip" areas on steep, brushy slopes, areas of cedar and vine maple, along streams, headwalls, and other areas that are unsuitable for commercial thinning.	Increase biological diversity.	Unthinned skip areas provide refugia for small plants and soil/litter layer animals that may be sensitive to thinning operations.
Place slash piles away from residual trees.	Reduce risk of heat and smoke damage to residual trees. (Burning of slash piles will not be needed due to project design.)	--
Remove slash from temporary road and landings. Within thinned areas, treat slash less than 3 inches in diameter as needed.	Minimize slash on roads and landings, reduce acres of slash treatment.	Felling away from roads is preferred; limited lop and scatter, where necessary for fuel hazard reduction is recommended. Contract provision 6.41#.

Design Feature/ Mitigation Measure	Objective	Comments
Wildlife		
Avoid harvest activities or associated disturbances within specified distances during the early spotted owl breeding season (March 1 to July 15) and early murrelet breeding season (April 1 to August 5).	Reduce risk of harassment and minimize take of Endangered Species Act (ESA) listed species.[14]	Compliance with Sec 7(a)(2) ESA and adherence to Programmatic Biological Opinion guidelines (Amended 2004). These restrictions apply to Units B02, B07, B11-15, B17-19, B21, C11, C28.
Buffer active raptor nests located during project layout. Restrict operations during species breeding season. Protect and retain trees with inactive raptor nests to provide nesting quarters for opportunistic (non-nest building) raptors.	Maintain suitable core nesting habitat. Maintain habitat necessary to provide for species diversity and viability. Minimize human disturbance so as to reduce likelihood of nest abandonment. Avoid disruption of normal nesting behavior patterns.	Raptor nest protection required by LRMP IV-49. "Nest sites actively used by raptors shall be protected from human disturbance until nesting, feeding, and fledging have been completed. Protection should maintain the integrity of the present tree structure and of the surrounding habitat." Contract Provision B 6.25
A Forest wildlife biologist would review any incidental removal of hazard trees greater than 21 inches during the breeding season for any listed species. Such review would occur for removal at any time of a tree greater than 36 inches.	Minimize potential "take" of federally listed species. Reduce risk of removing unknown nests or removal of potential nest structures.	Compliance with ESA and adherence to Programmatic Biological Opinion guidelines (Amended 2004).
Burning during the early breeding season for spotted owls (March 1 to July 15) or early breeding season for murrelets (April 1 to August 5) will be conducted 0.25-mile away from suitable nesting habitat. Burning during the nesting season for bald eagles (January 1 to August 15) or during the wintering period (October 31 through March 15) will be conducted 1 mile away from bald eagle use area.	Reduce risk of harassment and thereby minimize take of federally listed species. (Burning of slash piles will not be needed due to project design.)cies.	Compliance with Sec 7(a)(2) ESA and adherence to Programmatic Biological Opinion guidelines (Amended 2004)

[14] Conservation measures (limited operating periods) designed to minimize effects to federally listed species (spotted owl, murrelet, and bald eagle) will afford considerable protection to most avian species during the principal nesting season (March 1 through August 5).

Design Feature/ Mitigation Measure	Objective	Comments
In areas adjacent to suitable murrelet habitat, from April 1 through September 15 project activities shall not commence until two hours after sunrise and shall cease two hours before sunset.	Reduce risk of harassment and thereby minimize take of federally listed specie.	Compliance with Sec 7(a)(2) ESA and adherence to Programmatic Biological Opinion guidelines (Amended 2004)

Monitoring and Adaptive Management

Table 3 addresses monitoring and adaptive management common to both action alternatives. Monitoring would primarily occur during presale field work and contract administration. Additional monitoring may occur as funding allows.

Of particular note is some uncertainty related to the presence of the Quinault fawn lily in some units proposed for thinning. If the lily is found where suspected (Units B-18, 19 and 21), supplemental management direction would be needed to ensure viability of the population. The units may be removed from treatment consideration if no compatible management direction can be established.

Removal of units B-18, B-19, and B-21 from Matheny South would result in the following reductions in Matheny South activities and outputs:

Table 2. Effects from Eliminating Units with Quinault Fawn Lily

Alternative	Potential Treatment Acres Reduced	Potential Timber Volume Reduced	Potential Miles Road Reconstruction Reduced
2	70	0.6 MMBF	0
6	87	0.7 MMBF	0.6

Recently completed plant surveys have determined the presence of the Quinault fawn lily within some of the proposed treatment areas. Appropriate mitigation measures will be included in the final decision (see Decision Notice).

Table 3. Monitoring and Adaptive Management Common to Action Alternatives.

Resource Area	Monitoring	Who	Adaptive Management
Heritage Resources	Note any previously unknown heritage resource sites discovered during project planning, layout or implementation.	Forest Service Workers on the Project	Report new sites to the appropriate District Heritage Resource Specialist who will determine mitigation needed. Stop work until cleared by specialist.
Plant and Animal Species of Concern[15]	Note new populations of species of concern discovered during project planning, layout or implementation. Active spotted owl, marbled murrelet, or bald eagle nests found during breeding seasons will effect an immediate shutdown of operations within the harassment distances as outlined in Table G-1, G-2, or G-3 of the August 2003, amended 2004, Programmatic Biological Opinion.	Forest Service Workers on the Project	Report new sightings to the appropriate District Biologist who will determine mitigation needed. Stop work until cleared by biologist.
Fish	Walk roads to be closed and/or decommissioned following use but before closure. Develop criteria for stream bottom widths following road obliteration.	Hydrologist/ Fish Biologist	Develop stream rehabilitation specifications for road decommissioning following use.
Invasive Plants	Survey for presence/spread of invasive plants.	Botanist or Botany Technician	Identify and treat noxious weed populations of concern.
Soil and Water	Ensure adverse detrimental soil conditions do not exceed 20% of each unit the project area following treatment.	Timber Sale Administrator	Increase spacing between skid trails/skyline corridors, wet season closures.
Soil and Water	Ensure EA mitigations are implemented.	Timber Sale Administrator	Use all available contract administration tools.

[15] Species of Concern are those listed under the State or Federal Endangered Species Acts or Regional Forester's Sensitive List. Additional species of concern may be noted by the US Fish and Wildlife Service.

Resource Area	Monitoring	Who	Adaptive Management
Vegetation /Habitat	Review sale area for snag density and coarse woody debris coverage 3 to 5 years after harvest.	Forester/ Wildlife Biologist/ Technician	Develop vegetation treatments as needed using the most current analytical tools (such as DecAid).
Wildlife	Include project area in ongoing northern spotted owl demographic study. Help determine effects of habitat-improvement thinning and associated activities within existing study sites.	Forest and Regional Biologists	Develop design features and mitigation measures for future projects to improve effectiveness of treatments and reduce adverse effects.

Opportunities to Use Timber Sale Proceeds for Watershed Enhancement

The two timber sales may generate funding for watershed enhancement within the project area. Given the economic analysis in Chapter 3, limited opportunities may be available for projects funded by the timber sales. The Forest Service may use one of several mechanisms to use timber sale proceeds to accomplish watershed enhancement projects, including KV and stewardship contact authorities. The following watershed enhancement opportunities have been identified within the project area:

- decommissioning ten miles of system road[16]
- stabilizing eroding slopes and streambanks
- stabilizing and upgrading existing system roads within sale area, upgrading undersized and deteriorated culverts at stream crossing fills that have a moderate to high potential for failure.
- use of inoculants to create heart rot and other defects on living trees so they develop into desirable snags
- felling of coarse woody debris if needed to augment natural accumulation
- piling slash to create wildlife habitat for a variety of species
- planting forage on disturbed areas such as skyline landings

[16] If all roads were decommissioned in the project area according to the Access and Travel Management Plan, the road density would be reduced from its high of 3.1 miles per square mile in the Matheny Creek Watershed (based on the 1995 Watershed Analysis) to 2.36 miles per square mile. Current road density is 2.84 (about 10 miles of system road has been decommissioned since 1995).

- monitoring small carnivore use of the thinned area

Comparison of Alternatives

Table 4. Alternative Comparison

	Alternative 0	Alternative 2	Alternative 6
Acres Treated Matheny North	0	162	190
Acres Treated Matheny South	0	344	517
Total Acres Treated	0	506	707
Total Miles Closed System Roads Reconstructed and Closed After Use- Matheny North	0	0.4	0.4
Total Miles Closed System Roads Reconstructed and Closed After Use- Matheny South	0	1.0	1.7
Total Miles Closed System Roads Reconstructed and Closed After Use	0	1.4	2.1
Miles Non-System, Abandoned Roads Reconstructed and Closed After Use	0	0	0.9
Miles Non-System, Abandoned Roads Reconstructed and Closed After Use - Matheny South	0	0	2.9

	Alternative 0	Alternative 2	Alternative 6
Total Miles Non-System, Abandoned Roads Reconstructed and Closed After Use	0	0	3.8
Approx. Miles Temporary Road Construction Obliterated After Use – Matheny North	0	0	0.4
Approx. Miles Temporary Road Construction Obliterated After Use – Matheny South	0	0	1.6
Approx. Total Miles Temporary Road Construction Obliterated After Use	0	0	2.0
Miles System Road Decommissioned After Use	0	0.3	1.7
Acres Ground-Based Yarding	0	86	121
Acres Skyline Yarding	0	420	587
Potential Volume Removed (Million Board Feet) - Matheny South	0	3.6	5.4
Potential Volume Removed (Million Board Feet) - Matheny North	0	1.9	2.3
Total Potential Volume Removed (Million Board Feet)	0	5.5	7.7

	Alternative 0	**Alternative 2**	**Alternative 6**
Potential For Accelerated Erosion and Sediment Delivery, Loss of Soil Productivity	Existing. Some abandoned roads continue to deliver sediment and are at risk of failure.	Low, slightly increased risk of sedimentation in the short-term from 1.4 miles of closed system roads that would be reconstructed. Some abandoned roads continue to deliver sediment and are at risk of failure. Limited loss of soil productivity inherent to skid and skyline trails. Includes 0.3 miles of system road decommissioning with positive benefits.	Low, slightly increased risk of sedimentation (greatest among the alternatives) in the short term due to 2 miles of temporary road construction and subsequent obliteration; 3.8 miles of abandoned road reconstruction and 2.1 miles of closed system road reconstruction. Risk of sedimentation reduced over the long run from improvement and subsequent obliteration of abandoned roads. Includes 1.7 miles of system road decommissioning with positive benefits.
Effects on Fisheries	No Direct Effect	No Direct Effect. Indirect Effect of slightly increased risk in short-term, decreased risk in long-term.	No Direct Effect. Indirect Effect of more increased risk in short-term, more decreased risk in long-term. .

	Alternative 0	Alternative 2	Alternative 6
Potential Percentage Of Stand In A Detrimental Soil Condition Due To Road Construction, Landings and Skid Trails	Existing condition – 6 percent in detrimental soil conditions.	Estimated 3 percent increase in detrimental soil condition; 9 percent cumulative total.	Estimated 5 percent increase in detrimental soil conditions; 11 percent cumulative total
Contribution Toward Achieving LSR Objectives	Passive restoration continues. About 1,000 acres of 40- to 50-year-old stands are not in the desired condition. This results in a 0% effectiveness rating.	Treatment of 506 acres will move individual stands toward the desired condition. This results in a 51 percent effectiveness rating[17].	Treatment of 707 acres will move more individual stands and a greater proportion of the watershed toward the desired condition. This results in a 71 percent effectiveness rating.
Financial Analysis: Cost-Benefit Ratio	NA	1.10	1.01
Financial Analysis: Present Net Value	NA	$190,000	$40,000
Effects on T and E Species	No Direct Effect	May affect, not likely to adversely affect bald eagle, bull trout, and Designated Critical Habitat for spotted owl and marbled murrelet. May affect, likely to adversely affect spotted owl, marbled murrelet. Follows Programmatic Biological Opinion (August 2003, as amended October 2004)	May affect, not likely to adversely affect bald eagle, bull trout, and Designated Critical Habitat for spotted owl and marbled murrelet. May affect, likely to adversely affect spotted owl, marbled murrelet. Follows Programmatic Biological Opinion (August 2003, as amended October 2004)

[17] Effectiveness rating is the proportion of stands meeting treatment criteria (1000 acres) that would be treated in each alternative.

	Alternative 0	**Alternative 2**	**Alternative 6**
Impacts on Sensitive Wildlife Species	No Direct Effect	May impact pocket gophers, but will not lead to listing under ESA, no other direct effects.	May impact pocket gophers, but will not lead to listing under ESA, no other direct effects.
Impacts on Sensitive Fish Species	No Direct Impacts.	No Direct Impacts.	No Direct Impacts.
Effects on Management Indicator Wildlife Species (MIS)	No Direct Effects.	No effect on most MIS species, short-term increase in forage and decrease in cover for deer and elk	No effect on most MIS species, short-term increase in forage and decrease in cover for deer and elk.

CHAPTER 3 - ENVIRONMENTAL CONSEQUENCES

This section provides the scientific and analytical basis for comparison of alternatives presented in Table 4. It describes the existing physical, biological, and social environment and potential effects under each alternative. The focus of this section is on the key issues:

ISSUE 1: Potential for Accelerated Erosion, Sediment Delivery, and Loss of Soil Productivity, and Effects on Fisheries

ISSUE 2: Effects of Thinning On Stand Development and Meeting LSR Objectives.

ISSUE 3: Economic Viability

ISSUE 4: Effects on Threatened, Endangered, and Proposed Species (ESA), Sensitive Species, MIS Species, Survey and Manage Species

Potential for Accelerated Erosion, Sediment Delivery, and Loss of Soil Productivity, and Effects on Fisheries

Affected Environment

The geology, landforms, and soils within the Matheny Creek watershed are discussed at length the 1995 Watershed Analysis and will not be repeated here. Maps and narratives displaying the ecological soil map units for the project area are in the project files. Soils within proposed harvest units where the inventory management interpretations identified concerns from management activities were investigated in the field.

The project area contains mostly headwater streams that have gradients that are steep enough to transport sediments downstream. Units B15 to B21, C12, and C28 are on landscape features that have a high mass wasting potential. Headwater streams in or adjacent to these units are considered source reaches; in other words, they supply sediment through natural mass wasting processes or are highly susceptible to disturbances associated with roads, particularly drainage. The south side of the creek has more potential for mass wasting and sediment delivery than the north.

The 1995 Matheny Creek Watershed Analysis summarized the potential negative effects on stream flow, sediment delivery, and groundwater interception from existing roads within the eight subwatersheds that make up the Matheny Creek watershed. These effects increase proportionately with total road density, steepness, mileage within riparian reserves, and number of stream crossings. Table 4-C (page C-16 of the Watershed Analysis) described the road density and relative condition of each subwatershed.

The "Mainstem Matheny" Subwatershed (34B-00) ranked "High" for risk of sedimentation, owing to the "open road running surface, cutslope erosion, and existing debris flow and streambank failure tracks…Potential sediment sources are also believed to be the highest of the subwatersheds, due to the length of midslope roads, number of stream crossings which intersect unstable geomorphic terrains, and age and type of road construction."

The "Hook Branch" Subwatershed (34F) and the "Upper Matheny" Subwatershed (34I) rated "Moderate" for potential sediment sources because the roads within these subwatersheds crossed numerous unstable landforms. The remaining five subwatersheds ranked "Low" for sedimentation risk from existing roads.

The watershed analysis further described the effects from clearcutting on the physical environment. Page C-8 stated, "Debris flows associated with timber harvest are primarily the result of decreases in root strength and changes in hydrology due to clearcutting and burning." However, the Watershed Analysis also disclosed that, "Natural recovery occurs as vegetation is reestablished…usually within 5 years." All of the plantations within the Matheny Creek watershed are older than 5 years (see page C-44). Approximately 2,500 acres were clearcut between 1955 and 1964 (the age range targeted in the Matheny Complex thinning project). Ninety-eight percent of the watershed meets the criteria for hydrological maturity.

The watershed analysis disclosed that 117 miles of road existed in the Matheny Creek watershed in 1995. Of these, 52 miles were open to vehicular traffic. Most of the roads were built between 1950 and 1980, however approximately one mile was constructed as recently as 1991.

Since 1995, road restoration activities within the watershed have been extensive. Approximately 10 miles of road have been decommissioned, much of this within the "Mainstem Matheny" subwatershed. In addition, numerous projects such as sidecast pullback, storm damage repair, and road stabilization and upgrading have occurred. The 2003 Access and Travel Management Plan (ATM) recommended an additional 18 miles of secondary road decommissioning on the 2140 and 2160 road systems. No funding is currently secured for this decommissioning; a timber sale would provide the potential for funding through KV or stewardship contract authorities to be used for additional road decommissioning work within the proposed sale area boundary.

Table 5 displays road mileage in 1995 (from the Watershed Analysis), current condition following road decommissioning that has occurred since 1995, and the desired road mileage based on the ATM.

Table 5. Matheny Creek Watershed Road Mileage

	Matheny Creek Road Mileage
1995	117
2004	107
ATM	89

Over the last ten years, approximately 350 acres have been commercially thinned in Matheny Creek Watershed (Mat Wat and Mouse Inn timber sales). In addition, approximately 750 acres have been precommercially thinned, employing prescriptions designed to facilitate late-successional development through time. These projects have implemented Watershed Analysis recommendations in the area. Forest Plan Standards and Guidelines state "detrimental soil conditions should not exceed 20 percent". Detrimental soil conditions are currently estimated at about six percent of the project area, including the existing road system.

Significant populations of anadromous and resident salmonids use the Matheny Creek watershed for spawning and rearing. Fall coho (*Oncorhynchus kisutch*), winter and summer run steelhead (*O. mykiss)*, spring/summer and fall run chinook (*O. tshawytscha*), sea run and resident cutthroat trout (*O. clarki*) also use the Matheny Creek watershed. Native char (bull trout/Dolly Varden) are found in the Queets system, but their presence has not been documented in the Matheny watershed. During September 1999, the Pacific Ranger District had a survey crew from the Olympic National Park conduct surveys for bull trout presence in the mainstem of Matheny Creek, from the confluence with the Queets to RM 11.0. Surveying was accomplished using day and night snorkeling techniques and backpack electro-shockers. No native char were detected.

Anadromous and resident salmonids are found within the mainstem of Matheny Creek and the lower portions of several tributaries. No fish are present in streams found within units proposed for treatment, with the possible exception of the streams within unit C12 where presence is suspected but not confirmed (based on the 1995 Watershed Analysis). Sediment delivery and removal of streamside shade are the primary water quality issues related to the proposed project that may affect fish. Even though fish are not confirmed within the project area, streams in the area eventually flow into fish bearing reaches.

Environmental Consequences

Alternative 0 - No Action

No trees would be felled or yarded under Alternative 0. No *direct* effects on erosion, sediment delivery, or soil productivity would occur associated with commercial timber harvesting and road construction. No direct increase in detrimental soil conditions such as compaction, displacement, or puddling would occur under No Action.

In the absence of land management, soil productivity within the proposed units would continue to improve (in 20 to 50 years). Compaction and displacement would continue to be ameliorated through natural restoration processes, for example freeze/thaw, tree root expansion, ground cover root mass expansion, and organic matter, leaf, and litter layer development. There would be no direct effects on hydrological maturity within the watershed.

Under Alternative 0, there would be no effect on water quality. The present sediment recruitment rates into stream channels would continue. The current amounts of bedload and suspended sediment routed down stream channels associated with natural conditions and previous activities (timber harvest, road building) would slowly reduce over time, through regrowth of the cut-over areas within the drainage.

The effects of existing road conditions would continue. Road maintenance and repair would continue to the extent necessary to prevent ongoing resource damage and protect public safety, within existing budgets. No currently closed or abandoned roads would be opened. Road decommissioning would not occur.

Alternative 0 would have no *direct* effects on the road system. No temporary roads would be built. Alternative 0 would have no direct effects on water quality or fish habitat. Detrimental soil conditions are currently estimated at about six percent of the project area, including the existing road system. This meets the Forest Plan standard of less than 20 percent detrimental conditions within a project area.

The *indirect* effect of Alternative 0 is that opportunities to accomplish needed road work with a timber sale or sale proceeds would be foregone. Since no additional treatments would be associated with Alternative 0, this alternative would not contribute to the cumulative beneficial effects of road restoration. In their present condition, the abandoned roads have old fills and degraded culverts that could potentially fail. Alternative 0 would not add to *cumulative* soil, water quality, or fisheries effects.

Alternative 2

Alternative 2 includes about 506 acres of thinning and yarding merchantable trees. Approximately 167 of the 506 acres are within Riparian Reserves. Alternative 2 would approve log haul on approximately 32 miles of open system roads. No temporary roads would be built; short landing extensions would be allowed where necessary to control and reduce runoff and sedimentation, and to accommodate safe yarding and hauling. Alternative 2 would reconstruct about 1.4 miles of system roads that are currently closed[18] (2140-130, 2140-211). The purchaser would close these roads again after treatments were completed. About 1.3 miles of existing roads within Riparian Reserves would be used in Alternative 2.

In addition, Road 2140-211 (0.3 miles) would be decommissioned (as per the ATM) as part of the project.

Alternative 2 meets all Riparian Reserve Standards and Guidelines and would contribute to achieving Aquatic Conservation Strategy Objectives. Thinning as proposed would follow Matheny Creek Watershed Analysis recommendations such as:

- Increase Coarse Woody Debris recruitment rates for aquatic habitat (p. E-9).
- Reduce habitat fragmentation in the downstream portions of mainstem Matheny Creek. Include the mitigation of edge effects on ecological old-growth stands through plantings of trees, thinning to promote growth, etc. (p. E-9).
- Improve horizontal and vertical diversity in coniferous forest stands in the mainstem Matheny, South Fork, Hook Branch, and Middle Fork Matheny Creek (p. E-10).
- Strategic stand thinning and gap creation could be employed in the early- and mid-seral stages to promote late-seral characteristics and short-term forage (p. E-10).

[18] Closed system roads are also referred to as Maintenance Level 1 Roads.

- Enhance and maintain hardwoods with emphasis on riparian zones and mesic plant association groups with hardwood potential. Use plantings, thinning, and harvest prescriptions to establish hardwoods or reduce competition from conifers (p. E-10).
- Create snags and large woody debris in stands that are below acceptable levels (Brown et al. 1985). Emphasize stands within spotted owl core areas and riparian zones and prioritize early- and mid-seral stage stands in low and mid-elevation stands that have been most affected by fires, salvage, and timber harvest (p. E-11).
- Use silvicultural treatments to accelerate development of late-seral multi-storied stands for wildlife habitat enhancement in lower mainstem (p. E-11).

The watershed analysis indicates that these activities would contribute to attainment of ACS objectives in the watershed.

Direct and Indirect Effects - Roads

The direct effect of reconstructing 1.4 miles of currently closed roads in Alternative 2 would be a slightly increased risk of road-related adverse effects as described in the watershed analysis. No stream crossings are associated with the reconstruction.

Log hauling on gravel forest roads could increase fine sediment runoff and further degrade stream substrate (fish habitat) conditions if it is transported downstream. However, mitigation measures such as restricting use of roads during excessively wet periods (see Table 1) and expected low traffic volumes per day, would substantially reduce the potential amount of sediment delivered. These risks are also considerably reduced by application of design features and mitigation measures such as the application of Best Management Practices, adherence to Forest Plan Standards and Guidelines, and other design features and mitigation measures listed in Table 1. A short-term increase in road density would occur due to opening of existing roads. However, reconstructing abandoned roads would have a net positive benefit to the watershed because road conditions would be improved (i.e., drainage structure improvements, proper road closures, and decommissioning would occur post-treatment). Sediment inputs from the project are not likely to have a substantial effect on water quality or fish.

Units B15 to B21, C12, and C28 are on landscape features that have a high mass wasting potential. Headwater streams in or adjacent to these units are considered source reaches; in other words, they supply sediment through natural mass wasting processes or are highly susceptible to disturbances associated with roads, particularly drainage. However, design features and mitigation measures listed in Table 1, including Best Management Practices, would adequately protect these streams.

After timber harvest activities are complete, all closed roads specifically opened for the project would be closed again or decommissioned. The direct effect of decommissioning 0.3 mile of road as part of this project would be a slightly reduced risk of road-related adverse effects over the long term (road density would not be appreciably reduced by Alternative 2.)

Another indirect effect of Alternative 2 is that the timber sale would provide timber sale proceeds that could fund for additional road decommissioning and other watershed enhancement projects. These opportunities are described in Chapter 2.

Direct and Indirect Effects – Thinning and Yarding

Thinning and yarding activities have the potential to increase erosion and sediment delivery, particularly in the short-term (first few years after treatment). Temporary reductions in soil productivity may be associated with skidding and skyline trails and landings. Under Alternative 2, the percentage of detrimental soil conditions (soil compaction) in the project area is expected to increase by three percent from skidding, skyline trails, and landings.

Soil compaction may result in the loss of porosity and reduce water infiltration rate and saturated hydraulic conductivity. Microbial populations and nitrogen fixation (mycorrhizal fungi) by free-living organisms are decreased in compacted soils, resulting in decreases in nutrient cycling. Compacted areas also restrict root growth, resulting in an overall loss of vigor and increased susceptibility to wind-throw. Ground-based yarding may displace the organic and surface soil layers, increasing the potential for overland flow and erosion.

However, project design criteria and mitigation measures (see Table 1) would reduce the potential for sedimentation associated with ground-based logging. Buffers on all streams and wet areas in the sale area would place activities at a sufficient distance from water sources to protect them from actions foreseeable under this project. Overall, increases in sedimentation should be much less than experienced in the past because of the design features incorporated into this project.

Thinning within the Riparian Reserves has the potential to increase the stand complexity by increasing vegetation species and structural diversity and favoring development of desired habitat elements such as gaps, dense pockets, snags, and coarse woody material. The indirect effect of increased stand complexity would be improved watershed function.

The proposed thinning would not significantly affect hydrological maturity of the watershed. The thinning areas are small in size, juxtaposition, and intensity of treatment and would result in little or no measurable changes to current summer baseflow or winter/spring peakflow regimes (based on published literature regarding impacts of clearcutting such as Christner and Harr 1982, Grant et. al. 1984, Harr et. al. 1989). Thus, the influence of the thinnings on the hydrologic regime of surface waters would be very small and difficult to measure, even if all streams were gauged pre- and post-harvest (in fact, none of the streams of concern are gauged).

Alternative 2 may generate sediment that makes its way to fish habitat downstream. Incorporating design features and mitigation measures listed in Table 1 minimizes the risk of this effect actually occurring. The relatively small scale of the project (500 acres of treatment) in relation to the watershed size (24,000 acres) also limits the potential for adverse effects.

Cumulative Effects

The Matheny Creek Watershed Analysis described the negative effects on erosion, sediment delivery, and loss of soil productivity from past logging and road work. The watershed is currently recovering from these effects. Vegetation management would hasten recovery of these areas. Approximately 2,500 acres were clearcut between 1955 and 1964 (Matheny Creek Watershed Analysis page C-44). Alternative 2 would treat about 20 percent of the acreage in this age class.

Alternative 2 would thin about two percent of the watershed as a whole. This small scale greatly limits the risks and benefits of the project when considered in the context of the watershed as a whole.

The cumulative total of detrimental soils conditions in the project area, including the six percent from the existing road system and other disturbed areas, and the three percent predicted for Alternative 2, is nine percent. This meets the Olympic Forest Plan standard of less than 20 percent detrimental soil conditions within a project area.

As discussed previously, road restoration activity within the watershed has been extensive in recent years. About 9.7 miles of road have been decommissioned, and numerous other restorative projects have occurred. While the road reconstruction and timber harvest activities of Alternative 2 have the potential to increase sedimentation slightly in the short run, the road treatments would ultimately provide a marginal addition to the benefit derived from previous actions. Decommissioning 0.3 mile of road and the possibility that timber sale proceeds could fund watershed enhancement projects would result in slightly increased benefits added to the restorative effects of the projects undertaken to date.

However, under Alternative 2, abandoned roads would not be improved and closed. Abandoned roads would continue to have old fills and degraded culverts that could potentially fail.

Alternative 6

Alternative 6 would approve 707 acres of thinning, about 200 acres more than Alternative 2. About 29 percent of the acreage of 40- to 50-year-old plantations in the Matheny Creek watershed would be thinned (about three percent of the watershed as a whole). Approximately 212 of the 707 acres proposed for treatment are within Riparian Reserves.

Alternative 6 would use the same existing road system as Alternative 2. In addition, about 2.1 miles of currently closed system road would be opened (0.7 mile more than Alternative 2). About 1.7 miles of these would be decommissioned following the project (as per the ATM), with the remaining 0.4 miles returned to Maintenance Level 1 – Closed System Road status following treatment.

Alternative 6 would require construction of about 2.0 miles of temporary roads and reconstruction of 3.8 miles of existing abandoned roads. The purchaser would obliterate all of these roads after treatments are completed.

About 1.3 miles of existing roads within Riparian Reserves would be used in Alternative 6. Of the temporary roads, about one-third of them (0.6 mile) are within Riparian Reserves. In addition, approximately 1.2 miles of the abandoned and currently closed system roads to be reconstructed are within Riparian Reserves. Alternative 6 would construct or reconstruct 10 stream crossings. All new culverts would be sized to accommodate 100-year flow events.

Alternative 6 incorporates the same recommendations from the Watershed Analysis as Alternative 2. Alternative 6 incorporates the same design features, mitigation measures, and adaptive management requirements as Alternative 2. The effects of thinning on hydrological maturity and therefore peak flow would be similar to Alternative 2 (immeasurably small).

Direct and Indirect Effects – Roads

Alternative 6 has greater potential than Alterantive 2 to deliver sediment to streams, mainly due to the number of stream crossings, extent of road construction, and additional haul. However, the additional risk is relatively small. New temporary road construction would be fully mitigated by obliteration and subsoiling as needed. All temporary road segments are within stands proposed for thinning and no large trees would be cut.

Alternative 6 includes road construction and/or reconstruction at 10 stream crossings, and new disturbance within riparian reserves. Two units would include temporary road segments that cross minor, intermittent streams. Culvert installation activities may generate sediment and turbidity (and impact water quality and fish downstream). Sediment pulses would last for a few hours during installation and/or removal before water clears to background levels. Culvert installation and removal would occur during low summer flows and the stream channel would be dewatered during operations if needed. These measures would minimize the short-term impacts of stream crossing reconstruction.

The amount and duration of turbidity associated with culvert installation or removal is within the range of that produced by frequent natural freshets caused by heavy and prolonged precipitation within the watershed. Some additional sediment may be mobilized from disturbed fill slopes at culvert installation sites the first winter before they become fully revegetated. Design features and mitigation measures described in Table 1 would reduce the risk of sediment delivery.

Any sediment which erodes from the disturbed fill slopes would be carried into Matheny Creek and affected tributaries during high flows. The sediment generated from culvert installation areas would be negligible in relation to the high levels of natural sediment carried by the river during normal frequent high flows.

Road work could increase compaction, at least temporarily. Riparian reserves would be affected in some cases. Recent research that examined soil compaction and conifer growth after ground based logging in Washington coastal forests (Miller et. al, 1996) concluded that increased bulk density associated with compacted skid trails is short term (8 -10 years), and that tree growth (height and volume) did not differ among compacted and uncompacted soils. Based upon this research, it is expected that compaction of soils associated with roads and yarding would be short term. Residual tree roots in this thinning operation would aid in ameliorating this compaction. In addition, all temporary roads would be obliterated and subsoiled if needed to reduce compaction. Reconstructing and then obliterating 3.8 miles of abandoned road would result in net long-term watershed benefits since many of these roads were not effectively obliterated when initially closed and now present risk of failure.

Alternative 6 would reduce road density in the Matheny Creek Watershed through decommissioning of 1.7 miles of currently closed system roads. This would reduce road density from the current 2.84 miles per square mile to 2.79 miles per square mile and result in long-term beneficial impacts on water quality and fish (see watershed analysis for discussions about the benefits of road decommissioning).

Alternative 6 includes the possibility of timber sale proceeds that could fund additional road decommissioning and other watershed enhancement work. The temporary roads would allow for parallel skyline yarding corridors that would be lower impact than other yarding methods.

Water quality and downstream fish habitats are not likely to be adversely affected by this alternative.

Direct and Indirect Effects –Thinning and Yarding

Thinning and yarding in Alternative 6 has similar potential to increase erosion and sediment delivery as described for Alternative 2. Alternative 6 treats 200 more acres than Alternative 2, which increases the potential for short-term adverse effects from the project. However, Alternative 6 still treats a relatively small percentage of the watershed, and like Alternative 2, this small scale limits the probability that adverse effects would occur. Under Alternative 6, temporary roads, skid trails and landings are expected to increase the area compacted by five percent (as compared to three percent under Alternative 2).

Alternative 6 incorporates the same recommendations from the Watershed Analysis as Alternative 2. Alternative 6 incorporates the same design features, mitigation measures, and adaptive management requirements as Alternative 2. Alternative 6 does have increased potential for short-term adverse effects from proposed road work as compared to Alternative 2. However, some of the abandoned roads are currently in poor condition, and the work associated with Alternative 6 would result in long-term improvements to the condition of areas adjacent to these roads.

Cumulative Effects

The cumulative total of detrimental soil conditions in the project area, including the six percent from existing road systems and other disturbed areas, and the five percent predicted for Alternative 6, is 11 percent. This meets the Olympic Forest Plan standard of less than 20 percent detrimental soil conditions within a project area.

As discussed previously, road restoration activities within the watershed has been extensive in recent years. About 9.7 miles of road have been decommissioned, and numerous other restorative projects have occurred.

While the road reconstruction and timber harvest activities of Alternative 6 have the potential to increase sedimentation in the short run, the road treatments will ultimately provide additional benefits. Decommissioning 1.7 miles of road and the possibility of funding for additional watershed enhancement would result in slightly increased benefits added to the restorative effects of the projects undertaken to date.

Effects of Thinning on Stand Development and Meeting LSR Objectives

Affected Environment

The Quinault North and South LSR Assessment was prepared in 1996 to characterize the existing and desired condition for the area. The project area falls within the approximately 48,000-acre Quinault North LSR. The LSR Assessment discussed the major factors influencing forest structure in the LSR, inventoried vegetation conditions, described current land uses and species of interest, and included a fire management plan, implementation schedule and monitoring and evaluation plan. The LSR Assessment also described criteria for developing treatments for specific areas.

Table VI-I in the LSR Assessment described desired conditions for various forest elements. The Assessment prioritized management strategies for achieving those desired conditions. This project falls under Priority 2 (Accelerate), which addressed past harvesting that fragmented the forest. The project also falls under Priority 3 (Diversify), which addressed ecosystems that lack complexity.

Approximately 55 percent of the Matheny Creek watershed was harvested between 1950 and 1995 (see Matheny Creek Watershed Analysis, page C-42). These stands lack species diversity, have a single canopy layer, contain few snags and down logs, and have a high canopy closure. Understory reinitiation and individual tree growth has been retarded, delaying the development of a fully functional ecosystem. Broadcast burning within the clearcuts may have volatilized organic material; however, this is not a serious problem in this area because soil nitrogen is not a limiting factor.

Approximately 1,000 acres of 40- to 50-year-old plantations are in a condition that meets treatment criteria. The stands are even-aged and in the competitive exclusion or stem exclusion stage (Oliver and Larson 1991). Current relative densities indicate the stands generally are well into the "zone of imminent mortality." The canopy is at full closure, growing space is fully occupied, and crown recession parallels height growth. Further information on stand conditions is in the silviculture report in the project file. Some of the harvested stands have been thinned and are in the understory reinitiation phase. The past thinning created a two-tiered stand in some cases.

These stands are generally composed of a mix of hemlock, Douglas-fir, Sitka spruce, and a few red alder, western redcedar, and Pacific silver fir. Many of the stands are dominated by hemlock, some by Douglas-fir. They lie generally in the western hemlock and Pacific silver fir vegetation zones, from about 800 feet to about 2,400 feet elevation. Most of the stands were precommercially thinned at around age 15 to about a 10- to 12-foot spacing in anticipation of a commercial thin at age 40 to 50.

Basal areas are in the range of 280 to 360 square feet per acre. Hemlock relative densities range from around 50 to over 80 percent (Flewelling, Wiley, and Drew 1980) and Douglas-fir relative

densities range from 70 to over 100 percent (Curtis 1982). Canopy closure is estimated at 90 percent and greater.

Understory vegetation is generally sparse in these stands. There are numerous small snags, 6 to 10 inches DBH, but few larger snags. Coarse woody debris levels (CWD) are generally in the range of 8 to 12 percent cover (based on ocular estimates). Further information on stand conditions is in the silviculture report in the project file.

Environmental Consequences

Alternative 0 - No Action

Under Alternative 0, at least 1,000 acres of over-dense, 40- to 50-year-old plantations that meet LSR treatment criteria would not be commercially thinned. Tree-to-tree competition would result in crown recession (low crown ratios) and loss of growth and vigor. Trees would become more susceptible to insects and root diseases. Height/diameter (H/D) ratios would increase and could approach 100, where trees are at risk of succumbing to the "wet noodle effect" - bending and buckling under otherwise benign wind loads (Oliver and Larson 1990). The shrub and herb layer would remain sparse to non-existent, and the stand structure would remain simplified, with only a single canopy layer for many years.

Alternative 0 would have no *direct* effects on stand development. The *indirect* effect of Alternative 0 is that the stands would retain their "even-age and uniform spacing for many years" (see LSR Assessment page VI-7). Eventually, the stands would develop the full array of late-successional features (ibid. page VI-8).

Alternative 0 would not violate any LSR S&Gs, but would forgo opportunities to use thinning to meet LSR objectives. Since none of the stands identified as meeting LSR treatment criteria would be treated, Alternative 0 would receive a zero percent effectiveness ranking.

Alternative 2

Direct Effects

Alternative 2 would approve commercial thinning on about 506 acres (one-third of the originally identified project area). Variable density thinning would promote the development of late-successional characteristics by

- accelerating tree growth for the development of large trees, snags, and coarse woody debris,
- emphasizing retention of minor species overlooked by past management practices, and
- by providing opportunities to augment the numbers of snags and ground coverage of coarse woody debris (LSR Assessment, page VI-8).

Variable density thinning would also enhance spatial diversity by leaving some areas unthinned while creating gaps in the canopy in others. Design features and mitigation measures displayed in Table 1 would adequately minimize risk of any adverse effects on late-successional habitat elements, primarily because they would ensure that LSR Assessment findings and recommendations are followed.

Indirect Effects

Alternative 2 would likely improve habitat conditions for late-successional species on 506 acres (about two percent of the Matheny Creek watershed) by moving stands into the understory reinitiation stage of stand development. Increased light reaching the forest floor would stimulate the introduction and development of the herb and shrub layer, thus increasing structural and species diversity in the stands. Where light levels are increased sufficiently through thinning, hemlock and silver fir seeds in the litter layer would germinate and begin to develop an additional coniferous canopy layer. Large diameter trees would grow more quickly and shade-tolerant species would begin to occupy the understory. This would move the forest toward the objective of being multi-layered and structurally diverse (ibid.)

Over time, the shrub and herbaceous biomass will begin to increase over the unthinned stand condition, beginning with the first growing season following treatment. Stand basal area (of conifer trees) will approach or exceed pre-treatment basal area within approximately five years, based on observations of similar conditions.

Cumulative Effects

The Quinault LSR Assessment described the negative effects on late-successional habitat from past harvest and other disturbances. The watershed is currently recovering from these effects. Vegetation management within the watershed will hasten recovery of these areas.

Approximately 2,500 acres were regeneration harvested (clearcut) between 1955 and 1964 (Matheny Creek Watershed Analysis page C-44). Alternative 2 would treat about 20 percent of the acreage in this age class. Alternative 2 would thin about 51 percent of the 1,000 acres identified as meeting LSR treatment criteria, thus it would receive a 51 percent effectiveness ranking.

The treatment area of Alternative 2 would expand the acreage within the watershed overall which has received silvicultural treatment designed to enhance habitat characteristics and promote development of late-successional structure. Over the last ten years, approximately 350 acres have been commercially thinned in Matheny Creek Watershed (Mat Wat and Mouse Inn timber sales), in a manner similar to that proposed for this project. In addition, approximately 750 acres have been precommercially thinned, employing prescriptions designed to facilitate late-successional development through time. The addition of 505 acres treated in Alternative 2 would bring the amount of area within the watershed which has been moved toward desired future condition through silvicultural treatments to more than 1,600 acres.

Alternative 6

Direct Effects

Alternative 6 would approve commercial thinning on about 707 acres (about half of the originally identified project area). Alternative 6 would have the same effects as Alternative 2, on 200 more acres.

Indirect Effects

Alternative 6 would likely improve habitat conditions for late-successional species on 707 acres (about three percent of the Matheny Creek watershed).

Cumulative Effects

Alternative 6 responds to the same past effects as Alternative 2, except it treats more acreage. Alternative 6 treats about 71 percent of the 1,000 acres identified as meeting LSR treatment criteria. It has an effectiveness ranking of 71 percent (compared to 51 percent for Alternative 2).

The treatment area of Alternative 6 would expand the overall acreage within the watershed that has received silvicultural treatment designed to enhance habitat characteristics and promote development of late-successional structure. Over the last ten years, approximately 350 acres have been commercially thinned in Matheny Creek Watershed (Mat Wat and Mouse Inn timber sales), in a manner similar to that proposed for this project. In addition, approximately 750 acres have been precommercially thinned, employing prescriptions designed to facilitate late-successional development through time. The addition of 707 acres treated in Alternative 6 would bring the amount of area within the watershed which has been moved toward desired future condition through silvicultural treatments to more than 1,800 acres.

Economic Viability

Affected Environment

Cost-effectiveness is an important aspect of any project plan. In this case, the only certain funding source to accomplish the LSR thinning is through the sale of wood products that would be removed as part of the treatment.

Several factors influence cost-effectiveness. Costs considered in this financial analysis include:

- Yarding and haul costs
- Road construction and reconstruction
- Seasonal stormproofing and maintenance
- Road rehabilitation (decommissioning) after treatment

The analysis also considers the value of wood products sold as a result of the project, based on similar sales in the Olympic National Forest.

The socio-economic environment affected by activities within the Olympic National Forest is discussed in the Olympic National Forest Plan Final EIS (1990), the Forest Ecosystem Management Analysis Team (FEMAT) Report (1993), and the Northwest Forest Plan Final EIS (1994). The role of the wood products and forestry service contract industries in the economies of the northwest are discussed in these documents.

No timber harvest is programmed within the LSR, and the Forest Plans do not rely on LSRs to contribute to the wood products industry. However, LSR restoration projects such as the Matheny Complex Thinning Project may contribute to maintaining the wood products industry.

Environmental Consequences

Alternative 0 -No Action

Alternative 0 would have no *direct* costs or benefits. The *indirect* effect of Alternative 0 is that the costs and benefits of treating the stands could increase or decrease over time. Past harvesting has generally been cost-effective on the Olympic National Forest.

Alternative 2

Direct Effects

Alternative 2 would cost approximately 1.9 million dollars over three years to implement. The wood products value is estimated at 2.1 million dollars. Thus, the present net value of Alternative 2 is approximately $200,000. Its benefit-to-cost ratio is 1.1.

Indirect and Cumulative Effects

Alternative 2 could provide funding and other indirect economic benefits by helping maintain the wood products and forestry service contract industries. This project is relatively small so its potential for socio-economic effects is negligible.

Alternative 6

Direct, Indirect and Cumulative Effects

Alternative 6 is relatively less cost-effective than Alternative 2. It would cost slightly less than 2.9 million dollars over three years to implement. The wood products value is estimated at

slightly over 2.9 million dollars. The present net value of Alternative 2 is estimated at about $40,000. Its benefit-to-cost ratio is 1.01 (just over the break-even point).

The cost of the road work associated with Alternative 6 would not be fully paid for by the additional timber that would be sold (as compared to Alternative 2). However, the non-monetary benefits of the thinning and road work associated with Alternative 6 would exceed Alternative 2.

The indirect and cumulative effects of Alternative 6 are similar to Alternative 2. Alternative 6 is also relatively small so its potential for socio-economic effects would be negligible. Table 6 and Figure 5 illustrate the monetary and non-monetary trade-offs associated with the action alternatives. The graph on the left in Figure 5 displays the differences in present net value between the action alternatives. The graph on the right displays the differences in effectiveness in meeting the purpose and need for action.

Table 6. Financial Analysis Results

Alternative	Product Value in Millions	Project Cost in Millions	Present Net Value	Benefit to Cost Ratio
2	$2.1	$1.91	$190,000	1.1
6	$2.94	$2.89	$40,000	1.01

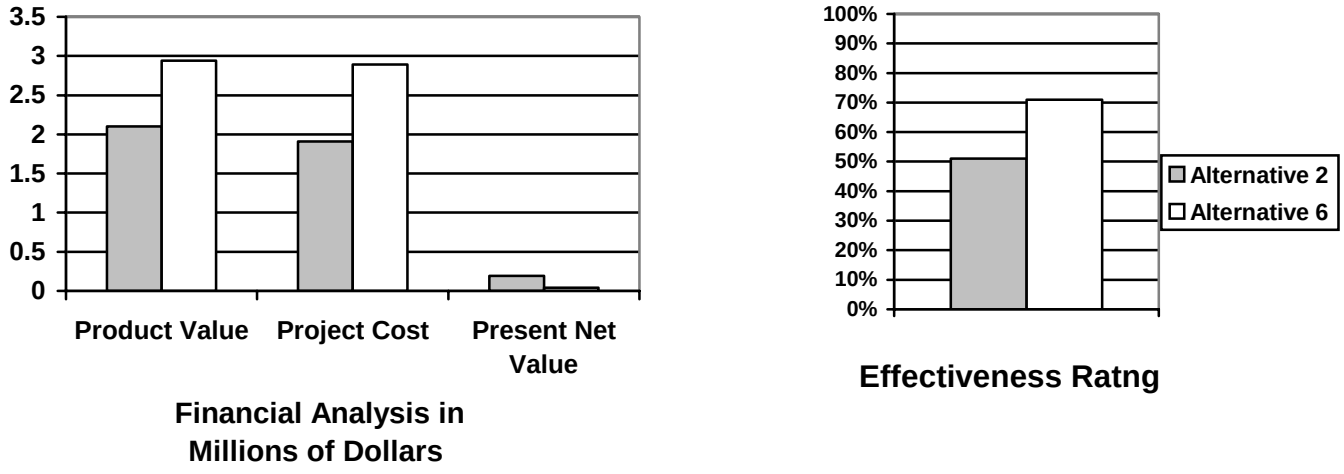

Figure 5. Financial Analysis and Effectiveness Rating Comparison

Effects on Threatened, Endangered, Sensitive, and Management Indicator Species

Affected Environment

Wildlife habitat in the Matheny Complex project area is reflective of the various vegetation conditions described previously. The Matheny Creek Watershed Analysis (USDA 1995) and Quinault LSR Assessment (USDA 1996) also discuss wildlife habitat characteristics and management recommendations. As discussed previously, the proposed thinning would promote development of late-successional forest structure (large trees, snags, and coarse woody debris). Minor species overlooked by past management practices would be favored. Some aspects of the treatment prescription may be more beneficial to some species (spotted owl) and less to others (marbled murrelet), but the treatments would generally improve conditions for all late-successional species.

This section focuses on special status species including species listed under the Federal Endangered Species Act (ESA), listed as Forest Service Region Six Sensitive species, and Management Indicator Species (MIS). [19]

Federally Listed Species

The project area provides habitat for four species listed under the Federal Endangered Species Act (ESA), the threatened northern bald eagle (*Haliaeetus leucocephalus*), the threatened northern spotted owl (*Strix occidentalis caurina),* the threatened marbled murrelet (*Brachyramphus marmoratus*), and the threatened bull trout (*Salvelinus confluentus*).

The project area is also designated Critical Habitat for spotted owl (WA-52) and murrelet (WA-02). No treatment would occur in bald eagle or spotted owl suitable habitat (nesting, roosting, or foraging) or in murrelet nesting habitat. No treatment would occur adjacent to potential bull trout habitat.

Units proposed for treatment in both action alternatives provide dispersal habitat for spotted owl. Previously unharvested stands in the analysis area provide suitable nesting habitat for spotted owl and murrelet.

Known bald eagle use of the project area is limited to an occasional fly-over or perching of a transient eagle. No nests, winter roost sites, or key foraging areas are located within the Matheny project area. Matheny Creek provides minimal foraging opportunity for bald eagles.

[19] A complete list of special status species considered in this assessment is in the Pre-field Biological Evaluation of the Olympic National Forest Special Status Species. Species with suitable habitat in the project area are considered in detail for this EA.

Spotted owls use the project area and two historic nest territories are located within the analysis area. No reproductive pairs have occupied either of these territories in the past three breeding seasons (as determined by the local demographic studies). Four proposed harvest units are within the 2.8-mile-radius home range of these territories, but no harvest units are within the 0.7-mile radius of a nest core area.

Murrelet have been detected (either visually or aurally) numerous times in the project area; however no documented nest sites are located within proposed harvest units.

Bull trout presence is well documented in the Queets River. Matheny Creek is part of the Queets basin and is managed as if utilized by bull trout, however no bull trout have been documented in surveys of Matheny Creek.

Section 7 Consultation with the U.S. Fish and Wildlife Service (FWS) was completed for effects from routine activities on the Olympic National Forest and a Programmatic Biological Opinion (PBO) prepared in August of 2003, as amended October 2004. The PBO includes project design criteria that apply to thinning projects like the Matheny complex (see Table 1, which includes applicable design features). The PBO determined that activities associated with commercial thinning during the early nesting season may adversely affect spotted owl and marbled murrelet due to harassment resulting from noise disturbance. The PBO also acknowledges potential effects to bull trout from projects like the Matheny Complex Thinning. No threatened or endangered plant species are documented within the project area.

Sensitive Species

Animals

The Regional Forester's Sensitive species list (July 2004) includes the following animals: Cope's giant salamander (*Dicamptodon copei*), Olympic torrent salamander (*Rhyacotriton olympicus*), Van Dyke's salamander (*Plethodon vandykei*), peregrine falcon (*Falco peregrinus*), Olympic pocket gopher (*Thomomys mazama melanops*), Pacific fisher (*Martes pennanti*), Common loon (*Gavia immer*), and Townsend's big-eared bat (*Corynorhinus townsendii*).

Matheny Creek provides the primary habitat for Cope's giant salamander and the Olympic torrent salamander while Van Dyke's salamander primarily use wet meadows. Use of the area by peregrine falcon is not known to occur. There are no cliffs or rock outcrops in the project area that would provide suitable nesting habitat. Foraging habitat is also lacking in the project area. Use of the area by Olympic pocket gopher is not known, but could potentially occur in natural meadows or meadow-like openings created by past harvest activities or along disturbed roadsides. The Pacific fisher is extirpated from Olympic Peninsula. There are no known mines, caves, abandoned wooden bridges or buildings in the area that could be used by the Townsend's big-eared bat. Habitat for the common loon is not found in the area.

Fish

Sensitive fish species including Chinook salmon, chum, coho salmon, and resident and anadromous cutthroat trout occur within the Pacific Ranger District but no habitat would be impacted by any alternative. The Regional Forester's sensitive species list of fish that may occur on the Olympic National Forest are Lake Pleasant and Lake Quinault sockeye, coastal cutthroat trout, coastal Chinook salmon, Pacific coast chum salmon, Olympic mudminnow and Salish sucker. Lake Pleasant and Lake Quinault sockeye and chum salmon are not found in the project area. Salish sucker has not been identified as existing in the Matheny watershed. The Olympic mudminnow has not been identified in the project area, though potential habitat for the mudminnow will not be impacted.

Coastal Chinook salmon and coastal cutthroat trout are found in the project area, but no habitat for these species would be directly impacted by the project. Indirect impacts (downstream impacts from sediment – see discussion under Issue 1) are minimized by incorporating design features and mitigation measures listed in Table 1. Therefore, no sensitive fish species are expected to be adversely impacted by either alternative (and no further discussion of impacts is included in this section).

Vascular Plants, Mosses, Fungi, Lichens and Terrestrial Mollusks

No vascular plants from the Regional Forester's Sensitive Species list were found in the proposed project area. However, there is one plant of special concern in three of the proposed thinning units, B-18, B-19 and B-21. The Quinault fawn lily, *Erythronium quinaultense*, was described as a new species in 2001, as a rare plant endemic to the Olympic Peninsula. It is currently listed as "Threatened" on the Washington State Department of Natural Resources rare plant list and would qualify for inclusion in the next update of the Regional Forester's Sensitive Plant list. Therefore, this plant should be considered as a species of concern for the Matheny project. Implementation of project design features and mitigation measures (Table 1) would result in no affect to the Quinault fawn lily.

There are no documented sites of four sensitive moss species or the fifteen sensitive fungi in the proposed project area. One of the ten sensitive lichen species, *Usnea longissima*, is listed as Forest Service Sensitive only for the State of Washington. It was not inventoried in the pre-2004 field surveys. However, it occurs in numerous areas on the Olympic Forest, and might occur in the Matheny Complex planning area. If trees with this lichen are felled for thinning or road-related work, a few individual lichens may be affected. However, due to similar or higher-quality habitat in forested areas surrounding the proposed thinning units, implementation of the Matheny project would not contribute to any loss of viability for this species.

Six terrestrial mollusk species are on the Olympic National Forest's sensitive species list. Field surveys were conducted for these species in the Matheny Complex project area in 2000 and 2001. Eighty-six locations of slugs in the warty jumping slug complex (*Hemphillia glandulosa and H. burringtoni*) were documented. However, there were no sites of the other four Olympic NF sensitive terrestrial mollusk species. (USDA FS Region 6 & USDI BLM ISMS database and associated GIS covers, 2004).

Although there are documented sites and suitable habitat for two of the sensitive jumping slugs in proposed thinning units and old temporary and unclassified spur roads, this is not a concern for the proposed thinning and road-related activities. Currently listed as two species, the warty jumping slug (*Hemphillia glandulosa*) and the Burrington jumping slug (*H. burringtoni*) are locally common and abundant on the Olympic Forest (Ziegltrum, 2001 Olympic National Forest monitoring report; and Ziegltrum, 2004, Draft Management Recommendations for Two Species of the Genus Hemphillia). Also, the plans for the thinning will leave significant amounts of down woody debris and hardwoods, which are suitable habitat for the jumping slugs. Therefore, the proposed activities would not affect the viability of these mollusks due to their abundance and widespread distribution across the Forest. It should also be noted that they are no longer considered distinct species, but rather species complexes (Wilke, 2004).

Eleven former Survey & Manage species were assessed for this project, since there is currently legal action on the 2004 Record of Decision that placed some survey & manage species onto the Forest Service sensitive list (USDA; USDI 2004). Nine former survey & manage lichens were not added to the Sensitive list. None of these lichens are documented in proposed activity areas in the Matheny Complex (USDA FS Region 6 & USDI BLM ISMS database and associated GIS covers, 2004).

Two of the former survey & manage terrestrial mollusks did not meet Forest Service sensitive species criteria for the Olympic National Forest. They include the *Megomphix hemphilli* snail and the evening field slug, *Deroceras hesperium*. Mollusk field surveys were conduced in 2000 and 2001, and no sites were documented for these two species in the project area (USDA FS Region 6 & USDI BLM ISMS database and associated GIS covers, 2004). Therefore, the proposed actions would not affect suitable habitat for these mollusk species.

Management Indicator Species

Management Indicator Species (MIS) are selected species whose welfare is believed to be an indicator of the welfare of other species using the same habitat or a species whose condition can be used to assess the impacts of management actions on a particular area (Wildlife Habitats in Managed Forests, The Blue Mountains of Oregon and Washington 1979). Management Indicator Species (MIS) that may occur in the project area include pileated woodpecker (*Dryocopus pileatus*), primary cavity excavators, Columbian black-tailed deer (*Odocoileus hemionus columbianus*), Roosevelt elk (*Cervus canadensis roosevelti*), American marten (*Martes martes*), and the federally listed northern bald eagle and northern spotted owl.

With the exception of Roosevelt elk and Columbian black-tailed deer, the MIS represent a suite of species that are dependent on mature and old-growth forest habitat. The black-tailed deer and Roosevelt elk represent wildlife associations that require a mix of vegetative age classes.

The Olympic National Forest Land and Resource Management Plan (Forest Plan) designated land based allocations to provide for the maintenance of sufficient habitat to assure viable populations of indicator species dependent upon old-growth and mature forest habitat types (USDA 1990). These allocations, coupled with associated management direction (standards and guidelines), were designated as specific Management Areas (Management Prescription C2 - pileated woodpecker/pine marten). While no specific land allocations were made to ensure the

maintenance of elk and deer habitat, implementation of the Forest Plan is expected to provide an acceptable mix of habitat conditions.

Forest Plan standards and guidelines require management at a level necessary to met regional policy of maintaining effective populations of primary cavity excavators in excess of 40 percent of their potential population levels. In the mixed conifer plant community for the pileated woodpecker, this equates to a minimum of five snags greater than or equal to 20 inches DBH per 100 acres (Thomas 1979). For the common flicker, the forest would need a minimum of 15 snags greater than or equal to 12 inches DBH per 100 acres (Thomas 1979).

Habitat within the project area for MIS that are dependent on mature and old-growth forests (i.e., pileated woodpecker, other primary cavity excavators, and American marten) is currently limited to areas in late-successional/old-growth (LS/OG) forests between and around the proposed harvest units. Proposed harvest units are over-dense, 40- to 50-year-old clearcuts that are deficit in snags and down wood, and lack overall structure. Suitable habitat for Columbian black-tailed deer and Roosevelt elk is provided in the proposed harvest units as well as in the LS/OG stands. Deer and elk would find some forage in the proposed harvest units, but would primarily utilize the proposed harvest units for cover.

Environmental Consequences

Alternative 0

Under Alternative 0 (no action), approximately 1,000 acres of over-dense, 40- to 50-year-old clearcuts that meet LSR treatment criteria would not be commercially thinned. These stands would remain in early- or mid-seral condition, generally overstocked with a single canopy layer, few snags and down logs, and a high canopy closure. There would be no direct effects to any sensitive, threatened, and endangered species or management indicator species dependent on old-growth habitat. More than 10,000 acres of unharvested area within the watershed would remain in a natural late-successional/old-growth condition and would continue to provide habitat for sensitive, threatened, and endangered species and management indicator species dependent on old-growth habitat.

Indirect effects would be the delayed development of additional acreage of late-successional/old-growth forests that could provide potential nesting, roosting and foraging habitat for sensitive, threatened and endangered species and management indicator species dependent on old-growth habitat. Indirect impacts may also result in the loss of meadows or meadow-like openings through the encroachment of conifers and the revegetation of roadsides, thereby reducing the amount of habitat for the Olympic pocket gopher. There would also be opportunities lost to improve forage conditions for deer and elk through thinning treatments. Opportunities to decommission existing roads would be lost; this could result in long-term indirect negative effects to sensitive, threatened, endangered and Management Indicator species due to higher road densities, erosion, and mass wasting, all of which could lead to degraded habitat conditions.

Alternative 2

Direct Effects

Alternative 2 would approve commercial thinning on about 506 acres (about half the acres considered for treatment in this EA). Effects from the thinning on bald eagle are limited due to their infrequent and transient use of the project area. Individuals could be disturbed during project activities, but no adverse effects are expected. The project may have adverse effects on spotted owl and marbled murrelet. Harvest operations during the early nesting season could result in harassment if activities are adjacent to suitable habitat. Harvest units and operational timing are designed to buffer adjacent suitable habitat to limit potential disturbance and avoid harassment of spotted owls or murrelets from harvest activities. Four units (B-3, B-10, B-16, and C-12) could have activities during the early nesting season and are adjacent to suitable habitat. All other units adjacent to suitable habitat would employ the mitigation measure described in Table 1 to eliminate the potential for significant disturbance. The maximum amount of suitable habitat that could be adversely affected from early breeding noise disturbance by Alternative 2 would be 49 acres. Alternative 2 would not have adverse effects to Designated Critical Habitat for the northern spotted owl and marbled murrelet.

The thinning prescription would maintain existing spotted owl dispersal habitat in the treated stands by maintaining more than 40 percent canopy cover in trees larger than 11 inches diameter. No nesting, roosting, or foraging habitat would be treated. Use of the project area by murrelets would be limited to nesting in areas of LS/OG forest outside the proposed harvest units or by birds passing through adjacent stands when returning to a nest site from foraging. Murrelets returning from foraging trips may also be disturbed by project activities. Conservation measures shown in Table 1 preclude project activities for two hours after sunrise and two hours before sunset to minimize disturbance to foraging murrelets that may be nesting in adjacent stands.

Alternative 2 would have little to no impact on any of the sensitive wildlife species that may occur in the project area. Habitat conditions present in the proposed harvest units provide a minimal amount of suitable habitat for any sensitive species. Use of the project area by Cope's giant salamander, Olympic torrent salamander, and Van Dyke's salamander would be limited to riparian habitats (including moist/wet meadows) and openings that would be buffered from treatment (table 1). Reconstruction of closed or abandoned roads may impact current use of old roadbeds by gophers but would not threaten population viability in the watershed.

Since the proposed harvest units provide virtually no habitat for old-growth dependant species, activities associated with the proposed action would have no direct effect on the pileated woodpecker, primary cavity excavators, and American marten. However, deer and elk may make some use of the proposed harvest units for forage and for a source of cover. Thus, Alternative 2 would likely cause short-term direct impacts from harvest activities and associated disturbances. Forage conditions would likely be improved in the short-term; cover quality may be reduced until the canopy closes again.

More than 10,000 acres of unharvested area within the watershed would remain in a natural late-successional/old-growth condition and would continue to provide habitat for bald eagle, spotted owl, and murrelet. No habitat for sensitive species would be affected. Alternative 2 would use approximately 32 miles of open system road to access the stands to be thinned. About 1.7 miles of road would be constructed or reconstructed and closed or decommissioned after use. Road

work under Alternative 2 would benefit threatened, endangered, and sensitive species by decreasing open road density as compared to Alternative 0.

Since bull trout are mainly found within anadromous salmonid reaches, and none of the streams within the units are fish bearing, no direct effects to potential bull trout habitat would be expected. All applicable measures to protect fisheries would be implemented with the project. The project is consistent with the applicable Endangered Species Act Programmatic Biological Opinion related to fish.

Indirect Effects

Development of late-successional/old-growth conditions would be accelerated in treated stands, thereby improving habitat conditions in the long term for threatened, endangered, sensitive, and Management Indicator species associated with late-successional forests on 506 acres (about two percent of the Matheny Creek watershed).

Overall, habitat conditions for bald eagle, spotted owl, and marbled murrelet would not be significantly affected due to the relatively small number of acres treated. Habitat conditions for sensitive species (salamanders) would be slightly improved through increased recruitment of coarse woody material into riparian reserves. Long-term beneficial impacts to the pocket gopher may be realized if open meadows are maintained. Decommissioning or closing currently abandoned roads would also improve long-term habitat conditions for pocket gopher.

Accelerated development of LS/OG structure would improve habitat conditions for MIS in the long-term. This would be especially important for the pileated woodpecker and other primary cavity excavators since current snag components are generally small diameter (6 to 10 inch DBH) and extremely limited. Indirect effects may also be realized from post-harvest-sale-area improvement projects. For instance, snag creation projects are proposed through KV funding to supplement the natural recruitment process.

Reconstruction of 1.4 miles of road could have indirect, short-term, negative effects by increasing human activities (disturbance) as well as attracting corvids and thereby increasing predation (especially to murrelets). After completion of harvest, the closing of all reconstructed roads and 0.3 mile of road decommissioning may result in long-term, indirect, beneficial effects from the stabilization and revegetation of these old road grades.

There is potential for some indirect impacts to bull trout habitat through sediment delivered downstream from road haul and road construction or deconstruction. However, it is not expected to be a measurable impact over and above natural levels.

Cumulative Effects

Between 1997 and 2001, 350 acres of commercial thinning occurred in the Matheny watershed (USDA 1995). These projects were in the western portion of the watershed that is primarily at lower elevations and downstream from the current project area. In addition, approximately 750 acres of precommercial thinning was conducted throughout the watershed. These activities, when considered cumulatively with Alternative 2, would accelerate the development of late-successional/old-growth conditions on 856 acres and move 750 acres toward suitable spotted owl dispersal habitat within the Matheny Creek Watershed. Additional stand tending would likely be needed in ten years or longer to fully reach desired conditions for late-successional species.

Alternative 6

Alternative 6 would approve commercial thinning on about 707 acres (about half of the acreage originally identified as meeting LSR treatment criteria). Variable density thinning would accelerate the development of late-successional characteristics similarly to Alternative 2, but on an additional 200 acres. Alternative 6 would treat approximately three percent of the watershed (compared to two percent for Alternative 2).

Direct and Indirect Effects

Alternative 6 is consistent with the PBO. Like Alternative 2, Alternative 6 "may effect, is not likely to adversely affect" bald eagle and "may effect, is likely to adverse affect" spotted owl and marbled murrelet. Harvest operations during the early nesting season could result in harassment if activities are adjacent to suitable habitat. Harvest units and operational timing are designed to buffer adjacent suitable habitat to limit potential disturbance and avoid harassment of spotted owls or murrelets from harvest activities. Four units (B-3, B-10, B-16, and C-12) could have activities during the early nesting season and are adjacent to suitable habitat. All other units adjacent to suitable habitat would employ the mitigation measures in Table 1 to eliminate the potential for significant disturbance. The maximum amount of suitable habitat that could be adversely affected from early breeding season noise disturbance by Alternative 6 would be 59 acres (compared to 49 acres in alternative 2). In addition, approximately two miles of temporary road would result in a loss of 4 acres of critical dispersal habitat, however the removal would not be considered an adverse effect to Designated Critical Habitat for the northern spotted owl or marbled murrelet.

Like Alternative 2, Alternative 6 is also associated with a "may impact individuals but not likely to lead toward federal listing or loss of viability" for pocket gophers. Habitat conditions for salamanders would be slightly improved through increased recruitment of coarse woody material into riparian reserves.

Alternative 6 would impact no other sensitive species. Increased road densities associated with 2.0 miles of temporary road construction may slightly reduce the habitat effectiveness of the project area for deer and elk but the total increase in miles of road is so small as to be insignificant.

Since bull trout are mainly found within anadromous salmonid reaches, and none of the streams within the units are fish bearing, no direct effects to potential bull trout habitat would be expected. All applicable measures to protect fisheries would be implemented with the project. The project is consistent with the applicable Endangered Species Act Programmatic Biological Opinion related to fish.

Cumulative Effects

The cumulative effect for Alternative 6 is similar to Alternative 2, with an additional one percent of the watershed associated with improved habitat conditions. An additional 6.5 miles of road construction and reconstruction (as compared to Alternative 2) could impact pocket gopher. After harvest, these roads would begin to revegetate and loose their habitat quality. Alternative 6 would decommission 1.7 miles of system road, which would have habitat benefits for most species. Over the long term, Alternative 6 would contribute to meeting habitat conservation goals slightly more effectively than Alternative 2.

Other Effects

Neo-tropical Migratory Birds

Executive Order (EO) 13186 signed by the President on January 10, 2001 defined the responsibility of federal agencies to protect migratory birds and their habitats. The intent of the EO was to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and minimize the take of migratory birds through consideration in land use decisions and collaboration with the U.S. Fish and Wildlife Service (FWS). Pursuant to EO 13186 the Forest Service entered into a Memorandum of Understanding with the FWS in January 2001 with the express purpose of incorporating migratory bird habitat and population management objectives and recommendations into the agency planning processes. To that end, bird conservation is an issue and shall be discussed in terms of effects as well as incorporation of mitigation.

Affected Environment

The Olympic National Forest falls within the Northern Pacific Rainforest delineation of Bird Conservation Regions (BCR) identified by the North American Bird Conservation Initiative. The coastal rainforest conservation region stretches from the western Gulf of Alaska south through British Columbia and the Pacific Northwest to northern California. Heavy precipitation and mild temperatures characterize its maritime climate. Forests of western hemlock and Sitka spruce in the far north dominate the region, with balsam fir, Douglas-fir, and coast redwood becoming more important farther south. Broadleaf forests are found along large mainland river drainages. High priority breeding forest birds include the spotted owl, marbled murrelet, Northern goshawk, chestnut-backed chickadee, red-breasted sapsucker, and hermit warbler.

Environmental Consequences

Project design criteria and mitigation measures (table 1) incorporate several seasonal restrictions including a limited operating period on all but four treatment units in both action alternatives for all harvest activities from March 1 to August 5. This measure alone will minimize the loss of nests during the reproductive season. Treatment prescriptions are designed to improve habitat for late-successional species including the spotted owl, marbled murrelet, and Northern goshawk. Due to the relatively small amount of acres proposed for treatment in either action alternative, the impacts to neo-tropical migrants is determined to be a very short-term loss of productivity with long-term benefits derived from improved habitat conditions.

ACS Consistency

The Olympic National Forest Plan was amended in March 2004 to require the following analysis for projects within Riparian Reserves:

> The record for a project within a Riparian Reserve must: (1) describe the existing condition, including the important physical and biological components of the fifth-field watershed(s) 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 record will address these items at a level of detail in proportion to the project. The project is consistent with Riparian Reserve standards and guidelines on pages C-31 to C-38 of this attachment that include direction to "meet," "not adversely affect," "not retard or prevent attainment of" or otherwise achieve ACS objectives, if the decision maker determines from the record that the project is designed to contribute to maintaining or restoring the fifth- field watershed over the long term, even if short-term effects may be adverse.

The existing condition of the fifth-field watershed is discussed throughout the Affected Environment sections of this EA, based on the Matheny Creek Watershed Analysis and updated information. The most important environmental indicators regarding the effects of this project include road condition, road density, and potential for development of late-successional/old-growth forest characteristics within riparian reserves in plantations. The EA compares the 1995 Watershed Analysis condition to the current condition. Table 4 summarizes the predicted effects on these indicators for the alternatives.

Both action alternatives are designed to contribute to restoration of the Matheny Creek watershed and follow Watershed Analysis recommendations. This is part of the purpose and need for action. Both improve watershed conditions relative to important indicators.

An analysis was prepared that discusses ACS objectives in relationship to the project (part of the past requirement to find consistency with these objectives). This analysis is in the project file, but is no longer required in project level analysis per the March 2004 Forest Plan amendment which clarified provisions relating to the ACS.

Clean Air Act

This project is not expected to impact air quality. Due to project design there will not be any underburning, or piling and burning of harvest generated fuels. Timber felling will be directed away from roads and landings resulting in few tops and branches being left within 30 to 50 feet, thus roadside piling and burning will not be necessary. Most limbs will be removed within the cutting units, and the small amount of branches yarded into landings will be yarded back into the units and scattered. Fuel loadings of small sized material is expected to be low, and this material is expected to decay fairly rapidly. As a consequence underburning will not be needed. Temporary road construction could create a limited amount of dust, but this would be confined to the project area.

Clean Water Act

The primary objectives of The Clean Water Act (Federal Water Pollution Control Act Amendments of 1972 and 1987) is to restore and maintain the integrity of the Nation's waters, and to have "water quality which provides for protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water".

As part of the implementation of this Act, the State of Washington maintains an inventory of water quality limited streams, which is based upon standards developed by the Washington Department of Ecology. Section 303(d) requires each state to identify waters that are not attaining established water quality standards, to prioritize these waters, and to establish a total maximum daily load (TMDL) designed to bring waters by into compliance with the standard.

Matheny Creek watershed and the Queets River subbasin are not cited on the Washington State Department of Ecology's 1998 303 (d) list as water quality limited. Limiting criteria most often includes sedimentation, temperature, and habitat modification on National Forest system lands.

Activities such as road building, timber harvest, mining, and fires can create non-point sources of pollution. Spills of fuels used in machinery can create point sources of pollution. Observing relevant Best Management Practices can serve to prevent or minimize both types of pollution, as can effective restoration and enhancement of watershed and riparian areas, and improved monitoring for the detection of water quality parameters of concern. Observing Best Management Practices would serve, at a minimum, to maintain current water quality in analysis area streams.

Both of the action alternatives (2 and 6) would have little or no effect on existing stream temperatures because no removal of trees would occur within the immediate riparian zone. thereby maintaining shading. The project poses some potential for soil erosion and off-site movement of sediment, but these would be kept to a minimum through protection of riparian areas, implementation of best management practices, and mitigation measures. Sedimentation is not expected to be enough to be measurably alter stream functionality. By observing the Best Management Practices and mitigation measures described in this Environmental Assessment, Alternative 2 and 6 would protect beneficial water uses in this area and maintain water quality in the associated streams in compliance with the Clean Water Act.

Invasive Plants

Noxious weeds and other invasive plants may pose a serious threat to the health of National Forests. Eleven invasive vascular plant species have been documented in the Matheny Complex project area (USDA FS, Natural Resources Information System, Invasive Plants module, 2004). The species include Canadian thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), Scot's broom (*Cytisus scoparius*), common St. Johnswort (Hypericum perforatum), hairy catsear (*Hypochaeris radicata*), oxeye daisy (Leucanthemum vulgare), big trefoil (Lotus pedunculatus), Himalayan blackberry (*Rubus discolor*), evergreen blackberry (*Rubus laciniatus*), tansy ragwort (*Senecio jacobaea)* and common tansy (*Tanacetum vulgare*). See Table 1 for Design Features and Mitigation Measures for invasive plants, along with Monitoring and Adaptive Management

activities (Table 3) for prevention of the spread of invasive plants and needs for treatment and monitoring of current infestations.

Essential Fish Habitat

This project will not adversely affect essential fish habitat for chinook, coho or pink salmon. Pink salmon are not found in the Matheny Creek watershed. Chinook and coho salmon are found in the project planning area, mainly utilizing the mainstem of Matheny Creek. Coho salmon may utilize the lower portions of several tributaries in the planning area. However none of the proposed harvest units are adjacent to streams utilized by either species. It is expected that any potential impacts would result from road reconstruction/deconstruction where stream crossings are involved. It is possible that some fine and/or coarse sediments may be generated at these disturbed sites for a short period of time, but of quantities that would not be measurable downstream in the coho or chinook bearing stream segments. Sediment transport generally occurs during storm events when large quantities of sediment are naturally mobilized and transported. This project will not have any measurable impact on fish habitat.

Socio-economic Effects

The Matheny Complex Thinning project has many potential but nonsignificant effects on socio-economic resources. Employment and personal income would be generated by the harvest of 5.5 million board feet (MMBF) in Alternative 2. Higher levels would be associated with Alternative 6 (7.7 MMBF). While exceedingly small in the context of the Olympic Peninsula economy overall, these benefits would contribute to social and economic well-being.

The project meets all visual quality guidelines for this area (VQO Maximum Modification). No environmental justice or civil rights concerns were raised during scoping.

Trade-offs Between Beneficial and Adverse Effects

This project involves relatively small-scale trade-offs. As discussed previously, the greater the acreage treated, the greater the potential benefit in terms of achieving project objectives. The effectiveness of each alternative in attaining LSR objectives was rated based on the percentage of identified acreage treated. Alternative 0 has an effectiveness rating of zero. Alternative 2 has a rating of 51 percent and Alternative 6 has a rating of 71 percent.

LSR standards and guidelines state that road construction and maintenance are generally not recommended unless potential benefits exceed the costs of habitat impairment. The project trade-off for treating additional acreages is an addition of about 2.0 miles of temporary road and 4.5 miles of reconstructed closed or abandoned road for the benefit of thinning 200 more acres. The additional temporary road construction would degrade less than 5 acres of habitat for a period of one or two decades, but benefit up to 200 more acres of plantation forest land with improved conditions that may persist several or even many decades. While the additional road

development of Alternative 6 slightly increases the likelihood of short term erosion and sedimentation effects, this trade-off is expected to be overshadowed in the long run by the ultimate benefits associated with the improved final condition of abandoned roads, the additional road decommissioning, and the potential for a watershed enhancement funding.

None of the alternatives would directly result in significant adverse effects, nothwithstanding the beneficial effects. All alternatives follow relevant management direction and comply with relevant S&Gs.

Public Health and Safety

Public health and safety is protected by adherence to Occupational Safety and Health Administration (OSHA) and other laws. Operational and public safety is addressed in the design features and mitigation measures in Table 1.

Historic or Cultural Resources, Parklands, Prime Farmlands, Wetlands, Wild and Scenic Rivers, or Ecologically Critical Areas

None of these designated areas would be adversely affected. The Quinault Tribe was consulted during the planning process. Cultural resource surveys were completed and the State Historic Preservation Office concurred that this is a "No Effect" undertaking. Small wetlands would be protected. Treatments in late-successional reserves and riparian reserves comply with all applicable guidelines.

Irreversible and Irretrievable Commitment of Resources, Unknown Risks and Precedents

No irreversible or irretrievable commitments of resources are associated with any alternative. Roads are often considered irreversible. In this project, all roads constructed are temporary and some existing system roads would be decommissioned and returned to productivity. This project is consistent with current scientific and ecosystem management concepts and does not involve unknown risks.

CHAPTER 4 - CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, federal, State, and local agencies, tribes, and non-Forest Service persons during the development of this EA:

Core IDT Members

The following list includes core IDT members; other federal land managers were consulted during the project planning process.

Geographic Information Specialist - Scott Schreier

IDT Leader – Ward Hoffman

Logging Operations Specialist – Ray Hershey

NEPA Coordinator – Rochelle Desser

Soils and Water Specialist – Scott Hagerty

USFS Fisheries Biologist - Phil DeCillis

USFWS Wildlife Biologist – Marc Whistler

Vegetation Manager – Verne Farrell

Federal, State and Local Agencies

State Historic Preservation Association

US Fish and Wildlife Service

NOAA Fisheries

State Department of Fish and Wildlife (commented during scoping)

Indian Tribes

Quinault Indian Nation

Individuals and Groups

Northwest Ecosystem Alliance (commented during scoping)

Bob Powne, interested citizen (commented during scoping)

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