United States Department of Agriculture | Forest Service | Umpqua National Forest

Cottage Grove Ranger District
78405 Cedar Park Road
Cottage Grove, Oregon 97424
(541) 767-5000 FAX 767-5075

File Code: 1950
Date: April 1, 2008

Interested Citizen

Enclosed is a copy of the Doris Thin Project Environmental Assessment (EA). The EA examines a No Action Alternative and two Action Alternatives for harvesting timber through commercial thinning and creating gaps, as well as conducting associated fuel treatments, road work, and other connected and similar actions. Alternative 2 has been identified as the preferred alternative. Additional copies of the Environmental Assessment are available on the Forest's website at www.fs.fed.us/r6/umpqua or by calling the Ranger District.

Comments must be submitted to District Ranger Deborah Schmidt, Cottage Grove Ranger District. The District Office is open from 8:00 am until 4:30 pm, Monday through Friday, excluding legal holidays. Electronic comments must be submitted to: comments-pacificnorthwest-umpqua@fs.fed.us. As the representative for the Responsible Official Cliff Dils, I will accept oral, electronic, and written comments during the comment period, which ends 30 days from the date this notice is published in the Roseburg News-Review, the official newspaper of record. Comments are due by April 30, 2008. This decision is subject to appeal pursuant to Forest Service regulations at 36 CFR 215.11. Appeals must meet the content requirements of 36 CFR 215.14. Individuals or organizations who submitted comments or expressed an interest in the project during the comment period may appeal.

Comments submitted anonymously will be accepted and considered; however, those who submit anonymous comments will not have standing to appeal the subsequent decision under 36 CFR Part 215. Additionally, pursuant to 7 CFR 1.27(d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality. Persons requesting such confidentiality should be aware that, under the FOIA, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets. The Forest Service will inform the requester of the agency's decision regarding the request for confidentiality, and where the request is denied, the agency will return the submission and notify the requester that the comments may be resubmitted with or without names and addresses.

Additional information on the proposal can be obtained from Suzanne Schindler, (541)-767-5040, email sschindler@fs.fed.us, at the Cottage Grove Ranger District. Thank you for your continued interest in the Doris Thin Project.

Sincerely,

/S/ Deborah G. Schmidt

DEBORAH G. SCHMIDT
District Ranger

USDA

United States Department of Agriculture

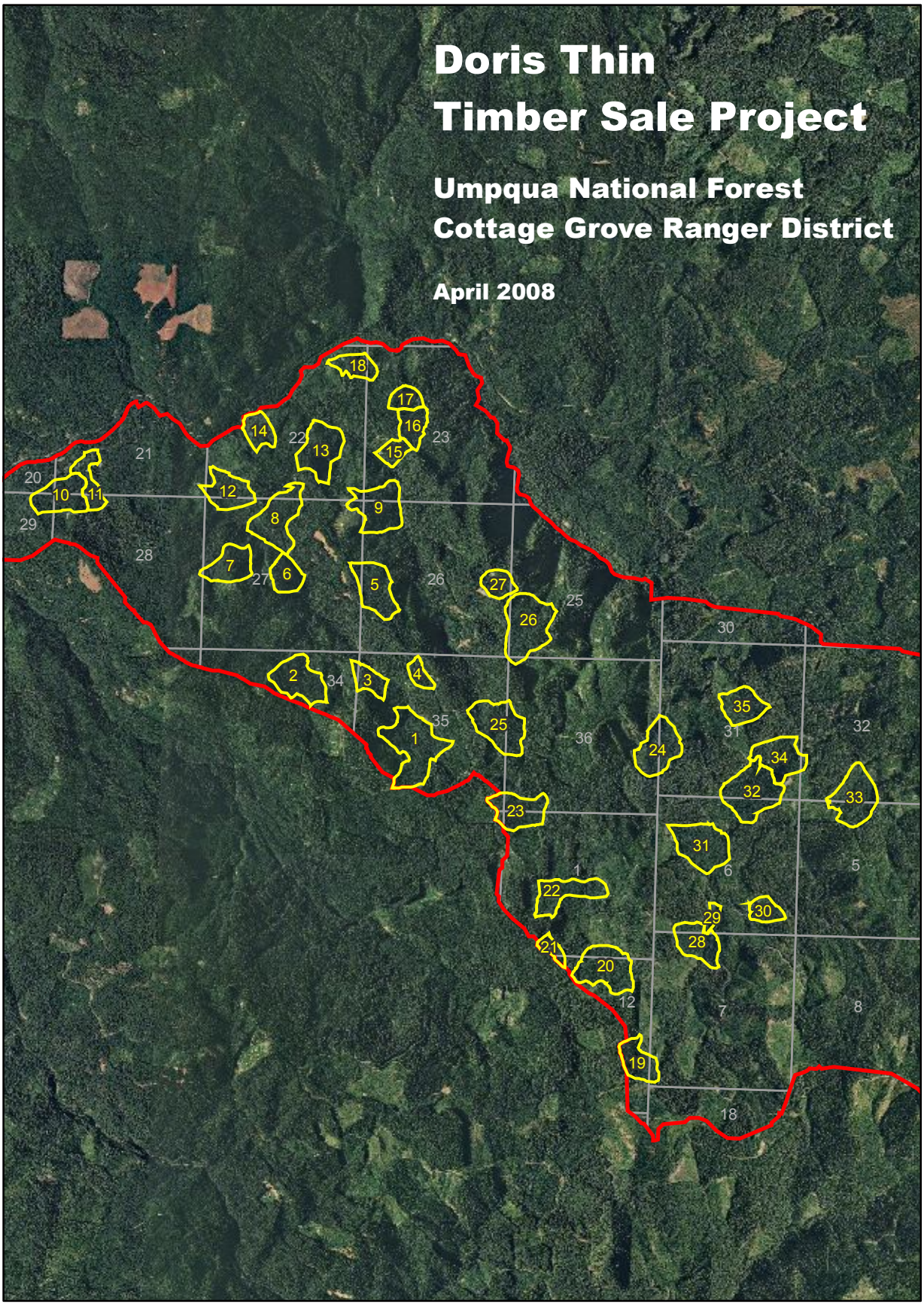
Forest Service

Pacific Northwest Region

Doris Thin Timber Sale Project

Umpqua National Forest
Cottage Grove Ranger District

April 2008



DORIS TIMBER SALE PROJECT

ENVIRONMENTAL ASSESSMENT

Lane County, Oregon

April 2008

Lead Agency: USDA Forest Service, Umpqua National Forest

Responsible Official
Forest Supervisor
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Electronic comments can be mailed to: comments-pacificnorthwest-umpqua@fs.fed.us

Abstract

This Environmental Assessment (EA) documents the alternatives considered for commercially harvesting timber, treating activity generated fuels, conducting road improvement, construction/reconstruction and road maintenance, and implementing connected actions within the matrix and riparian reserve land allocations of the Layng Creek Subwatershed on the Umpqua National Forest, Cottage Grove Ranger District. Alternative Two has been identified as the preferred alternative.

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CHAPTER ONE

PURPOSE AND NEED FOR ACTION

INTRODUCTION

This Environmental Assessment (EA) documents the analysis of a range of alternatives, including the proposed action, for timber harvest and associated activities in the 42,195-acre Layng Creek subwatershed of the Row River located on the Cottage Grove Ranger District of the Umpqua National Forest.

Chapter One describes the purpose, need, and proposed action for the Doris Timber Sale Project. This chapter also identifies the project area, outlines applicable management direction, addresses the scope of the decision, summarizes the scoping process, and lists the issues identified during scoping.

The 11,335 acre Doris Planning Area is located within the Layng Creek subwatershed, which is a tributary to the Row River (Figure 1). Layng Creek is a municipal watershed for the city of Cottage Grove. A special set of standards and guidelines in the Umpqua National Forest Land and Resource Management Plan (LRMP) addresses watershed management and the protection of water quality (LRMP Appendix G). The lower eight miles of Layng Creek is listed on Oregon Department of Environmental Quality's Final 2002 303(d) Water Quality Limited Stream List for temperature concerns. Doris and Harvey Creeks, located within the planning area, flow into Layng Creek within the listed section.

The planning area is in a highly productive western hemlock climax plant association. Managed and fire-regenerated stands dominate the landscape. The major overstory tree species are Douglas-fir, western hemlock, western redcedar, red alder and bigleaf maple. Western hemlock and western redcedar are the primary regenerating species. Shrubs species include vine maple, Pacific rhododendron, salal, and Oregon-grape.

ENVIRONMENTAL SETTING AND RELATIONSHIP TO OTHER PLANNING DOCUMENTS AND ANALYSES

The 1990 LRMP and its amendments to date, including the 1994 Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (referred to as the Northwest Forest Plan), provide broad management direction for the Layng Creek subwatershed.

The planning area is within Management Area 10 (MA 10, Figure 2) as established in the 1990 LRMP. The primary objective of MA 10 is to produce timber on a cost-efficient, sustainable basis consistent with other resource objectives. Under the 1994 Northwest Forest Plan, over half of the planning area lays within the Matrix land allocation, where the majority of timber harvest and silviculture treatments are to occur. Less than half of the planning area is in the riparian reserve land allocation where riparian dependant resources receive primary emphasis. An important component of the Northwest Forest Plan is the Aquatic Conservation Strategy, which is a landscape-scale approach based on maintaining the natural disturbance regime (USDA/USDI, 1994).

Multiple hundred-acre late-successional reserve areas are located within the planning area. The objective for these reserve areas is to protect and enhance conditions of late-successional and old-growth forest ecosystems and their associated species. There are no units within these reserves.

This analysis tiers to the Final Environmental Impact Statement of the 1990 Umpqua National Forest LRMP as amended and the 2005 Final Environmental Impact Statement for the Pacific Northwest Region Invasive Plant Program. It also incorporates by reference the recommendations in the 1995 Layng Creek Watershed Analysis (WA), the Layng WA 2005 iteration, and the 2007 Doris Roads Analysis.

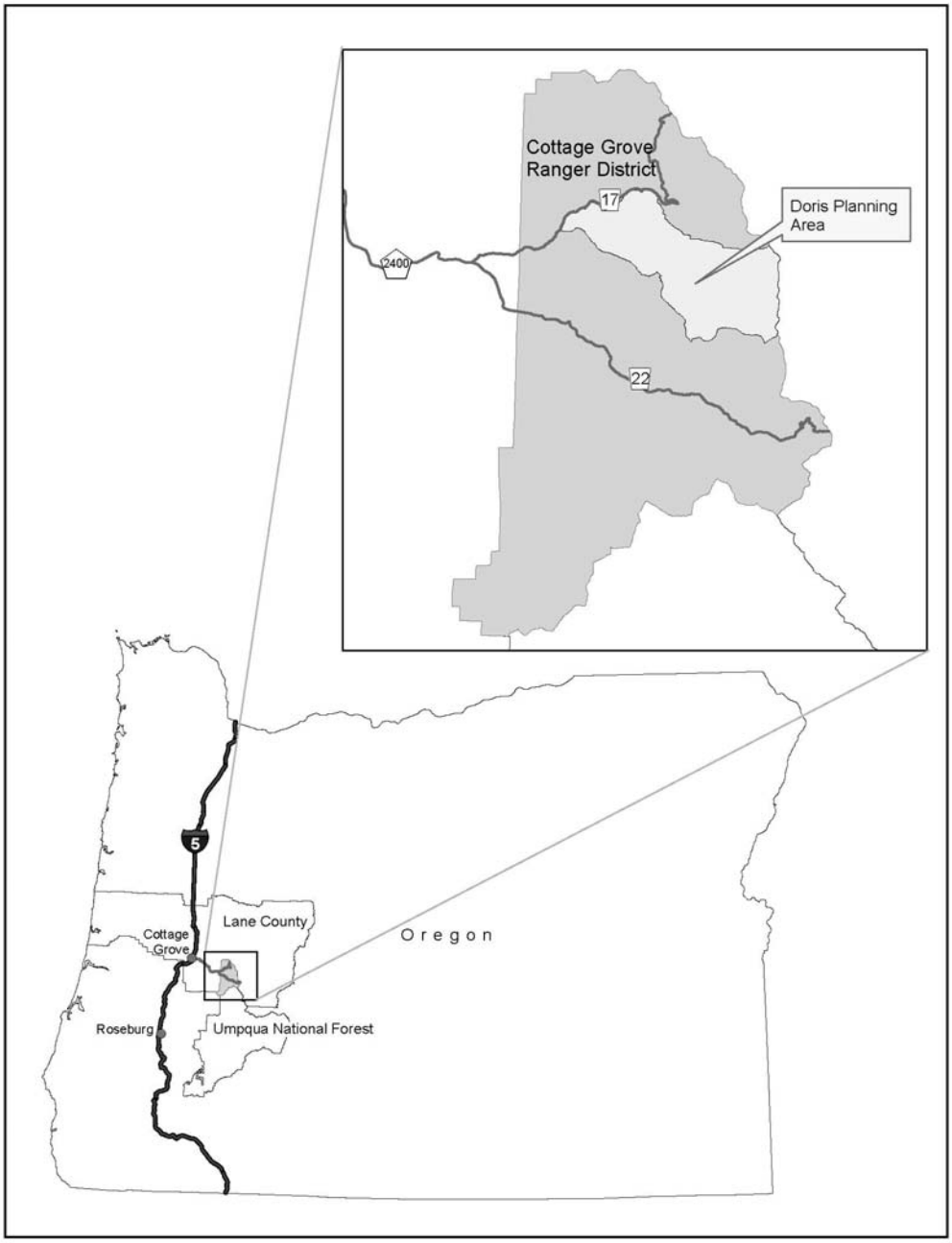


Figure 1. Location of the Doris Planning Area

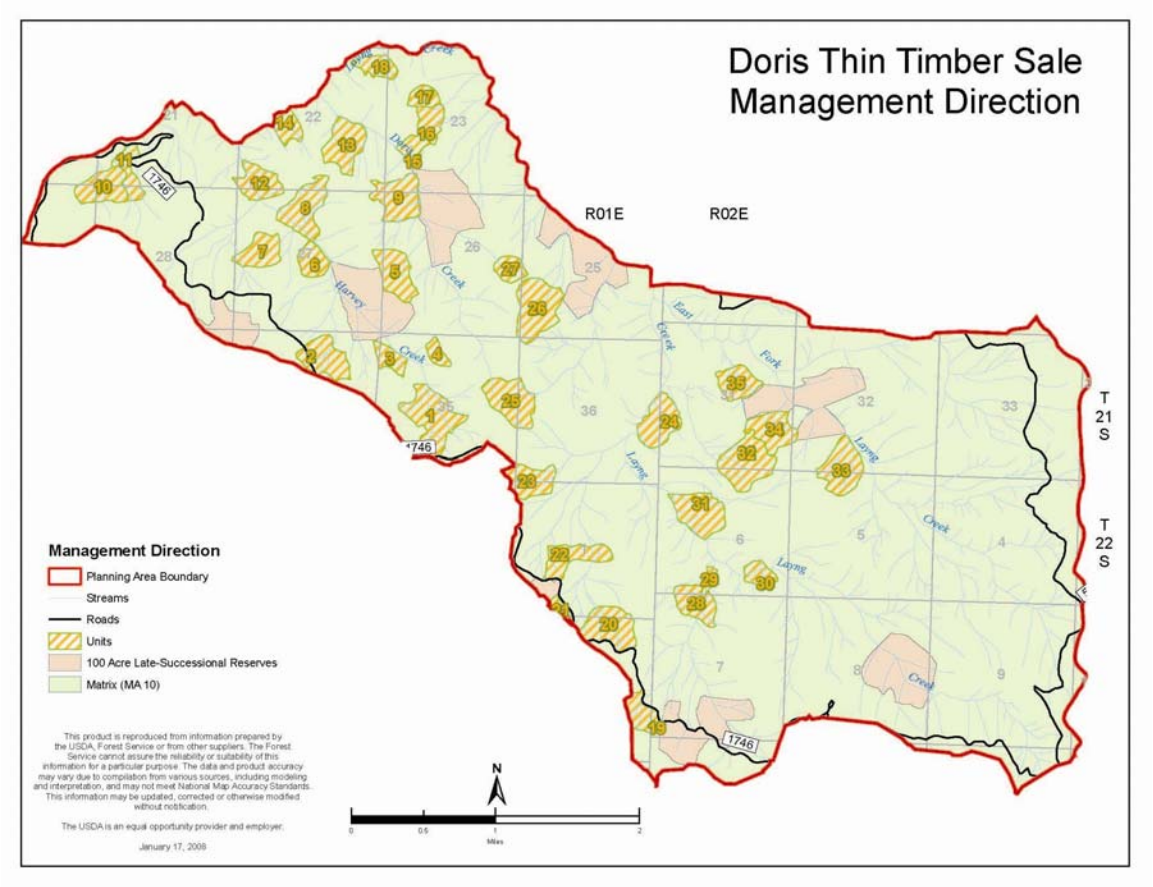


Figure 2. Management Direction for the Doris Planning Area[1]

Layng Creek Watershed Analysis

The Northwest Forest Plan states that a watershed analysis is an on-going, iterative process that should expand as appropriate to consider additional available information. The Federal Guide for Watershed Analysis describes it as a stage-setting process; the results of a watershed analysis establish the context for subsequent decision making processes (USDA/USDI 1994). The original 1995 Layng Creek Watershed Analysis was updated in 2005 with its first iteration. This iteration expands upon the original WA by incorporating new information. The main changes are associated with a landscape analysis (recommended in the 1995 WA) and an assessment of fire risk (prompted by national direction) to ascertain the fire regime condition class. These new land strata, in conjunction with the results of an inventory of these habitat structures and the use of the decayed wood advisor (DecAID), were used as the basis for updating certain recommendations for snags and down wood. Original WA recommendations related to the Aquatic Conservation Strategy (ACS) were clarified, deleted, or replaced based on recent literature regarding riparian area management.

Silviculture objectives for matrix land as described in the 1995 Layng WA and its iteration include implementing a sustainable harvest program for this very productive subwatershed while stressing species diversity and stand structural diversity. The WA

[1] From the 1990 Land and Resource Management Plan including the allocations from the1994 Northwest Forest Plan

also recommends the use of landscape level techniques to determine priorities, connectivity, and patch size.

Landscape Objectives

The Layng Creek subwatershed consists of four broad landscape areas that are based on relationships between forest vegetation, climate, and physiography. The delineations in Figure 3 represent broad areas of land that tend to have similar disturbance processes. Inclusions of landforms that differ from this rule can be found at this scale of mapping. The units in the Doris thinning project primarily fall into three of the landscape areas—the gentle valley bottom, gentle mountain slope, and the steep landscape areas. Two units, and portions of three other units in the east end of the planning area, were previously mapped in the high elevation landscape area. Field reconnaissance revealed that they are more appropriately mapped within the gentle mountain slope landscape area.

The gentle valley bottom landscape area is the most likely fire refugia area. The ancient landslide deposits that filled valley bottom areas retain high moisture levels throughout the growing season. Consequently, surface fire dominated, with limited amounts of crown fire. The gentle upslope mountain areas retain less moisture, and have fewer barriers to fire spread. There is historic evidence of larger patches of stand replacement fire than are found on the gentle valley bottoms. The steep landscape area is dominated by slopes where fire intensity is generally greater and stand replacement fire is more frequent than in the other landscape areas.

A landscape analysis provides information about landscape scale disturbances and vegetation patterns. This information is useful in developing management strategies that consider these processes. This approach is based on the principle that when an ecosystem element moves outside its historic range the element, and those elements depending upon it, may not be sustained. This coincides with the Aquatic Conservation Strategy of restoring disturbance regimes and managing landscape-scale features.

Two recommendations from the WA iteration are relevant for the Doris project:

- At the landscape scale, enlarge patches[2] to approximate the acreage of large-scale disturbance, or treat groups of adjacent patches simultaneously to accelerate structural development and ultimately reduce the effects of fragmentation.
- At the stand scale, focus vegetation treatments in the mature and stem exclusion stages to restore species and structural diversity.

2 Landscape patches are patches of vegetation that differ from one another by their vegetative structure. For instance an area may contain several scattered 20-50 acre plantations (patches) embedded in a matrix of old-growth forest.

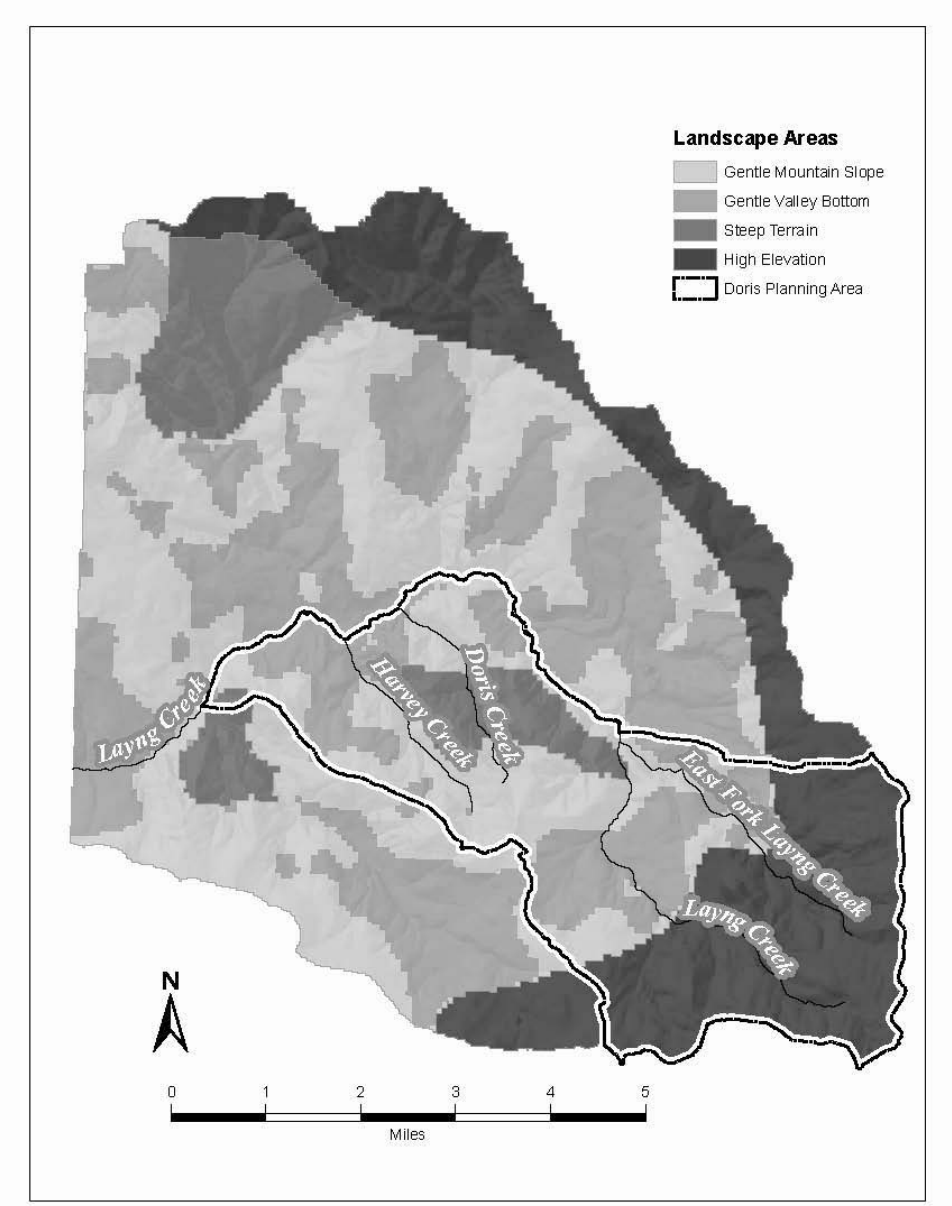


Figure 3. Landscape Areas in the Federal ownership of Layng Creek[3].

The following 2005 WA recommendations are relevant to proposed treatments in the following landscape areas:

Gentle Valley Bottom Landscape Area

1) Thin stem exclusion patches that are adjacent to late-successional patches in order to accelerate stand development and decrease fragmentation.

3 The area to the west of the vertical line equates to about 5,000 acres of private ownership in the Layng Creek subwatershed.

2) Apply thinning treatments and create small canopy gaps (¼ to one acre) in early seral, stem exclusion, and mature structural stages in order to restore species and structural diversity characteristic of a mixed (moderate) severity fire regime.

3) Where appropriate, initiate an uneven-aged management strategy that would culture a shade tolerant understory layer.

4) Allow higher levels of larger diameter fuels relative to the other landscape areas based on the results of the Layng Creek Coarse Woody Debris (CWD) inventory (USDA, Umpqua NF, 2005a).

Gentle Mountain Slope Landscape Area

1) Apply thinning, canopy gap creation (¼ to one acre), and underburning to restore structural and species diversity characteristic of a mixed (moderate) severity fire regime in areas of stem exclusion, mature, and unnaturally dense understories of older stands.

2) Use prescribed fire (i.e. underburning) to create snags and coarse woody debris.

3) Manage for moderate levels of larger diameter fuels based on the results of the Layng Creek CWD inventory (USDA, Umpqua NF, 2005a).

Steep Landscape Area

1) Manage all forest stages to improve resilience to fire by opening canopies and raising canopy base heights.

2) Manage stands to maintain even-aged characteristics.

3) Manage for lower levels of larger diameter fuels based on the Layng Creek CWD inventory (USDA, Umpqua NF, 2005a).

Not every project would implement all watershed analysis recommendations and objectives, and the desired condition may not be reached with the implementation of a single project. In addition, some of the watershed analysis objectives may not be implemented consistently across the land. The Doris project focuses primarily on the watershed analysis objectives and recommendations for stands of second growth timber in the stem exclusion stage of development[4].

NEED FOR ACTION

The purpose of the project is to restore species and structural diversity in stem exclusion stands of 40-50 year-old second growth timber, to improve the condition class in the municipal watershed by improving stand fire resiliency, and to provide wood products to the local community. Clearcutting and fire suppression practices of the past have resulted in young forests that lack the structural and species diversity that would have otherwise developed via the natural processes of a moderate severity fire regime (USDA, Umpqua NF 2005).

4 The stem exclusion stage occurs in 20 to 80 year old stands where new species do not appear and some present species are dying from competition. The average tree diameter is about 10" DBH and canopy closure is ≥53%. Thinning accelerates stand development out of this stage.

A goal of the Aquatic Conservation Strategy of the Northwest Forest Plan is to maintain the natural disturbance regime (ROD B-9). As recommended in the 2005 Layng Creek Watershed Analysis Iteration 1.1, management practices would include the use of timber harvest and fuels treatments to approximate landscape patterns of vegetation structure and composition that are associated with a moderate severity fire. Where possible, thinning and fuel treatments would be planned over larger, more contiguous blocks of land. This approach is more economically efficient than harvesting individual, fragmented patches as done in the past (USDA, Umpqua NF 2005).

The difference between the existing and desired condition defines the need for action in terms of elements that can be measured. These elements are:

Element 1: Stand Density

The 40-50 year old stands in the Doris planning area (both in the uplands and in the riparian reserves) are densely-stocked and dominated by Douglas-fir trees of the same age class. In the stands that were pre-commercially thinned, shade tolerant conifers and hardwoods were routinely cut, leaving most of today's stands in simplified conditions. Stand densities exceed 500 trees per acre. Most stands lack natural canopy gaps and associated understory diversity. Some stands, located on the most productive and moist sites, have receding tree crowns and are susceptible to toppling.

The desired condition for both upland and riparian second-growth stands is a more open condition that approximates what would typically exist in a moderate severity fire regime. Removing some of the standing trees in the matrix and riparian reserve land allocations would reduce stand density and canopy closure, allowing the development of understory layers. This would in turn improve stand stability in the wettest locations, and improve fire resiliency in the drier locations.

Element 1 would be measured by:

•Acres of second growth thinned to improve conditions for species and structural diversity.

•Acres of improved fire resiliency.

Element 2: Timber Production

In order to produce a sustained yield of timber from the matrix land allocation, harvest needs to occur on a regular basis. This is particularly true in stem exclusion stands where salvaging the predicted suppression mortality improves the growth potential of the leave trees. If left untreated, increased suppression mortality, declines in growth, and lost economic opportunities would continue in these unnaturally dense, stem exclusion stands.

Element 2 would be measured by:

•Board feet of timber produced by commercial thinning.

•Cost-efficient thinning measured by benefit/cost ratio and net present value.

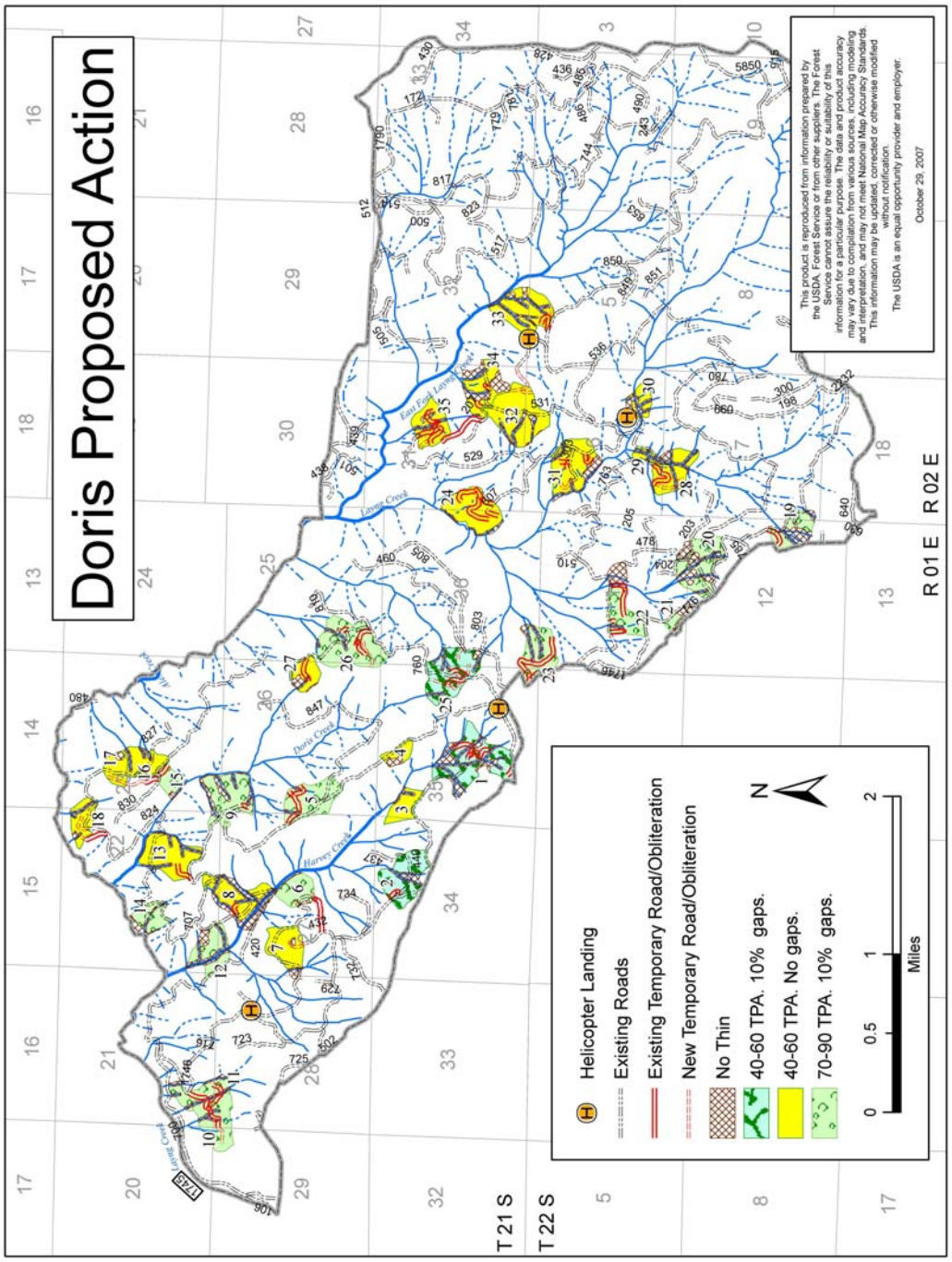
PROPOSED ACTION

The proposed action (Alternative Two, Figure 4) was designed to meet the purpose and need of restoring species and structural diversity in stem exclusion stands of second growth timber, to improve the condition class in the municipal watershed by enhancing stand fire resiliency, and to provide wood products to the local community. Applicable Standards and Guidelines were applied to the proposed action and the alternatives that were developed. The most relevant Standards and Guidelines are listed in Chapter Three of this EA; others are incorporated by reference.

In Chapter Two of this EA, Alternative Two is thoroughly detailed and terms used are defined. Alternative Two includes:

- Of the 1,282 acres in the analysis area, commercial thinning 1000 acres of timber stands using helicopter, ground-based, and skyline logging systems in both the matrix and riparian reserve land allocations to generate about 13.4 million board feet (mmbf) of timber. No thinning would occur on 282 acres of riparian or unique habitat areas, or where protection of rare plant species and soils is a concern.
- Treating activity-created fuels on 609 of the thinned acres by underburning, machine piling, and hand pile and burning.
- Building four new landings for helicopter logging.
- No new system roads would be constructed. Approximately 6.6 miles of existing temporary roads would be used, and another 2.2 miles of temporary roads would be created. All temporary roads would be obliterated after use.
- Road reconstruction work includes replacement of twenty six 18-inch ditch relief culverts along with three new ditch relief culverts and six stream crossing culverts. Road grading and ditch line maintenance would occur on 38 miles of existing road.
- Utilizing the existing Silverstairs rock pit as the rock source for the road work.
- Implementing numerous similar and connected actions such as tree planting in the larger canopy gaps, precommercial thinning, road inactivation, rehabilitation of compacted soil, snag creation, invasive weed management, replacement of the Harvey Creek fish passage culvert and pump chance, and the replacement of other stream crossings for erosion reduction.
- Implementing three project-level amendments to the 1990 Forest Plan (see Project Level Forest Plan Amendments later in this chapter for further discussion):
    1. Thinning of second growth plantations in dormant earthflow terrain,
    2. Thinning up to the boundaries of hardwood stands and rock outcrops, and
    3. Conducting thinning that differs from several of the guidelines in the Layng Creek Municipal Watershed Plan (LRMP Appendix G) that was designed primarily for old-growth harvest rather than second-growth thinning.

Figure 4. Doris Proposed Action – Alternative Two



DECISION TO BE MADE

Based on the analysis documented in this environmental assessment, the Forest Supervisor of the Umpqua National Forest will decide the following:

- To implement the project as proposed, to implement a modified version (alternative) of the project that addresses unresolved issues, or to not implement the project at this time (no action).
- If the project is implemented, the mitigation measures, monitoring requirements, water quality best management practices, and similar or connected actions necessary to achieve the resource goals and objectives of the project.
- Whether to amend the Forest Plan as proposed.
- Whether there is a significant effect on the human environment that would require preparation of an Environmental Impact Statement.

SCOPING

The Forest Service listened to all input and addressed as many concerns as possible during development of the proposed action. Formal scoping (a process used to surface issues) began after the proposed action was developed and the project was first listed in the October 2007 Umpqua National Forest Quarterly Schedule of Proposed Actions (SOPA). A scoping notice and field trip announcement was sent to the public in late October 2007 with the intent of introducing the proposed action and soliciting issues. Three members of the public attended a November 2007 field trip, which raised numerous comments and concerns. Follow-up consisted of letters, e-mails and phone conversations. The Doris Project File contains a scoping summary that details the scoping comments received for the project.

ISSUES

Significant issues associated with a proposed action are the focus of an environmental assessment because they provide the basis for formulating and comparing alternatives to the proposed action (40 CFR 1502.14). Significant issues may also be used to prescribe mitigation and monitoring measures, and may be used for analyzing environmental effects. Significant issues are based on unresolved conflicts concerning alternative uses of available resources. An issue is a point of disagreement, debate, or dispute about the proposed action based on effects identified through scoping. Scoping identified a number of issues and concerns (non-issues) related to the proposed thinning in the planning area.

The following significant issue was used to develop an alternative to the proposed action:

Issue 1: Less Road Building

Cascadia Wildlands Project, and Oregon Wild (formerly ONRC) state that building 2.2 miles of new temporary road may cause numerous environmental impacts including erosion, channeling water, spreading noxious weeds, increased off-highway vehicle (OHV) use and increased risk of human-caused fires. To help quantify and track this issue through the analysis, the following indicator was developed:

- Miles of temporary road built.

Issues that did not drive alternatives:

Several other issues were resolved by clarifying the proposed action, developing mitigation measures to address them, or by further discussing issues with the people who raised them. These issues did not require the development of an alternative to the proposed action. These are discussed below by category, and are also available in the analysis files at the Cottage Grove Ranger Station.

Issues resolved by further discussion or by clarifying the proposed action:

One Acre Gap Size

The proposed action includes creating one acre gaps in Units 1, 2, and 25 at the intensity of ten percent of the thinned acres. Within these gaps 10 trees will be clumped in the center and made into snags for wildlife species habitat. Surrounding these snag patches the area will provide temporary forage for big game. Minor tree species such as western redcedar and incense-cedar will be planted and protected to provide tree species diversity.

Cascadia Wildlands and Oregon Wild believe these one acre gaps to be excessive in size and wanted to know the rationale behind them. This issue was resolved in further discussion with Josh Laughlin when describing the process to create the snag patches will be the use of underburning. The larger gap size is needed to provide a buffer between the center of the gap where the creation of snags will be located and the outside of the gap where residual thinned trees would be maintained. The advantage of underburning is the cost savings in snag creation while also providing fuel reduction and site preparation for planting.

In addition, American Forest Resource Council supports management activities that enhance big game forage by providing larger gaps. As mentioned, these gaps will provide short term forage, and forage may also be provided by seeding temporary roads and helicopter landings after use.

Variable Density Thinning

The proposed variable density thinning would be accomplished through the placement of canopy gaps within areas that are thinned from below (harvesting the smaller trees and leaving the largest trees), by varying the levels of leave trees and retaining unthinned areas. Under the proposed action, harvest prescriptions would vary between units based on a site's disturbance regime and other resource concerns such as spotted owl habitat needs and fuels reduction requirements.

Cascadia Wildlands Project and Oregon Wild wrote that variable density thinning should result in varying densities within every stand and the retention of clumps or for example, leaving four Douglas-firs together.

This issue was resolved in discussion with Josh Laughlin of Cascadia Wildlands Project that the between-unit variability and between thinning sale variability (Curran Junetta, Dinner, Crawdog EAs) was appropriately scaled given the different disturbance regimes used to apply the unit prescriptions; and where appropriate minor species will be retained. Furthermore, it was determined that the unthinned areas included in each stand, intermixed with thinned areas and gaps, would achieve the desired within-unit variability. A review of the unthinned areas in the 35 units range from 1/2 to 26 acres and the average acres retained is eight. Within these retained no thin areas clumps of

four Douglas-firs is common and generally average 100 trees per acre depending on their designation (hardwoods, riparian areas, unique habitats).

Slash Burning

The proposed action includes treating thinning activity-created fuels on approximately 609 acres by underburning, machine piling, and handpile and burning. This is in part a response to the purpose and need of this project to improve stand fire resiliency. Jim Delapp and Mora Dewey were both concerned with nutrient and carbon loss with the burning of slash; conversely the Umpqua Watersheds Inc. representative Tim Ballard was concerned with having enough fuel treatment.

The potential effect for nutrient loss from harvest and fuel treatments depends on the distribution of the carbon biomass in the forest. The largest portion of nutrients found in the harvested timber would be contained in the new growth found in needles, fine roots, and twigs. (Kimmins, March 1977). Ecosystem nitrogen is a key nutrient managed for long-term site productivity. The distribution of nitrogen in the ecosystem will vary by stand age, climatic conditions, and the nutrient/moisture holding capacity of the soil. In Douglas-fir ecosystems 78% to 85% of the total nitrogen capital is stored within fine roots and soil organic matter primarily located in top 10 inches of soil, with an additional 6% to 15% stored at the soil surface as large down woody material, litter and duff (Edmonds et al. 1989). In temperate Douglas-fir ecosystems, such as that found in the Doris Timber Sale, sound practices with even the most intensive harvest that protect the organic capital of the forest floor and soil, usually remove less than 10% of the total nitrogen (Edmonds et al. 1989) and therefore would not expected to have a major effect on the long-term site productivity of the stand.

The proposed action attempts to find a balance between retaining carbon and the risk of wildfire. Units that are treated with prescribed fire would potentially reduce 65% of the down woody fuels resulting in a potential loss of 13 metric tons per hectare (MT/ha) of surface carbon with no effect to soil carbon (Doris FOFEM, Hoover 2002). In contrast, a wildfire in the same area could consume greater than 80% of the litter and duff layer over 28% to 40% of the burn area and may expose 60% to 72% of the soil to soil heating, potentially displacing 35 metric tons per acre (MT/ha) surface carbon with additional losses in the soil. The proposed action prescribes a mixture of fuel treatments that will achieve greater complexity and carbon sequestration over time.

Non-significant issues:

Non-significant issues include those that are outside the scope of the proposed action or are already decided by law, regulation, Forest Plan, or other higher level decision. There was one main issue raised during scoping that was dismissed as a non-significant.

This issue was a desire to use the stewardship authority. The District, along with interested private parties has invested time and implemented a stewardship project, and may propose another stewardship project in the future. However, according to FSH 2409.19, 61.1g “Stewardship contracting is a tool for meeting resource objectives and should not be included in the NEPA document and decision notice as a requirement of the project.” Therefore, requiring stewardship contracting as a part of this NEPA process is outside the scope of the project.

PROJECT-LEVEL FOREST PLAN AMENDMENTS

Three project-level Forest Plan amendments are proposed to be implemented. Most of the standards and guidelines in the 1990 Umpqua LRMP were developed in the context of the even-aged harvest of most of the remaining old-growth forest. They were crafted to protect areas from major impacts of logging and site preparation, and to retain areas of old growth timber to both help mitigate loss of habitat and to reduce risks associated with disturbance. The level of disturbance associated with thinning and gap creation in dense second-growth stands is substantially less than that of clearcutting and broadcast burning old growth. In this context, the following project-level Forest Plan amendments are proposed in order to meet the purpose and need in practical and cost-effective ways.

1. The Final Environmental Impact Statement (FEIS) of the Umpqua National Forest Land and Resource Management Plan describes one class of unsuitable land as an unsuited, non-manageable block of land having an unacceptable risk for mass movement within an average 10-year climatic event (FEIS, Appendix B, pp 8-9, 12). Changes to the Forest suitable and unsuitable lands inventory occurs on a continual basis[5] as more detailed information is gathered either during project work or via special inventories. Site-specific reconnaissance carried out during the development of the Doris Project has identified refinements to the Forest Suitability Layer. The Doris project-level Forest Plan amendment reclassifies 364 acres of soil suitability. Specifically, this amendment will reclassify 232 acres from its current classification of unsuitable slope stability to suitable for harvest in Units 6, 12, 14, 18, 19, 20, 21, and 22. Reclassification will occur on 107 acres from unsuitable to Categorically Unsuitable in Units 3, 16, 17, 28, 29, 32, 33 and reclassification from suitable to Categorically Unsuitable slope stability on 12 acres in Units 32, and 33; both types of reclassifications allow thinning without gaps to increase root stability. Finally, 13 acres will be reclassified from suitable slope stability to unsuitable slope stability in Unit 33 (no thinning will be allowed on these acres). These changes are consistent with LRMP standard and guideline #7 (IV-44) and the 1991 Guidelines for Updating Timber Suitability[1].
2. The second project level Forest Plan amendment would allow thinning up to the boundary of hardwood stands designated as unique habitat (Ref. Proposed Action). Currently, prescription C5-1 states that no timber harvest is permitted within 150 feet of inventoried openings; outcrops and hardwood stands are included in the Umpqua LRMP as unique habitat. Vegetation manipulation or structural improvement may occur if it is designed to enhance wildlife (LRMP IV-200). In the case of the hardwood stands within the harvest units, leaving a 150 foot no cut buffer adjacent to the hardwood stands would arbitrarily exclude these areas from thinning, which would preclude and or retard development of the larger diameter trees that may otherwise enhance structural diversity. The project level Forest Plan amendment would allow for thinning adjacent to these hardwood habitats to help develop the desired condition described in the Purpose and Need.
3. The third proposed amendment applies to two of the management guidelines in the Layng Creek Municipal Watershed Plan (Appendix G of the LRMP).The

[5] USDA-Forest Service. August 5, 1991. Updating Timber Suitability. Umpqua National Forest. Roseburg, OR

guidelines to limit turbidity in Layng Creek were developed in the context of old-growth, even-aged management. The following guidelines would be amended for the Doris project:

A) Disturbed Area guidelines E2 and E3 of the Municipal Watershed Plan (LRMP Appendix G-7) established an annual threshold of no more than 350 acres of newly disturbed area. Disturbed area acres include all new activities where new areas of soil exposure would have less than 50% residual ground cover vegetation the first winter following the creation of new cut and fill slopes on roads, rock pit work, landings, waste disposal sites and any harvest areas where less than 50% crown closure exists. No more than 20% (70 acres) of such new disturbance is to occur as a result of road or landing construction or road reconstruction. Approximately 602 acres of the 1,000 acres proposed for thinning and gap creation would potentially result in overall unit canopy closures of less than 50%. In these units canopy closures would likely range from about 35%-47%, including the areas in gaps, and the thinned and unthinned areas within each unit (ref. Vegetation section). Thinned overstory canopies begin to close at an average of two percent per year (Chan, et al. 2006).

The proposed Forest Plan amendment increases the threshold to 800 acres of area disturbance associated with the thinning acres, while the annual acres of disturbance associated with road construction, reconstruction, and landing construction would remain under 70 acres as detailed in Appendix G. These disturbed areas would receive treatments (best management practices) that would further mitigate the likelihood of sedimentation (see Chapter Two).

It is unlikely that all 602 acres of the heavier thinning prescription would be thinned within one year; if it were, the unit canopy closures would not be substantially lower than the 50% level. The Municipal Watershed Plan estimated an average removal of 55,000 board feet of timber per acre. The heaviest thinning prescriptions in the Doris units would remove about 20,000 board feet per acre under partial harvest conditions, which is less than half of what was assumed in the Plan. Based on observations following similar types of thinning prescriptions and site preparation, adequate levels of effective ground cover (activity generated slash and residual undisturbed ground cover) have been present. Also, non-treatment stream buffers parallel all perennial streams, which mitigates the delivery of surface erosion to streams. This project-level Forest Plan amendment would allow the disturbed acres (from thinning) to exceed 350 acres in any one year in order to meet the watershed protection objectives set forth in the Plan, and to achieve the desired riparian and upland stand density conditions in an economically feasible way.

B) Yarding guideline #3 of the Municipal Watershed Plan (LRMP Appendix G-12) requires a no-equipment zone of 100 feet on each side of stream channels. However, heavy equipment would be allowed in riparian units (RU)[6] "at designated crossings or for specifically planned and authorized activities" (Riparian Unit Guidelines – Part I; Constraints #2 – Heavy Equipment).

6 Riparian Units are defined in the Layng Creek Municipal Watershed Plan (Appendix G of the 1990 Umpqua National Forest Land and Resource Management Plan) as riparian areas designated to protect watercourses from the impacts of soil and vegetation disturbances adjacent to watercourses as well as upslope from disturbed areas.

Ground based yarding would generally be restricted to designated skid trails located on existing skid trails created in the last harvest entry of the 1950s and 1960s. Another safe guard is to restrict operations to dry weather conditions and to slopes less than 30 percent. An amendment proposes allowing such operations within 100 feet of streams during the dry operating periods, thereby achieving desired riparian stand conditions in an economically feasible way.

PROJECT IMPLEMENTATION

Should one of the action alternatives be selected, the Forest Service would implement most of the timber harvest, road construction and reconstruction through timber sale contracts. Either action alternative would likely result in two separate timber sale contracts.

In the course of implementing complex harvest projects with several fuels treatments and connected actions, minor changes may be needed during implementation to better meet on-site resource management and protection objectives. For example, fuels prescriptions may be modified if site conditions dictate and other resource objectives can still be met. Minor adjustments to unit boundaries may be needed during final layout for resource protection, to improve logging system efficiency, or to better meet the intent of the resource prescriptions. Changes in logging systems, including locations of temporary spur roads, may be required to better facilitate logging systems and provide for resource protection. Many of these minor changes would not present sufficient potential impacts to require any specific documentation or action to comply with applicable laws.

In determining whether and what kind of further NEPA action is required to document any changes, the criteria for whether to supplement an existing Environmental Assessment (FSH 1909.15, sec. 18) would be followed.

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CHAPTER TWO

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

INTRODUCTION

The National Environmental Policy Act (NEPA) requires analysis of a proposed action and other reasonable alternatives, including no action. The no action alternative provides a baseline for estimating environmental effects. Three alternatives, including no action, are considered in detail in this document. The proposed action was developed to meet the purpose and need established by the District Ranger and will be approved by the Forest Supervisor. Alternative Three was developed in response to a significant issue identified during scoping. Another alternative was considered, but eliminated from detailed study.

ALTERNATIVES CONSIDERED, BUT ELIMINATED FROM DETAILED STUDY

An alternative was considered to drop acres to helicopter thin in Alternative 3, in response to the no new temporary roads issue. This proposed alternative would reduce thinning by about 170 acres, and would not meet the Purpose and Need for Action to reduce tree density and improve stand fire resiliency. In addition, this alternative dismissed is very similar to Alternative Three, and thus does not need to be considered as it duplicates an existing alternative. This alternative was eliminated from study.

ALTERNATIVE ONE – NO ACTION

Under Alternative One no thinning, fuel treatment, road construction, reconstruction, or maintenance, or other similar or connected activities including tree planting, pre-commercial thinning, subsoiling, fish passage improvement, or culvert replacement would take place. No ground-disturbing activities would take place and no timber would be offered for sale. On-going activities, including road maintenance, recreation use, and noxious weed control would continue to occur (Table 7). Future activities, such as those described in Table 8 would also occur.

ALTERNATIVE TWO - PROPOSED ACTION

(**Figure 4, Tables 1 and 2**)

This alternative is the proposed action used in the scoping process. The proposed action was developed to meet the purpose and need. It includes the following:

- Of the 1,282 acre planning area, commercial thinning 1000 acres of timber stands using helicopter, ground-based, and skyline logging systems in both the matrix and riparian reserve land allocations to generate about 13.4 million board feet of timber. No thinning would occur on 282 acres of riparian or unique habitat areas, or where protection of rare plant species and soils is a concern.
- Treating activity-created fuels on 609 of the thinned acres by underburning, machine piling, and hand pile and burning.
- Building four new landings for helicopter logging.

- No new system roads would be constructed. Approximately 6.6 miles of existing temporary roads would be used, and another 2.2 miles of temporary roads would be created. All temporary roads would be obliterated after use.
- Road reconstruction work includes replacement of twenty six 18-inch ditch relief culverts along with three new ditch relief culverts and six stream crossing culverts. Road grading and ditch line maintenance would occur on 38 miles of existing road. Replacement of 11 stream crossing culverts will take place.
- Utilizing the existing Silverstairs rock pit as the rock source for the road work.

The Forest Plan Amendments described in Chapter One would be included in Alternative Two. The specific treatments, on a unit-by-unit basis for Alternative Two, are as follows (Table 1):

Table 1. Alternative Two unit summary[7].

Unit	Thin Acres	Harvest Rx (trees per acre left)	Gaps	MBF Volume Removed	Logging Systems	Fuels Prescription[8]
1	51	40-60	1 ac 10%	991	Helicopter, Ground, Skyline	Underburn Machine Pile
2	40	40-60	1 ac 10%	615	Ground, Skyline	Underburn, Machine Pile
3	17	40-60		302	Skyline	Underburn
4	9	40-60		81	Skyline	Underburn
5	42	70-90	¼ ac 10%	476	Ground, Skyline	Machine Pile
6	23	70-90	¼ ac 10%	253	Ground, Skyline	Machine Pile
7	31	40-60		341	Skyline	No Treatment
8	27	40-60		587	Ground, Skyline	Machine Pile, Hand Pile
9	39	70-90	¼ ac 10%	376	Ground, Skyline	Underburn, Machine Pile
10	37	70-90	¼ ac 10%	407	Ground, Skyline	Machine Pile
11	19	70-90	¼ ac 10%	171	Ground, Skyline	Machine Pile, Hand Pile
12	23	70-90	¼ ac 10%	253	Helicopter,Skyline	Hand Pile
13	41	40-60		451	Ground, Skyline	Machine Pile, Hand Pile

7Acres and volumes were rounded; column totals may not exactly add up, but are within +/- 10% variance.

8 A light underburn or "Jackpot Burn" will be used in this timber sale. Jackpot burning is the application of prescribed fire to concentrations of fuels rather than the landscape as a whole. Typically, it is applied during the time of year when the probability of fire spread is very low and in situations where fuels reduction is not a primary objective. Jackpot burning is the method used in units where residual activity created fuels or natural fuels are discontinuous. Jackpot burning would be implemented in the late fall, winter, or spring seasons (October to March) when soil and live fuel moistures are elevated and existing shrubs are more likely maintained.

Unit	Thin Acres	Harvest Rx (trees per acre left)	Gaps	MBF Volume Removed	Logging Systems	Fuels Prescription[8]
14	17	70-90	¼ ac 10%	217	Skyline	No Treatment
15	13	70-90	¼ ac 10%	143	Skyline	No Treatment
16	30	40-60		270	Ground, Skyline	Machine Pile
17	6	40-60		66	Ground, Skyline	Machine Pile
18	18	40-60		198	Ground, Skyline	Machine Pile
19	19	70-90	¼ ac 10%	132	Ground	Machine Pile
20	35	70-90	¼ ac 10%	344	Ground, Skyline	Underburn, Machine Pile
21	4	70-90	¼ ac 10%	32	Skyline	Underburn
22	31	70-90	¼ ac 10%	541	Ground, Skyline	Machine Pile, Hand Pile
23	34	70-90	¼ ac 10%	439	Ground, Skyline	Machine Pile
24	40	40-60		842	Ground, Skyline	Machine Pile
25	47	40-60	1 ac 10%	741	Ground, Skyline	Underburn, Machine Pile
26	62	70-90	¼ ac 10%	682	Ground, Skyline	Underburn, Machine Pile
27	15	40-60		165	Ground, Skyline	Underburn, Machine Pile
28	27	40-60		351	Helicopter, Ground, Skyline	Machine Pile
29	4	40-60		58	Skyline	No Treatment
30	10	40-60		169	Helicopter	Underburn
31	43	40-60		807	Ground, Skyline	Machine Pile
32	58	40-60		967	Ground, Skyline	Machine Pile, Hand Pile
33	35	40-60		452	Helicopter, Ground, Skyline	Machine Pile
34	24	40-60		260	Helicopter, Ground, Skyline	Machine Pile
35	29	40-60		261	Ground, Skyline	Machine Pile
	1000			13,441	**Skyline – 604 ac; Helicopter – 48 ac; Ground based– 347 ac.**	**609 ac fuel treatment, 672 ac no treatment**

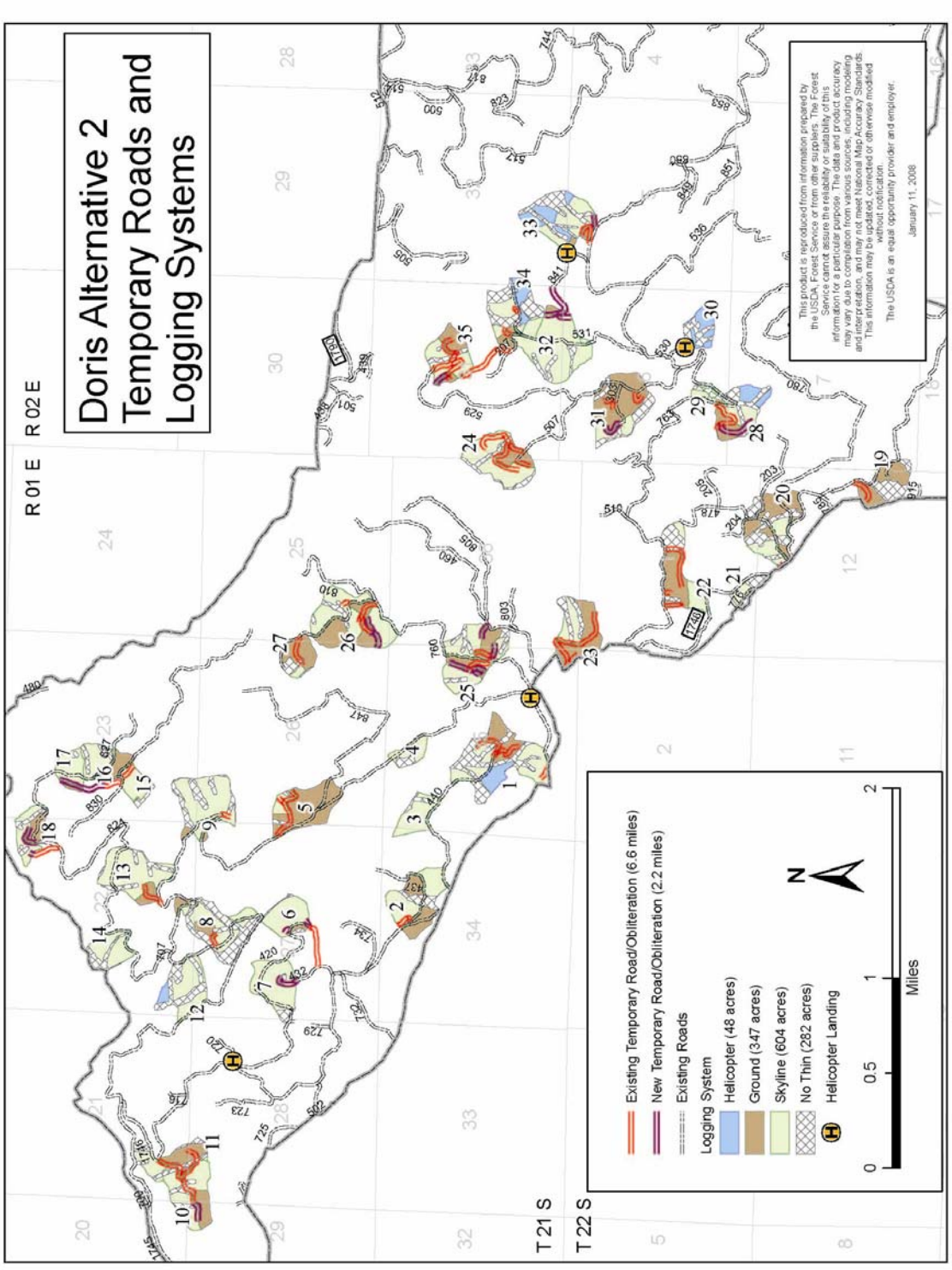

Figure 5. Alternative Two

For Alternative Two, the road construction necessary to access stands for thinning is displayed in Table 2 on a unit-by-unit basis.

Table 2. Alternative Two. Summary of road construction and reconstruction[9].

Unit #	New Temp. Road Construction (miles)	Existing Temp. Roads Reused (miles)
1	**None**	**0.47**
2	**None**	**0.11**
5	**None**	**0.38**
6	**0.07**	**0.23**
7	**0.16**	**None**
8	**None**	**0.08**
9	**None**	**0.05**
10	**0.11**	**0.16**
11	**None**	**0.42**
13	**None**	**0.16**
15	**None**	**0.09**
17	**0.25**	**0.09**
18	**0.17**	**0.14**
19	**None**	**0.15**
20	**0.01**	**None**
21	**None**	**0.23**
22	**None**	**0.41**
23	**None**	**0.61**
24	**None**	**0.69**
25	**0.41**	**0.24**
26	**0.20**	**0.32**
27	**None**	**0.17**
28	**0.22**	**0.27**
31	**0.13**	**None**
32	**0.34**	**None**
33	**0.07**	**0.21**
34	**None**	**0.09**
35	**0.09**	**0.83**

Permanent System Road Construction

There would be no permanent system road construction.

9 Summary of road construction and reconstruction for logging access by individual unit.

Temporary Roads

The 2.2 miles of new temporary road to be constructed under Alternative Two would be native surface roads (no rock added) constructed on side-slopes under 30% and would have grades under 10%. Temporary roads are typically constructed with a tractor, and after logging would be obliterated with an excavator equipped with a "winged ripper" that de-compacts the soil. Any excavated material, including soil and woody material, would be pulled back over the road to re-establish the original contour as much as feasible, and entrances would be blocked. In addition to the 2.2 miles of temporary road discussed above, there would be an additional 6.6 miles of existing temporary road that would be reused in this alternative. Once logging operations are complete, these existing temporary roads would be restored in the same manner as the newly constructed temporary roads.

Road Reconstruction

Road reconstruction on existing system roads would take place in order to meet standards and guidelines of the Northwest Forest Plan to accommodate flood flows, minimize the disruption of natural water flow pathways, and lessen risk of erosion, (ROD C 32-33), while providing for safe, cost-effective timber haul. The reconstruction would include:

- Reconstruction of six rusted and damaged culverts at existing stream crossings. Reconstruction would help to either eliminate the potential for stream diversion or to accommodate 100-year flood flows on road 1746 at mile post 8.51; 1746-529 at mileposts 0.5, 0.72, and 1.32; and 1746-707 at mile posts 1.76 and 1.95;
- The replacement of 26 rusted ditch relief culverts on roads 1746,1746-204, 1746-707, 1746-780 and 1746-763;
- The placement of three additional ditch relief culverts on the 1746-707 road near the 2.45 mile post ;
- The repair of four road fill failures posing risk of erosion or risk to safe timber haul on roads 1746-707 (MP 1.32), 1746-763 (MP 0.73) and 1746-824, (MP 0.20 and 0.25). The reconstruction of two of these failures would require shifting the road alignment into the hillslope and removal of excavated or slumping soil/rock masses. Other work would include an the addition or replacement of ditch relief culverts, refurbishing ditchlines and adding road aggregate.

Road maintenance

An estimated 38.28 miles of road maintenance would be done by timber sale purchasers on 25 different road segments that would be used for timber haul (refer to the Project File for more detail). This would include road-side mowing of vegetation, grading and shaping the road prism, and ditch pulling and cleaning. If hazard trees are identified along the haul routes (in compliance with the Biological Opinion (1-15-2006-F-0035)), they may be felled and left on site as needed to meet Occupational Safety and Health Administration (OSHA) requirements.

Connected and Similar Actions

Connected actions (actions closely related to the proposed alternatives and similar in regards to timing and geography) must be considered when determining the combined impacts of a project. Connected and similar actions, financed either by funds appropriated from Congress or by funds collected from the sale of timber, may be used for the improvement of renewable resources. Depending on the results of a cost-benefit

analysis, connected and similar actions that may qualify for funding include:

- 13 acres of reforestation in openings that are one acre in size;
- 1,870 snags to be created by inoculation with heart rot fungus and 130 snags created from underburning;
- Four acres of revegetation of bare ground for erosion control;
- 180 acres of predicted noxious weed treatments within harvest units and other areas of disturbance;
- 13.19 miles of high priority road inactivation (removing culverts, installing water bars, and blocking entrances) of existing system roads 1746-204 (0.24), 1746-203 (0.51), 1746-205 (0.30), 1746-776 (0.18), 1746-803 (0.29), 1746-827 (0.44), 1746-824 (3.16), 1746-847 (1.74), 1746-440 (1.08), 1746-437 (0.40), 1746-780 (1.66), 1746-830 (0.46), 1746-507 (0.58), 1746-530 (0.12), 1746-531 (1.39), 1746-303 (0.20) and 1746-432 (0.44);
- 70 acres of precommercial thinning in young plantations;
- Replacement of the Harvey Creek fish passage culvert and pump chance**;**
- 5.21 miles of moderate priority road inactivation (removing culverts, installing water bars, and blocking entrances) of existing system roads 1746-198 (1.70), 1746-536 (1.01), 1746-460 (0.73), 1746-300 (0.46), 1746-805 (1.10), and 1746-510 (0.21); and
- Six fire sumps would be maintained. This maintenance includes: the addition of rock to sump access roads; the excavation of filled-in gravel, soil, and vegetation within the existing sumps; vegetation brushing and mowing along sump access roads.
- Five culverts would be upgraded to reduce potential erosion concerns. These culverts are located on the 1746-763 road at mile posts 0.36, 0.8 & 2.02 and on the 1746-707 road at mile posts 0.75 & 1.09.

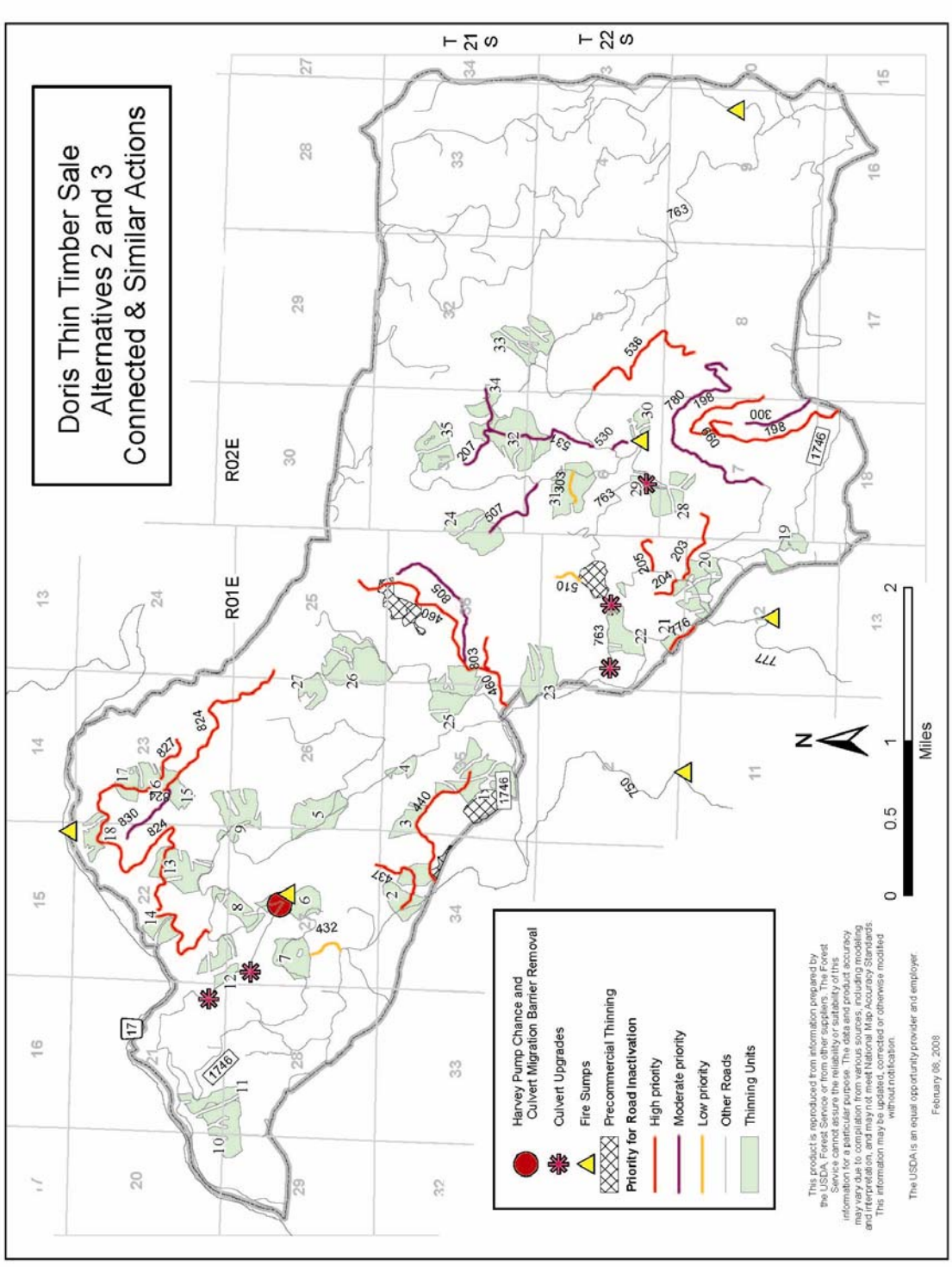

Figure 6. Connected and Similar Actions (Alternatives Two and Three)

ALTERNATIVE THREE

(Figure 5, Table 3)

Alternative Three was developed to meet the purpose and need and to respond to the issue of temporary road building. Alternative Three would build 0.2 miles of new temporary roads, with a shift to more helicopter logging and decreased activity-created fuels work as compared to Alternative Two.

Specifically, Alternative Three differs from Alternative Two by building 0.2 miles of temporary roads, which equates to 2.0 fewer miles of new temporary road than proposed in Alternative Two. With fewer temporary roads, Alternative Three would increase the use of helicopter logging by 122 acres over that in Alternative Two.

The harvest units, silvicultural prescriptions, connected and similar actions associated with Alternative Three would be the same as Alternative Two with the same timber output of approximately 13.4 million board feet.

Alternative Three includes the following:

- Of the 1,282 acres in the analysis area, commercial thinning 1,000 acres of timber stands using helicopter, ground-based, and skyline logging systems in both the matrix and riparian reserve land allocations to generate about 13.4 million board feet of timber. No thinning would occur on 282 acres of riparian or unique habitat areas, or where protection of rare plant species and soils are a concern.
- Treating activity-created fuels on 598 thinned acres by underburning, machine piling, and hand piling and burning.
- Building nine new landings for helicopter.
- No new system roads would be constructed. Approximately 6.4 miles of existing temporary roads would be used, and another 0.2 miles of temporary roads would be created then obliterated after use.
- Road reconstruction work includes replacement of twenty six 18-inch ditch relief culverts and six stream crossing culverts. Road grading and ditch line maintenance would occur on 38 miles of existing road. Replace six stream crossing culverts.
- Utilizing the existing Silverstairs rock pit as the rock source for road work.

The Forest Plan Amendments described in Chapter One would be included in Alternative Three. The specific treatments, on a unit-by-unit basis for Alternative Three, are as follows (Table 3):

Table 3. Alternative Three Summary[10].
(Bold type in this table displays how logging systems and fuels treatments in this alternative are different from those in Alternative Two.)

Unit	Thin Acres	Harvest Rx (trees per acre left)	Gaps	MBF Volume Removed	Logging Systems	Fuels Prescription[11]
1	51	40-60	1 ac 10%	991	Helicopter, Ground, Skyline	Underburn, Machine Pile
2	40	40-60	1 ac 10%	615	Ground, Skyline	Underburn, Machine Pile
3	17	40-60		302	Skyline	Underburn
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8	27	40-60		587	Ground, Skyline	Machine Pile, Hand Pile
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10	37	70-90	¼ ac 10%	407	**Helicopter,** Ground, Skyline	**Machine Pile**
11	19	70-90	¼ ac 10%	171	Ground, Skyline	Machine Pile, Underburn
12	23	70-90	¼ ac 10%	253	Helicopter,Skyline	Hand Pile
13	41	40-60		451	Ground, Skyline	Machine Pile, Hand Pile
14	17	70-90	¼ ac 10%	217	Skyline	No Treatment
15	13	70-90	¼ ac 10%	143	Skyline	No Treatment
16	30	40-60		270	Ground, Skyline	Machine Pile
17	6	40-60		66	**Helicopter,** Skyline	**No treatment**
18	18	40-60		198	**Helicopter,** Ground, Skyline	**Machine Pile**
19	19	70-90	¼ ac 10%	132	Ground	Machine Pile

10 Acres and volumes were rounded; column totals may not exactly add up, but are within +/- 10% variance.

11 A light underburn or "Jackpot Burn" will be used in this timber sale. Jackpot burning is the application of prescribed fire to concentrations of fuels rather than the landscape as a whole. Typically, it is applied during the time of year when the probability of fire spread is very low and in situations where fuels reduction is not a primary objective. Jackpot burning is the method used in units where residual activity created fuels or natural fuels are discontinuous. Jackpot burning would be implemented in the late fall, winter, or spring seasons (October to March) when soil and live fuel moistures are elevated and existing shrubs are more likely maintained.

Unit	Thin Acres	Harvest Rx (trees per acre left)	Gaps	MBF Volume Removed	Logging Systems	Fuels Prescription[11]
20	35	70-90	¼ ac 10%	344	Ground, Skyline	Underburn, Machine Pile
21	4	70-90	¼ ac 10%	32	Skyline	Underburn
22	31	70-90	¼ ac 10%	541	Ground, Skyline	Machine Pile, Underburn
23	34	70-90	¼ ac 10%	439	Ground, Skyline	Machine Pile
24	40	40-60		842	Ground, Skyline	Machine Pile
25	47	40-60	1 ac 10%	741	**Helicopter,** Ground, Skyline	Machine Pile
26	62	70-90	¼ ac 10%	682	**Helicopter,** Ground, Skyline	Underburn, Machine Pile
27	15	40-60		165	Ground, Skyline	Underburn, Machine Pile
28	27	40-60		351	**Helicopter (increase ac),** Ground, Skyline	Machine Pile
29	4	40-60		58	Skyline	No Treatment
30	10	40-60		169	Helicopter	Underburn
31	43	40-60		807	**Helicopter (increase ac),** Ground, Skyline	Machine Pile
32	58	40-60		967	**Helicopter** , Skyline	**Hand Pile**
33	35	40-60		452	Helicopter, Ground, Skyline	Machine Pile
34	24	40-60		260	Helicopter, Ground, Skyline	Machine Pile
35	29	40-60		261	**Helicopter (increase ac),** Ground, Skyline	Machine Pile
	1000			13,441	**Skyline – 493 ac; Helicopter – 170 ac; Ground based– 336 ac.**	**598 ac fuel treatment 683 ac no treatment**

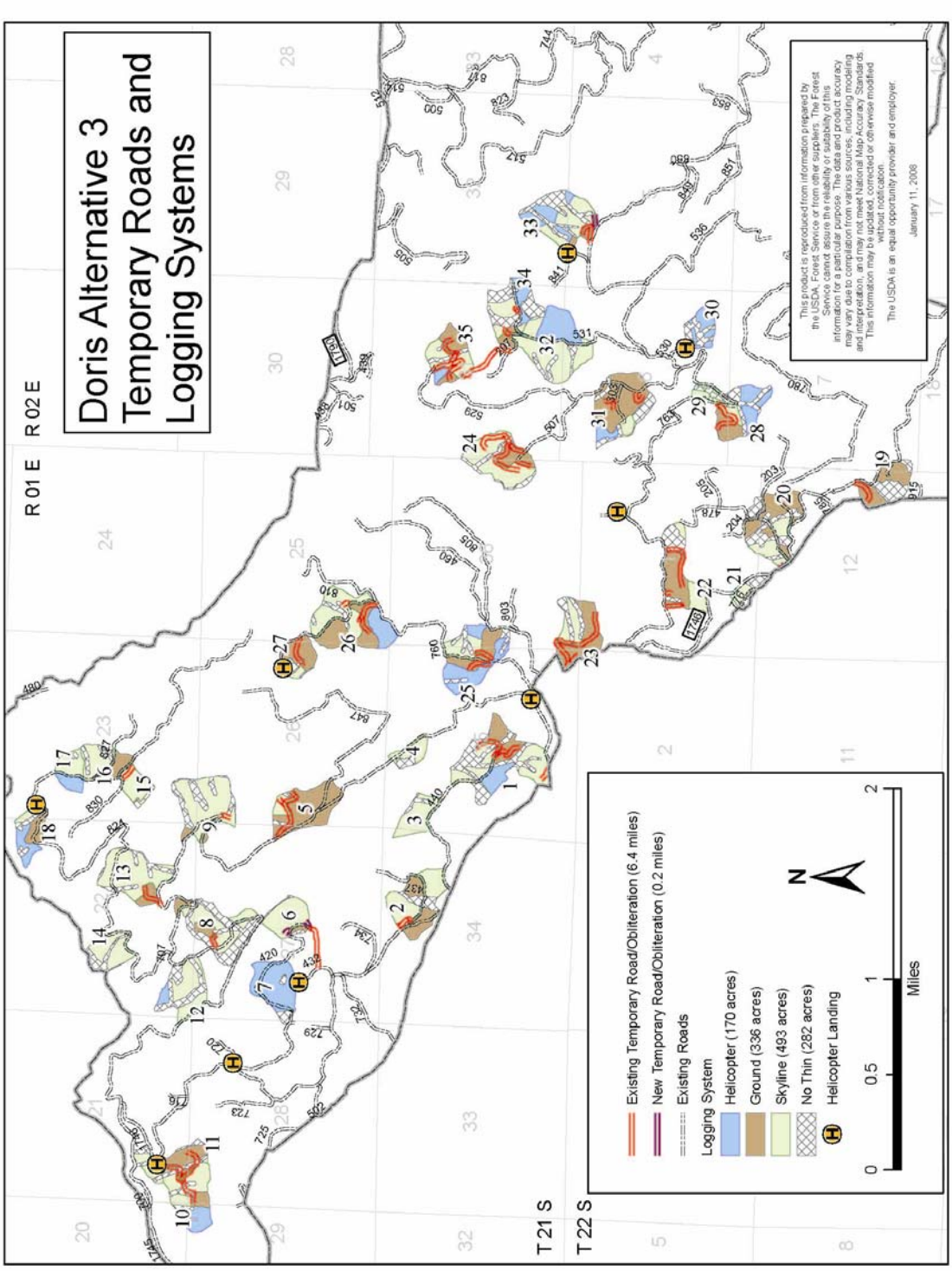

Figure 7 Temporary Roads and Logging Systems

Permanent System Road Construction

There would be no permanent system road construction under this alternative.

Temporary Road Construction

The 0.2 miles of temporary road to be constructed under Alternative Three would be native surface roads (no rock added) constructed on side-slopes under 30% and would have grades under 10%. Temporary roads would be obliterated and de-compacted after logging. Any excavated material, including soil and woody material, would be pulled back over the road to re-establish the original contour as much as feasible, and entrances would be blocked. In addition to the 0.2 miles of temporary road discussed above, there will be an additional 6.4 miles of existing temporary road that will be used in this alternative. Once logging operations are complete, these existing temporary roads will be restored in the same manner as the newly constructed temporary roads.

Road Reconstruction, Road Maintenance, and Connected and Similar Actions remain the same as in Alternative Two.

COMPARISON OF ALTERNATIVES

Table 4 compares the alternatives by the elements of the purpose, need, and issue indicators, and summarizes other activities, actions and effects that would occur.

Table 4. Comparison of Alternatives.

	Alt. 1	Alt. 2	Alt. 3
Element 1 – Stand Density • **Acres of second-growth thinning to improve conditions for species and structural diversity and stand stability** • **Acres of improved stand fire resiliency in the gentle mountain slope (GMS) and steep landscape areas**	**0**	**1000** **362 – GMS** **92– Steep**	**1000** **358 – GMS** **92 – Steep**
Element 2 –Timber Production and Cost Efficiency of Thinning • **Million board feet (MMBF) of timber produced by commercial thinning** • **Benefit/Cost ratio** • **Net Present Value**	**0** **0** **0**	**13.0 MMBF** **1.05** **$266,338**	**13.0 MMBF** **1.00** **(-$14,258)**
Issue 1 – Road Building • **Miles of temporary roads built**	**0**	▪ **2.2 miles new temp** ▪ **6.6 miles of existing temp road reconstructed** ▪ **5.0 miles spot system reconstruction**	▪ **0.2 miles new temp** ▪ **6.6 miles of existing temp road reconstructed** ▪ **5.0 miles spot system reconstruction**

	Alt. 1	Alt. 2	Alt. 3
Comparison of Activities/Effects			
Logging systems ▪ **Skyline** ▪ **Helicopter** ▪ **Ground based**	 **0** **0** **0**	 **607** **48** **345**	 **494** **170** **336**
Fuels Treatments ▪ **Underburn** ▪ **Handpile along paved road** ▪ **Machine Pile/Burn** ▪ **No Treatment**	 **0** **0** **0** **0**	 **237 acres** **23 acres** **672 acres** **349 acres** **672 acres**	 **237 acres** **23 acres** **683 acres** **338 acres** **683 acres**
Landings for Helicopter Logging ▪ **New Landings** ▪ **Existing Landing Use**	 **0** **0**	 **0** **4**	 **4** **5**
• **Inactivation of existing roads**	**0**	**18.96 miles**	**18.96 miles**
Instream Activity ▪ **Stream Crossings removed through road inactivation** ▪ **Stream Crossing Fish Passage Improvement** ▪ **Stream Crossings Upgraded to prevent erosion concerns**	 **0** **0** **0**	 **20** **1** **11**	 **20** **1** **11**

Best Management Practices, Mitigation Measures, Management Requirements, and Monitoring

The following measures address the laws, regulations and policies that relate to reducing potential environmental effects. These requirements apply to both action alternatives unless otherwise stated. Mitigation measures are defined as actions that:

- avoid the impact all together (such as avoiding harvest on unstable land);
- minimize impacts by limiting the degree or magnitude of the action;
- rectify the impact via rehabilitation or restoration activities;
- reduce the impact over time through recurring operations such as road maintenance.

General Water Quality Best Management Practices (BMPs) and project design features are symbolized by a (✓), and are mitigation measures prescribed to protect the beneficial uses of water and to address water quality objectives as required by the Federal Clean Water Act and the 1990 Forest LRMP. The BMPs are listed by codes used in the Pacific Northwest Region's General Best Management Practices Guide (USDA, Forest Service, 1988). A complete BMP checklist is included in the Project Record.

Other management requirements not related to compliance with the Clean Water Act are indicated by a bullet (•). Monitoring is delineated by a lightning bolt (↯). Forest Plan Standards and Guidelines (S&Gs) are listed where they apply.

LOGGING EROSION CONTROL MEASURES

BMPs T-3, T-13, T-14, T-15, T-16; Forest Plan S&Gs IV-60-5; IV-68-2; IV-71-13, IV-72-16, and Appendix G-20, items 1-5.

OBJECTIVE: Ensure any increase in sedimentation is minimized during and after logging or associated activities. Logging methods are described in the Project File.

ACTIONS:

✓ Stream course protection would be used on all stream classes.

✓ Erosion control measures would be identified where project areas have the potential to produce erosion or sedimentation that may affect water quality and beneficial uses of surface waters. The installation and application of appropriate erosion control measures would be applied on designated soil gouges in skyline corridors, and on ground based equipment skid trails that may reroute or concentrate runoff, spread water and allow soil infiltration.

✓ All water bars would be located and flagged by the Forest Service before construction (LRMP Appendix G).

✓ All skid roads would be made self-maintaining at the end of each operation season in which road is constructed or used (LRMP Appendix G).

✓ Cut-and-fill slopes would have full erosion control work completed the same year as constructed (LRMP Appendix G).

✓ All required erosion control work shall be completed before October 15 each year (LRMP Appendix G).

✓ Over-steepened landing debris should be pulled back to slope gradients of 70% or less to minimize failure risk (LRMP Appendix G).

✓ The requirement to not create any more than 350 acres of new disturbed area, including any harvest areas with less than 50% crown closure, is waived since this Forest Plan guideline (Appendix G-7) is proposed for amendment as described in Chapter One.

LOGGING PRACTICES

BMPs T-11, T-12, T-1, T-16; Forest Plan S&Gs IV-60-5, IV-60-2, IV-67-1, IV-68-2.

OBJECTIVE: Minimize timber harvest impacts to water quality and soil productivity to the extent practical.

ACTIONS:

✓ To reduce the number of skyline corridors, skyline roads would be no closer than 150 feet at the outer unit boundary of all units, or as required in order to protect green trees prior to felling.

✓ Location of all skid roads, at an average of 100 feet apart would be agreed to prior to felling unless otherwise agreed to in writing.

✓ Locate landings so that timber can be yarded with minimal disturbance to riparian reserves.

✓ Landing size should be no larger than needed for a safe, efficient yarding and loading operations.

✓ The tree lining requirement in riparian units in the Layng Creek Municipal Watershed Plan (Appendix G-12) is waived since this Forest Plan guideline is proposed for amendment as described in Chapter One.

✓ The requirement to keep all equipment 100 feet away from each side of stream channels is waived since this Forest Plan guideline (Appendix G-12) is proposed for amendment as described in Chapter One.

✓ No yarding corridors are planned to cross stream channels. If there is an unforeseen change, the District Fisheries or Wildlife Biologist will be consulted. Where feasible, full suspension will be required.

CONTROL OF PURCHASER OPERATIONS

BMPs T-5, T-10, T-11, T-13, T-14, T-15, T-18, T-19, T-21, T-22, R-3, R-19, R-20, W-4; Forest Plan S&Gs IV-83-3, IV-82-5, IV-61-9.

OBJECTIVE: Enable the Forest Service to exercise control of operations to prevent impacts which could have detrimental results to water quality.

ACTIONS:

✓ To prevent damage to water quality during the operating period, restriction of equipment shall be enforced through the use of appropriate Timber Sale Contract (TSC) provisions when conditions for timber harvest, road construction, or road use are such that excessive damage would result. The kind and intensity of erosion control work done by the purchaser shall be adjusted to ground and weather conditions and the need for controlling runoff.

✓ Restrict ground base yarding to slopes less than 35% (LRMP Appendix G).

✓ All skid roads locations would be approved by the Forest Service prior to use (LRMP Appendix G).

✓ Erosion control work shall be kept current immediately preceding expected seasonal periods of precipitation or runoff. Any soil disturbed during the rainy season in excess of 0.5 acres would have effective ground cover placed on site in order to minimize erosion potential.

✓ Purchaser erosion control structures and maintenance work must be inspected prior to acceptance by the Forest Service, and would be specified in the TSC.

✓ Pollutants from logging or road reconstruction equipment would be kept from entering waterways during servicing or refueling by selecting areas at least 100 feet away from wet areas and surface water, and by using berms around sites to contain spills. If the volume of fuel exceeds 660 gallons in a single container or a total on-site storage of 1320 gallons, a Spill Prevention Control and Countermeasures (SPCC) Plan is required, and necessary equipment would be on site during operations. The purchaser shall take appropriate preventative measures to ensure that any spill does not enter any stream. Any spill that occurs must be reported to the Contracting Officer.

✓ Roadwork contractors would have spill prevention and recovery equipment on site during all road construction operations as agreed to by the Forest Service.

✓ No dust abatement would be applied on roads within 25 feet of perennial stream crossings.

✓ All landing locations would be approved by the Forest Service prior to landing construction. Agreed upon plans for the landing shall insure water quality protection.

✓Military training route IR-346 is directly above the Doris planning area. It enters the Forest at T21S-R1E-19 SW/SW (43.43.5 N. Lat, 122.45 W Lon.) and proceeds directly east to exit at T21S-R2E-29 NE/NE (43.43.2 N Lat., 122.35.5 W Lon.). This line denotes only the centerline; the route's width extends approx. 4 nautical miles both north and south of this line. Airspeed is subsonic above 360 knots ground speed, and allows operation by pilots visually (VFR) between 200 ft. above ground level (AGL) during the day, and 800 AGL at night. Navy aircraft may operate between 500 AGL and the **minimum obstruction altitude** regardless of weather, both day and night. It is essential that any activities related to this timber sale take this active route into consideration. This may include but is not limited to cables spanning canyons, yarders that protrude above the surrounding canopy or terrain, helicopter work or any activities that may include blasting.

RIPARIAN AREAS WITHIN OR ADJACENT TO CUTTING UNITS

BMPs T-4, T-7, T-8; Forest Plan S&Gs IV-60-4, 5, 6; IV-33-5.

OBJECTIVE: Establish riparian area protection zones to minimize stream temperature increases, protect channel bank structure, provide a debris filter for sediment and debris which could enter the channels, and maintain a source of large woody debris for continued stream channel stability and structural diversity.

ACTIONS:

✓ Wetlands would be protected from microclimate change or ground disturbance by applying the following: a 50-foot no-cut buffer; no yarding through the buffers or

wetlands (cables ok); and not igniting fire in the buffers or wetlands during fuel treatment.

✓ During ground-based logging, restrict equipment entry to within 40 feet of a stream and wet area.

✓ Apply no-cut buffers to all perennial streams following guidance in the Northwest Forest Plan Temperature TMDL Implementation Strategies (USDI/USDA 2005) to protect the primary shade zone from harvest. The site specific buffers have been mapped by unit. The following widths are from the TMDL implementation strategies:

Height of Tree	%Hill Slope <30	%Hill Slope 30 to 60	%Hill Slope >60
Trees < 20 feet	12' buffer	14' buffer	15' buffer
Trees 21 to 60 feet	28' buffer	33' buffer	55' buffer
Trees 61 to 100 feet	50' buffer	50' buffer	60' buffer

✓ Burning within the riparian zone to reduce fuel hazard near stream channels would be carefully controlled by allowing fire to back into the no-cut buffers (from previously ignited areas outside the buffers) to minimize fire intensity and mortality of fire-susceptible species such as hemlock, cedar and true fir (LRMP Appendix G).

WATERSHED PLANNING AND MONITORING

BMPs W-1, W-7.

OBJECTIVE: To repair degraded watershed conditions, improve water quality and soil stability, and track the long-term water quality trends in the watershed.

ACTIONS:

✓ Use interdisciplinary analysis of road management needs and aquatic/watershed trade-offs to recommend opportunities for road improvement, closure and inactivation (Roads Analysis in the Project File).

✓ Water quality monitoring would continue with the long-term turbidity monitoring in the main stem of Layng Creek at the City of Cottage Grove Water Treatment Plant (LRMP Appendix G).

FISHERIES/WATERSHED

BMP R-14

OBJECTIVE: Minimize turbidity and other risks to water quality while implementing aquatic restoration projects.

ACTIONS:

✓ All road work that involves working in or around a stream channel, such as culvert replacements and culvert removals, would be completed during low flow conditions when the potential for delivery of construction-related sediment can be minimized.

✓ The Oregon Department of Fish and Wildlife (ODFW) in-water work period is July 1 – October 15, unless otherwise approved by the ODFW District Fisheries Biologist.

✓ In the larger perennial streams, remove woody debris that could be mobilized during high flows and contribute to downstream problems (such as at culvert crossings, etc.) (LRMP Appendix G).

TEMPORARY AND SYSTEM ROAD CONSTRUCTION, ROAD RECONSTRUCTION, AND ROAD MAINTENANCE

BMPS R-2, R-3, R-4, R-5, R-6, R-7, R-9, R-15, R-23; Forest Plan S&G IV-83-6.

OBJECTIVE: To minimize sedimentation, the effects of water concentration on roadbeds, cut slopes or fill slopes, and subsequent production of sediment associated with the reconstruction of five miles in Alternatives Two and Three, and maintenance of approximately 38.28 miles for Alternatives Two and Three. In addition, temporary roads would be constructed to facilitate harvest operations and then obliterated after logging is completed. Safety of the road system would be maintained.

ACTIONS:

✓ Develop an erosion control plan to be included in the TSC.

✓ Where appropriate, native-surfaced system roads would have water bars installed and road barriers placed to prevent damage after commercial use is complete. Aggregate surfaced system roads to be closed following use would be barricaded and treated with water bars as needed to prevent drainage problems.

✓ Avoid blading ditches that are functioning and effectively draining. Grading of roads would be done in accordance with maintenance specifications. Apply water during blading when sufficient moisture is not present.

✓ During reconstruction activities, waste material shall be placed in areas agreed to by the Forest Service. These areas shall generally avoid riparian, fish, wildlife, cultural, and botanical resources.

✓ Gravel would be placed as needed on access roads into water sources to reduce sedimentation to streams.

✓ Utilize stable natural benches and ridges wherever possible. Avoid slumps, slides, and wet spots.

✓ All temporary stream crossings on temporary roads in units 1, 5, 10, 11, 24 and 3 will be constructed between June 1st and September 30th and removed during the same operating season. However, construction activities may be suspended anytime during wet weather to protect water quality of affected streams.

✓ End-hauled material would be disposed of only at Forest Service approved waste sites outside riparian areas, and on stable areas with slopes less than 55 percent.

✓ Provide relief culverts as needed, not to exceed 400-foot spacing.

✓ Provide relief culverts within 150 feet of any naturally defined channel to minimize the cumulative road drainage entering a stream-course.

✓ Construction activities that may expose new soil (including clearing, grubbing, excavating, and fill placement) would be limited to the June 1 to September 30 time period. However, construction activities may be suspended anytime during wet weather to protect water quality of affected streams.

✓ Surface rock placement may be done outside June 1 to September 30 as weather and road conditions permit.

✓ All roads would be rocked or blocked, before October 15, for the winter wet season. Earth-surface roads, including uncompleted roads to be rocked, would be cross drained before October 15.

✓ Relief culvert locations would be located, flagged, and approved by the Forest Service before installation.

✓ Required erosion control work would be completed before October 15.

✓ Cut-and-fill slopes would have required erosion control treatments completed the same year they are constructed even if they are not completed to final acceptance specifications. If the same area requires further disturbance to complete the road construction, it would be re-vegetated as needed to insure surface soil protection.

✓ All road cut slopes, fill slopes, and ditch lines would be stabilized with grass/forbs.

✓ Heavy vehicles would be restricted to all-weather roads outside the June 1 to September 30 time period. Commercial truck traffic may be suspended based on (1) road condition, and (2) turbidity increases in natural channels, as influenced by the truck haul route. Both conditions are defined in the Umpqua National Forest's road rules (04/08/2005).

✓ During construction, temporary roads would have the surface A-horizon (8 to 12 inches) removed and stored in a manner that would not cause surface water flow to concentrate behind it.

✓ Water bars sufficient to disperse water shall be designated by the Forest Service to disperse subsurface water and prevent future traffic.

✓ All temporary roads would be reviewed prior to treatment to initiate and finalize the treatment prescription, the effectiveness of the temporary road restoration prescription in preventing erosion and providing suitable plant habitat may be monitored by a resource specialist.

✓ Along haul routes hazard trees would be identified, felled, and left on site as needed to meet OSHA requirements. If hazard trees are identified within a Critical Habitat Unit, first coordinate with the District Wildlife Biologist.

ROCK SOURCE DEVELOPMENT

BMP R-22, R-17

ACTIONS:

✓ Rock pit benches, access roads, and work areas within the Silverstairs rock pit would be out-sloped at 5% to provide for adequate drainage.

FIRE SUPPRESSION AND FUELS MANAGEMENT

General Water Quality BMPs F-1, F-2, F-3; UNF LRMP S&Gs IV-68-2 & 3; IV-92-4, 7, 8; Appendix G-28(4), G-35 & 36 items 1-4; NWFP ROD S&Gs C 35-36, FM-1, FM-4

OBJECTIVE: Improve stand fire resiliency while reducing the potential water quality degradation, subsequent flooding, or soil displacement caused by prescribed or wildland fire. Reduce fuel loads to reduce wildfire effects to soil productivity, minimize erosion, and prevent ash, sediment, nutrients and debris from entering water bodies.

ACTIONS:

✓ Burn plans would include water quality objectives and burning would be carried out when fuel moistures are sufficient to ensure retention of effective ground cover where needed.

✓ Levels and methods of fuels treatment would be guided by the protection and resource objectives within the management area.

• Burn plans would be prepared in advance of ignition and approved by the appropriate line officer for each prescribed fire.

• Air quality would be emphasized during prescribed fire planning. Mitigation measures that would be considered shall include extending the burning season to spread emissions throughout the year. All burning would be planned and conducted to comply with applicable air quality laws and regulations and coordinated with appropriate air quality regulatory agencies.

• Burning would be conducted to meet air quality standards as outlined by Oregon DEQ. Air quality monitoring would be conducted by the DEQ.

• General burning guidelines are designed to minimize erosion and are presented in Table G-11 of the LRMP (Slash Burning Guidelines to Minimize Potential Soil Erosion).

• As needed, firelines would require water bars at slopes greater than 30%. Fireline water bars would deflect surface run-off from the trail down slope onto stable material such as rock surface cover. Fireline would not be constructed through sensitive areas like unique habitats. Firelines would be constructed in portions of Doris stand #'s: 1, 2, 3, 4, 9, 11, 20, 21, 22, 25, 26, 27 and 30.

• Whip felling, pruning and relocating slash concentrations would be utilized to remove fuels between the tree crowns and the ground across approximately 3% of the acreage targeted for fuel reduction treatments, particularly where there are heavier accumulations of fuels in the immediate vicinity of desirable retention trees. The layer of vegetation affected would be the shrubs, seedlings and saplings of conifer species, and all hardwood species. Hand piles would generally be constructed about four feet wide by six feet long and not more than six feet high. Piled slash would be less than six inches diameter on the large end. Piles would be covered with plastic sheeting to facilitate burning.

• Sump improvement work would be accomplished on six pump chances within the project area. This work would include falling hazard trees, gravel placement on sump spurs and landings, brushing of ingress and egress areas, maintaining or replacing signs, and removing accumulated sediment as needed. If there is not a stable place to deposit sediment nearby, it will be hauled to a site agreed upon by Forest Service resource specialists. The intent is to avoid having these sediments leaching back into adjacent stream channels causing an increase of turbidity. To avoid weed infestation and erosion, all bare soils, including the waste area, would be vegetated with native seed and weed free mulch. This would occur during fall months as described in the Revegetation mitigation measures section.

• Tops should be removed from skyline units.

- Tops may be left in the woods if they can be treated with machine piling or hand piling.

• Equipment used to pile slash would be track mounted with ground pressure not to exceed seven pounds per square inch (psi) and would meet the following specifications: capability of reaching 25 feet; climbing ability up to 35% slope; pivot-operator cab,

engine, and arm able to swing 360 degrees while tracks remain stationary; machine would be equipped with a brush grapple or articulating brush grapple mechanism.

• Equipment used to machine pile slash would use legacy skid trails, and temporary and permanent roads on slopes less than 35% as much as possible in units 1, 2, 5, 6, 8, 9, 10, 11, 13, 16, 17, 18, 22, 23, 24, 25, 26, 27, 28, 31, 32, 33, 34 and 35.

- Soils would be protected in several ways; methods would include jackpot burning in the spring, creating well constructed and covered hand piles that would burn quickly and completely, and developing burn plans that address desired fire intensity in areas of particular concern.

SILVICULTURE AND VEGETATION MANAGEMENT

BMP T-20

OBJECTIVE: To manage and protect desired vegetation and to reforest all suitable land within five years of harvest.

ACTIONS:

• Under the action alternatives the ¼-acre gaps would be located in units 5, 6, 9, 10, 11, 12, 14, 15, 19, 20, 21, 22, 23 and 26 and the one-acre gaps would be located in units 1, 2 and 25. Do not locate gaps on mapped Conditionally Unsuitable soils. Gaps would not be located closer than 50 feet slope distance from any stream channel.

↗ The Silviculturist would review marking guides and prescriptions for designate by description (DxD) with the presale crew prior to marking, and will monitor for quality on a sample of each type of prescription as funding and staffing allows. It is expected that the prescriptions would meet plus or minus 10 percent of the target. If not, remarking or amending the silvicultural prescription would be necessary.

• Reforestation activities would occur on 13 acres within the one-acre canopy gaps in units 1, 2 and 25. These one-acre gaps would be planted with western redcedar or incense-cedar.

• Animal damage protection, including netting or big game repellant, would be applied after planting as needed.

• Minimize damage to residual live trees during the bark slippage period, which is the time during which the sap of trees is flowing and the trees are susceptible to logging operations damage (bark is separated from the connective cambium tissue). Protection measures would be required from April 15th through July 1st.

SOIL AND SITE PRODUCTIVITY

BMP T-9, T-12; Forest Plan S&Gs IV-67-1, 2, 3, IV-71-12 Appendix G-12(4).

OBJECTIVES: To prevent soil erosion, reduce soil compaction and improve site productivity.

ACTIONS:

✓All new landings, skid roads and temporary roads used by the purchaser would be subsoiled to increase water infiltration and reduce surface water runoff to streams. Subsoiling would occur to a depth of 20 inches or to a rock limiting depth using an excavator with winged subsoiler attachments. The edge of the compacted road surface shall be fractured three feet beyond the edge of the prism, with the majority of the

subsoiling made at an angle that crosses the road to disperse surface water runoff. Equipment shall not operate on top of the treated soil once it has been subsoiled. An exception may be given to areas where the sale administrator determines slash concentrations are too high to allow for subsoiling.

✓ For ridge top roads, the soil depth associated with these roads are typically shallow, with some occurrences of moderately deep soil. Subsoil to a depth of at least 20 inches unless otherwise agreed to by the Forest Service. All subsoiling would be covered with available harvest slash or other suitable organic material. Stabilization of soil surface with organic material is done to prevent resulting subsoiled surface from crusting.

✓ While subsoiling skid trails, the purchaser would pull available harvest slash or other suitable organic material onto the un-compacted surface. This would help stabilize the soil surface with organic material and prevent resulting subsoiled surface from crusting.

✓ Prior to the sale closing, all temporary roads and skid trails used by the purchaser would be subsoiled to mitigate past and existing disturbance, and to meet standards and guidelines for soil disturbance and long-term site productivity. Subsoil landings where feasible.

✓ Skid trails would be designated by the purchaser and approved by the Forest Service. When possible, skid trail location should be in previously disturbed areas (i.e. on old skid trails).

✓ Landing slash piles created by the purchaser would be placed on pre-disturbed (compacted) soil such as old skid trails, landings, or roads, and away from waterways and ditches.

✓ During the rainy season (November 1 - April 30) no more than ½-acre of exposed soil (S&G#13, LRMP pp. IV-71) (including landings, skid trails, and temporary roads) would exist at any time without erosion control that is effective in preventing sediment from reaching streams or any concentrated surface flow in excess of one cubic foot per second (cfs). Note: silt fencing is not effective at flows in excess of one cfs (Brown et al. 1986).

✓ Designate and locate skid trails to minimize the area affected by logging operations; use pre-existing skid trails whenever possible. Locate skid trails away from areas identified as having sensitive soils (Forest Soils Suitability Layer).

✓ Restrict ground based logging to terrain less than 35% slope.

✓ Maintain at least 85% or more effective ground in categorically unsuited areas (CU); in all other areas maintain at least 65% effective ground cover in order to maintain soil productivity and prevent soil erosion.

✓ The levels of effective ground cover would be monitored by the Forest Service as the project progresses. If monitoring determines that effective ground cover goals are not being met, site specific recommendations would be developed by the sale administrator, soils scientist or fire/fuels management. To determine if soil management objectives are being met, monitoring would include representative samples of each yarding method, fuels treatment, subsoiling mitigation, and tree mortality along treatment areas (S&G#11, LRMP IV-71). Ground skidded units shall be given high priority for soils monitoring.

✓ In order to mitigate effects to soils, where practical, slash piles would be placed on new and existing skid trails, and on landings. When machines are used to pile slash, soil restoration and piling operations would be implemented together in a single pass, with equipment that is suited for both operations (i.e. excavator with a combination subsoiler and brush-rake attachment).

REVEGETATION – BEST PRACTICES

All revegetation requirements would be met using genetically local native species (Umpqua NF Policy Memo 3/8/2002). Seed would be certified weed free (Umpqua NF Integrated Weed Management DN/FONSI, p. 4 #6).

Place waste material only in stable areas and at least 50 feet away from stream channels. Contour waste piles to about 1.5:1 slope to minimize potential for surface erosion or mass soil movement. Waste areas would be seeded or planted using native species that are approved by the District or Forest Botanist.

- ✓ To prevent erosion all temporary roads and adjacent landings would be planted with native vegetation and mulched.
- ✓ Initial seeding of disturbed areas with adequate plant cover would normally be done in the fall seeding period (LRMP Appendix G).
- ✓ Seed shall be applied to areas that are prone to erosion and that have been disturbed by purchaser's operations in order to establish an adequate cover of grass or other herbaceous vegetation. Seeding should precede expected periods of rain. The seed mix to be used would be provided or agreed to by the Forest Service.
- Revegetate all areas of exposed soils including landings, roadsides and waste areas as soon as possible. To enhance weed exclusion, broadcast grass seed at rates of 10-15 lbs/ac, and mulch.

BOTANY

Invasive Plant and Noxious Weed Mitigation Measures

PNW Invasive Plant Program ROD, October 2005 Standards and Guidelines, USDA Forest Service Guide to Noxious Weed Prevention Practices 2001 Umpqua National Forest Integrated Weed Management DN/FONSI 2003.

Bulleted practices in this section are Forest Plan standards contained in the Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision (2005).

Project-wide Weed Management

OBJECTIVE: Minimize the creation of conditions that favor invasive plant introduction, establishment and spread during land management actions and land use activities.

ACTIONS:

- Actions conducted or authorized by written permit by the Forest Service that would operate outside the limits of the road prism (including public works and service contracts) require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering National Forest System Lands (Prevention Standard 2 – Regional Invasive Plants FEIS, and B/BT6.35).

- A District of Forest weed specialist will inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that are judged to be weed free (including material from commercial sites) by District or Forest weed specialists (Prevention Standard 7 – Regional Invasive Plant FEIS).

- ✓ Treat or require treatment of high priority weeds before any use of infested Silverstairs rock pit material (Prevention Standard 7 – Regional Invasive Plant FEIS). Starting with the highest slopes that have invasive vegetation growing in previously disturbed areas, scrape off the top several inches of soil and rock to remove the entire seed bank. Stockpile this material in a location at the quarry where it would not be disturbed (i.e. no machinery should drive over the pile). This contaminated material would be monitored and covered as necessary to ensure it does not become a future source of weeds at the quarry.

- ✓ Forest Service would map all known locations of priority invasive weeds prior to work commencing. Forest Service would provide the contractor with a map indicating where the known infestations are located. Maps would also be provided to all Forest Service personnel working on the project. Any unmapped high priority weeds found during pre-sale or harvest operations should be reported to the district weed coordinator.

- ✓ To prevent creation of conditions that promote the spread of weeds, maintain existing roadside native vegetation and minimize areas of soil disturbance during all harvest activities including spur road construction and re-opening, road reconstruction, etc.

- To prevent spread of seeds, infestations of meadow knapweed, Scotch broom and blackberries within the active project, areas would be brushed in late spring or early summer.

- ✓ Avoid weed infested sites when parking and operating vehicles and off-road equipment, including ATV's, fire and timber sale equipment.

- Only Oregon certified weed-free straw or hay may be used on projects conducted or authorized by the Forest Service, on National Forest System Lands. (Prevention Standard # 3) Consider the use of other weed free mulches such as Woodstraw or wood chips.

- Treat weeds in the project area for up to three years after sale closure.

- ✓ The following activities are prohibited within 30 feet of identified high priority weed infested sites, unless such activities are unavoidable due to safety requirements. These areas would be identified on weed maps and would be marked on the ground with carsonite posts.

    - o stockpiling of raw materials
    - o temporary placement of spoil material
    - o excavation work or extraction of material
    - o parking of vehicles and off-road equipment
    - o temporary storage of equipment & materials
    - o turning around vehicles

- ✓ Due to a population of meadow knapweed along Road 707, approximately 200 feet west of Unit 9, do not store equipment, park or use turnouts in this area unless required to avoid hazards.

- ✓ Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants in consultation with District or Forest-level invasive plant specialists; incorporate invasive plant prevention practices as appropriate (Prevention Standard 8 – Regional Invasive Plants FEIS). Scotch broom and meadow knapweed sites will be marked with fluorescent orange flagging and labeled "NOXIOUS WEEDS" with black lettering.

- ✓ Contractor will avoid ground-disturbing activities in the flagged and/or staked areas unless otherwise directed by the COR/FSR. Whenever possible, roadside brushing will be accomplished prior to seed setting of noxious weed species (approximately late June) in noxious weed flagged areas. The intent is to stop and/or prevent noxious weed spread and establishment.

Protection of TES Species Sites

OBJECTIVE: To ensure that Forest Service actions do not contribute to loss of viability of any native or desired plant or contribute towards the Federal listing of any species. (Forest Service Manual 2672.41).

ACTIONS:

Five populations of *Peltigera pacifica* (pacific felt lichen) and one population of *Pseudocyphellaria rainierensis* occur within four of the proposed thinning stands. The habitats of *P. pacifica* and *P. rainierensis* will be protected using 100' radius buffers that surround the populations. Whenever possible, trees should be felled away from these buffers, and there would be no yarding, fuels treatment, or other entry permitted.

One population of *Tetraplodon mnioides* (dung moss) occurs adjacent to unit 3 on the bark of a fallen tree in the middle of the 440 Road. The persistence of this ephemeral species is uncertain and will require further monitoring. Mitigation measures to assure the survival of this population will involve revisiting this site prior to the initiation of ground disturbing activities.

Unique Habitats

Umpqua LRMP Prescription C5-1 amended with this project.

OBJECTIVES: To provide maximum protection for areas of high wildlife and plant values (Ch. 2 FEMAT 1994, USDA, Umpqua NF 1990).

ACTIONS:

Table 5. Habitat Buffers

Unit	Habitat	Buffer Width[12]
1	Wetlands	50'
4	Intermixed hardwood stand	0'
7	Rock outcrops/screes/cliffs	0'
8	Intermixed hardwood stand	0'
12	Intermixed hardwood stand	0'
14	Intermixed hardwood stand	0'
19	Wetlands Intermixed Hardwood Stand	50'

[12] There would be no entry into unique habitats.

Unit	Habitat	Buffer Width[12]
20	Wetlands	50’
22	Wet meadow on edge of unit	50’
27	Rocky minimal vegetation potential	0’
31	Mesic to moist meadow	50’
32	Moist meadow	50’
33	Rock outcrop/screes/cliffs	0’
34	Wetlands	50’
35	Hardwood stand	0’

WILDLIFE MANAGEMENT

ACTIONS:

- ✓ During treatment (harvest and burning) retain and protect all snags, and existing down wood greater than six inches diameter (on small end), to the extent practical from disturbances that might otherwise destroy the integrity of the substrate.
- ✓ To mitigate a decreased rate of large snag recruitment caused by thinning suppression mortality, two trees per acre would be inoculated after thinning and burning.
- ✓ All trees damaged during harvest operation, such as intermediate support trees or line damage trees, would be retained to mitigate the decreased rate of snag recruitment caused by thinning and harvest activities.
- ✓ No trees felled for guyline tail-holds would be removed from Riparian Reserves or 100-acre LSRs.
- ✓ A seasonal restriction for the northern spotted owl (March 1st through July 15th) is required on units:
    - Common units for both action alternatives
        - Unit 5, skyline portion west of 1746-707 and 1746-847 road
        - Unit 9, skyline portion east of road 1746-707 road
        - Unit 20, skyline portion east of 1746 road and north of 478 road, western tip of the unit
        - Unit 21
        - Unit 22, skyline portion south of 1746 road
        - Unit 26, skyline portion east of 1746-760 road
        - Unit 33, helicopter portion
        - Unit 34, helicopter portion and the skyline and ground skid portion north of 531 and 207 road. Additionally no road construction or obliteration.
        - Unit 35, Skyline and ground skid portion, south of existing temporary road. Additionally no road construction or obliteration.
    - Alternative 3
        - Unit 32, helicopter portion
        - Unit 35, helicopter portion

RECREATION, VISUALS, AND HERITAGE RESOURCES

ACTIONS:

- ✓ Safety signs would be maintained on the main travel routes during logging operations.

- ✓ In the event that an unknown historic or prehistoric site is discovered in the course of the project, the activity would be stopped and the appropriate measures would be taken to stop any adverse effects to the site. Any adverse effects, should they occur, would be mitigated.
- ✓ Field surveys indicated approximately 6% of the project acres have high probability for heritage resources. However, dense vegetation and duff in some units hampered field survey. Implementation of the timber sales under this EA may expose soil, thereby providing better ground visibility than was typical during surveys. Therefore the following high probability areas would be scheduled for monitoring during and/or after project implementation in order to protect undiscovered heritage resources:
    - Unit 5, approx. 10 acres
    - Unit 8, approx. 5 acres
    - Unit 20, approx. 20 acres
    - Unit 22, approx. 4 acres
    - Unit 31, approx. 10 acres

CHAPTER THREE

AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

INTRODUCTION

This chapter describes the components and scope of the human environment that may be affected by implementation of the alternatives outlined in Chapter Two, and discloses the potential consequences of implementing each alternative including the mitigation measures, watershed best management practices and management requirements associated with each alternative. A complete description of each alternative is found in Chapter Two.

This chapter presents the scientific and analytic basis for the comparison of alternatives. The effects are discussed in terms of social and environmental changes from the current condition and include quantitative assessments where possible as well as qualitative assessments. All discussions are tiered to the Umpqua National Forest Final Environmental Impact Statement, as amended. In addition, many of the discussions in this chapter utilize the information found in the supporting documents, such as the 1995 Layng Creek Watershed Analysis, the 2005 Layng Creek Watershed Analysis Iteration 1.1, and the 2006 Doris Roads Analysis.

ACTIVITIES THAT MAY CONTRIBUTE TO CUMULATIVE EFFECTS

Tables 6-8 document the relevant past, present, and reasonably foreseeable activities that may contribute to cumulative effects for the Doris project. Recently, the Council on Environmental Quality issued a memo stating that agencies are not required to "catalogue or exhaustively list and analyze all individual past actions" (CEQ memo, June 24, 2005). Instead, agencies should use scoping to focus on relevant past actions and discuss their relevance in terms of the cause and effect they had on a resource. This direction is followed in the Doris project. The following tables are displayed to summarize information known about the Layng Creek subwatershed. Discussion of these activities occurs throughout this chapter, where relevant.

Table 6. Past Activities in Layng Creek.

Activity	Decade	Acres	Method
Regeneration Harvest Forest Service	1910's	950	Unknown
	1920's	1858	Unknown
	1930's	71	Unknown
	1940's	1696	Unknown
	1950's	427	Highlead
		97	Skyline
		4661	Unknown
	1960's	279	Highlead
		139	Tractor
		3550	Unknown
	1970's	236	Balloon
		113	Helicopter
		980	Highlead
		1595	Skyline
		70	Tractor
		952	Unknown
	1980's	605	Highlead
		1538	Skyline
		17	Tractor
		353	Unknown
	1990's	24	Highlead
		320	Skyline
		27	Tractor
		8	Unknown
	2000's	179	Skyline
		1	Helicopter
		20,745	**TOTAL**
Regeneration harvest BLM & private	1990-2006	**3,691**	Unknown
Final Overstory Removal	1970's	87	Tractor
	1980's	185	Skyline
		58	Highlead
	1990's	77	Skyline
		407	**TOTAL**
Commercial Thinning	1970's	228	Skyline
		22	Tractor
		517	Helicopter
	1980's	1745	Skyline
	1990's	386	Skyline
	2000's	342	Skyline
		3,240	**TOTAL**

Activity	Decade	Acres	Method
Pre-commercial Thinning (PCT)	1910's	492	N/A
	1920's	71	N/A
	1930's	71	N/A
	1940's	873	N/A
	1950's	4383	N/A
	1960's	3340	N/A
	1970's	2967	N/A
	1980's	861	N/A
	1990's	2727	N/A
	2000's	1032	N/A
		16,817	**TOTAL**
Reforestation	1910's	950	N/A
	1920's	1818	N/A
	1930's	71	N/A
	1940's	1696	N/A
	1950's	5185	N/A
	1960's	3968	N/A
	1970's	4237	N/A
	1980's	2707	N/A
	1990's	368	N/A
	2000's	180	N/A
		21,180	**TOTAL**
Animal Damage Control	1950's	52	Chemicals
	1960's	625	Baiting/repellants/chemicals
	1970's	15	Netting
	1980's	957	Netting/repellants/tubing
	1990's	979	Netting/repellants/tubing
	2000's	178	Netting
		2,806	**TOTAL**
Fertilization	1940's	940	Unknown
	1950's	3677	Unknown
	1960's	1962	Unknown
	1970's	466	Unknown
	1980's	1902	Unknown
	1990's	386	Unknown
		9,333	**TOTAL**
Burning	1920's	71	Broadcast/Slash Burning
	1930's	71	Broadcast/Slash Burning
	1940's	1047	Broadcast/Slash Burning
	1950's	4775	Broadcast/Slash Burning
	1960's	3611	Broadcast/Slash Burning
	1970's	3370	Broadcast/Slash Burning
	1980's	2850	Broadcast/Slash Burning
	1990's	898	Broadcast/Slash Burning
	2000's	442	Broadcast/Slash Burning
		17,135	**TOTAL**
Pruning	1990's to present	**888**	N/A

Activity	Decade	Acres	Method
Road Building (planning area only)	1940's to present	826 acres/ (70 miles)	ML1* - 18.25 miles; ML2 - 45.6 miles; ML3 - 0 miles; ML4, - 6.42 miles
Dinner Dam Removal	2003	N/A	Dinner Dam removed, opening up about 2 miles of habitat upstream. Located about 500 feet upstream of Dinner Creek's confluence with Layng Creek, dam removal involved use of an excavator to remove the concrete structures.
Layng Creek culvert replacement	2004	Paterson Ck and Saltpeter 7th fields	Layng Creek culvert replacement; Replacement of two major culverts with stream simulation culverts

*ML is an acronym for maintenance level. ML 1 roads are closed roads that are used intermittently and that may require basic custodial maintenance focused on the maintenance of drainage facilities and runoff patterns; ML 2 roads are open roads that are maintained to only accommodate high clearance vehicles; ML 3 roads are open roads that are maintained for travel by a standard passenger cars; and ML 4 roads are maintained to provide a moderate degree of user comfort and convenience at moderate travel speeds.

Table 7. Present and on-going Activities in Layng Creek.

Activity Type	Total Acres/Miles	Location
Dinner Thin Timber Sale	793 acres of commercial thin harvest	Upper and Lower Dinner 7th field watersheds
Dessert Timber Sale	208 acres of commercial thin harvest	Harvey 7th field watershed
Salty Timber Sale	127 acres of commercial thin	Patterson Cr & Saltpeter 7th field watersheds
Junetta Timber Sale	475 acres of commercial thin harvest	Upper, East Fork, Lower Junetta 7th field watersheds
Curran Timber Sale	700 acres of commercial thin harvest	Curran, West Fork and Middle Junetta 7th field watersheds
Road Work	Road maintenance to continue as needed.	Blading, ditch clean out, and maintenance as budgeted. Scattered throughout the Layng Creek 6th field watershed
PCT	200-300 acres	Throughout the 6th field Layng Creek watershed
Noxious weed work	30-50 acres	Throughout the 6th field Layng Creek watershed

Table 8. Reasonably Foreseeable Activities in Layng Creek.

Activity Type	Total Acres/Miles	Notes
Private timber harvest	200 – 600 acres per year	Ongoing regeneration harvest by private land owners.
Road Work	Road maintenance to continue as needed.	Blading, ditch clean out, and road maintenance as budgeted. Scattered throughout the Layng Creek watershed
Campground maintenance	Rujada Campground	Maintenance of camp sites/facilities and travel routes
Commercial Thinning	1200 acres FY09	Holland/Moonsalt Timber Sale, to be planned in FY 09, includes commercial thinning of about 1200 acres, as well as road work and other connected actions
Layng Creek Instream Work – City of Cottage Grove	1 acre	The city of Cottage Grove is planning to remove two water diversions (Rujada and Prather Creek) and portions of a water transmission line along Prather Creek. The existing water treatment facility and the Layng Creek pipeline located adjacent to Layng Creek and Rujada Campground will remain, and will be transferred to the Row River Valley Water District. Further improvements to the treatment facility will occur on Layng Creek on the adjacent private land. This is proposed to occur in the next two years and would result in short term instream impacts from removing a couple of dams, intake facilities and Prather Creek pipeline proposed to occur in 2008.
Instream Enhancement Work – Layng and Harvey Creeks	2 miles	Install instream structures to enhance aquatic habitat as identified in the Dinner EA.
Road Rehabilitation	2.5 miles	Various road decommissioning activities which are identified in the Dessert and Junetta Timber Sale Area Improvement Plan.
Sale Area Improvements	Variable	Typical improvements and mitigation to Dinner, Curran-Junetta Thin, Salty and Dessert timber sales include understory burning, snag creation, noxious weed treatments, timber stand improvement and a variety of other activities. See Dinner Thin, Curran Junetta and Salty timber sale environmental assessments and sale area improvement plans for more detailed descriptions.

Social Environment

ROAD BUILDING AND ACCESS – TRACKED AS A SIGNIFICANT ISSUE

Existing Condition

The transportation system in the Doris planning area includes 85.9 miles of roads, which equates to a density of 4.85 miles per square mile of land.

The transportation system provides access for commercial users, including forest product harvesters. Recreation use focuses on hunting, fishing, and driving for pleasure, with the majority of the use in the fall.

A project-level roads analysis (RA) is included in the Project File and is incorporated by reference. A complete description of the current road system, and the risks associated with it, are listed in the roads analysis.

Relevant Standards and Guidelines

- Road density should be the most economical system necessary to meet land management objectives. Evaluation of road development alternatives for planned uses would consider safety, costs of transportation, and the effects upon lands and resources.
- Assure short-term (temporary) roads are closed within one year of when the timber purchaser has completed contractual requirements for the portion of the timber sale served by the road. Re-establish vegetation cover to put land back into production within ten years of contract, lease, or permit termination on roads not remaining a permanent part of the Forest transportation system.
- Forest development roads (system roads) would generally be open to use by vehicles licensed for highway travel, except when closed for one of the following reasons:

    1. The mode of access causes unacceptable damage to, or negates adequate protection and management of, Forest resources.

    2. Safety hazards to the road user exist.

    3. Prescriptions in the Forest Plan recommend closures in elk winter range.

    4. To provide security to contractors/cooperators, special use permittees, private land owners, and Forest Service administrative facilities.

    5. Road maintenance costs to keep a road open are high compared to existing or expected use of the road.
- Roads closed for one of the above reasons may be closed either seasonally or year-around. Seasonal closures are preferred over year-around closures wherever feasible, consistent with Forest Plan prescriptions, and where the objectives of the closure can be met.

Watershed Analysis and Roads Analysis Recommendations

The Layng Creek Watershed Analysis (USDA, Umpqua NF, 1995) and the Project-level Roads Analysis (USDA, Umpqua NF, 1995) made several recommendations in order to improve the current condition. Specific recommendations for this project are noted below. Refer to Chapter Two, Alternatives Two and Three, Road Reconstruction for more specific information.

- Replacement of five undersized culverts at existing stream crossings. Replacement would help to either eliminate the potential for stream diversion or to accommodate 100-year flood flows on road 1746-763 at mileposts 0.36, 0.80, and 2.02; and 1746-707 at mile posts 0.75 and 1.09;

- Evaluate roads that are not "primary" or "secondary" according to the listed criteria to determine what roads would be classified as open, closed, or decommissioned.

Direct and Indirect Effects

Cascadia Wildlands Project, and Oregon Wild (formerly ONRC) state that building 2.2 miles of new temporary road may cause numerous environmental impacts including erosion, channeling water, spreading noxious weeds, increased off-highway vehicle (OHV) use and increased risk of human-caused fires. Oregon Wild also asked that the trade-offs of accessing thinning stands by temporary roads versus thinning by other methods be displayed (this is tracked by efficiency, as displayed in the economics section). To help quantify and track this issue through the analysis, "miles of temporary road construction" was developed as an indicator.

Table 9. Summary of Road Activities Associated with Each Alternative.

Alt	New Temporary road construction/ obliteration (miles)	Existing Temporary road use/ obliteration (miles)	Total road (miles)	Road Inactivation (miles)	Roads maintained by purchaser (miles)
1	**0**	0	**85.9**	**0**	**0**
2	**2.2**	6.6	**85.9**	**18.4**	**38**
3	**0.2**	6.4	**85.9**	**18.4**	**38**

There is no change in the number of total system road miles in the planning area compared to Alternative One. The issue's first indicator focuses on miles of temporary roads built. As displayed in Table 9, Alternative Two builds 2.2 miles of new temporary road, while Alternative Three builds 0.2 miles. Both alternatives would subsequently obliterate the roads after logging is complete.

There would be no change in access between all alternatives. The only planned road construction is temporary for both Alternatives Two and Three with subsequent obliteration after use. Both Alternatives Two and Three would reuse existing non-system roads in the planning area. Alternative Two would reuse 6.6 miles of existing non-system temporary roads and Alternative Three would reuse 6.4 miles of the same type of roads. All existing non-system temporary roads used would be obliterated after use. These roads exist within the planning area and would not be obliterated in Alternative One. The overall total existing temporary road miles are decreased slightly more under Alternative Two than under Alternative Three. Both Alternatives Two and Three would inactivate 18.41 miles of existing roads by removing culverts and blocking entrances.

Road reconstruction is generally intended to fix specific drainage concerns, perform deferred maintenance items, and bring the road surface to the design standard so it can facilitate timber haul. The reconstruction identified for each Alternative in Chapter Two addresses the specific recommendations of the Watershed and Roads Analyses. Both Alternatives Two and Three include the replacement and upgrade of six rusted and damaged culverts at existing stream crossings, the replacement of five under-sized

culverts at existing stream crossings, and replacement of 26 deteriorated ditch relief culverts, along with installing three new additional ditch relief culverts. In addition, the repair of four road fill failures posing risk of erosion or risk to safe timber haul would be included. The reconstruction and maintenance work would provide for safe and economical timber haul, as well as improved drainage capacity and reduced risk of failure.

Road maintenance is important for user comfort and safety, and for the protection of resources and the road facility. The Umpqua Forest-level Roads Analysis (USDA, Forest Service 2003) describes the current situation of declining budgets for road maintenance, the reduction in timber sale-related maintenance and the amount of maintenance that needs to be done on the Forest. The Project-level Roads Analysis estimated annual maintenance needs for the planning area at about $52,700. Maintenance that would be performed by timber purchasers could provide a substantial portion of the total needs for several years. Alternatives Two and Three would provide equal amounts of maintenance and improve the road conditions in the planning area at a cost to the purchaser of about $27,900 annually for three years; Alternative One provides for no purchaser maintenance. Improved road maintenance results in higher degrees of user comfort and safety. In addition, well-maintained roads reduce the risk of road failures and the resulting ecological and economic effects.

Cumulative Effects

The Doris Planning Area is the scale at which cumulative effects are analyzed for roads. Very little changes to the road system have occurred in the past in the subwatershed in terms of decommissioning and road closures. Both Alternatives Two and Three do not propose road decommissioning; although road 1746-420 (located in the planning area) is planned for decommissioning under the Dinner Timber Sale EA for a total of 1.01 miles. This road is a dead-end spur that would not contribute to a cumulative effect of reduced access, as it is currently closed. While future projects may propose decommissioning of roads, it is unlikely any of these roads would restrict or reduce access to the point of negatively effecting road users.

ECONOMICS

This economic analysis focuses on the direct, indirect, and induced costs and benefits of the alternatives described in Chapter Two. Net present value and benefit/cost ratio are the primary criteria used to compare the direct effects of the alternatives to the Federal Government, and are termed the economic efficiency analysis. Impacts to the general economy of the area are modeled using IMPLAN Professional, an input/output model developed by the Forest Service. Assumptions regarding the economic analysis are footnoted where appropriate.

Most timber sales from the Cottage Grove Ranger District are purchased and operated by individuals and companies based in Lane County. Total mill capacity in Lane County in 2001 stood at just over 1 billion board feet/year (Spelter 2001). This number is used to estimate the contribution of each alternative towards meeting demand. Final demand is assumed to be wood products ready for shipment at the mill yards.

Lane County Economic Situation

Total employment in Lane County is difficult to quantify exactly, as the Oregon Labor

Market Information System (OLMIS), Census Bureau, and IMPLAN use different criteria to measure employment. Because of this, percentages and relative differences are used for analysis where possible instead of absolute numbers.

The county has diversified its economy in recent years, particularly the manufacturing sector, as the timber industry has declined. Still, the forestry and wood products sectors provide 4.5% of Lane County's employment, and 8.5% of the overall industrial output, according to the 2002 IMPLAN data.

The trends in employment in Lane County continue to show a shift from logging and wood products manufacturing toward retail sales and service sectors (Stevenson 2003). Although overall employment is expected to grow by 13.6% between 2002 and 2012, logging occupations are expected to decline by 3.6%. The average wages paid in the retail and service sectors ($21,465 and $23,020 respectively) are less than the logging and wood products average wage ($29,040 and $49,375 respectively) based on the 2002 IMPLAN data.

Benefit/Cost Analysis

The direct effects of the alternatives in the context of the benefit/cost analysis are displayed in Table 10. The standard criterion for deciding whether a government program can be justified on economic principles is net present value (NPV), which is the discounted[13] monetized[14] value of expected net benefits (OMB A-94).

Both of the action alternatives produce revenue for the Federal Treasury and associated projects, and exceed the associated direct costs.

Table 10. Economic Efficiency Analysis.

	Alt 2	Alt 3
Timber Volume (MBF)	**13,440**	**13,440**
Acres by Harvest Method		
Helicopter	**48**	**170**
Skyline	**430**	**355**
Multi-span Skyline	**177**	**139**
Ground based	**345**	**336**
Total Acres	**1,000**	**1,000**
Volume (MBF)/Acre	**13.44**	**13.44**
Total Present Value Benefits		
Gross Benefits	**$6,048,000**	**$6,048,000**
Value/MBF	**$450.00**	**$450.00**
Value/Acre	**$6,048.00**	**$6,648.00**
Total Present Value Costs		
FS Prep & Admin	**$352,240**	**$352,240**

13 Discounting is the process of calculating the present value of a future amount of money. 4% is the standard discount rate for long-term projects (OMB A-94).

14 Lit. "to give the character of money to." A cost or benefit is monetized when it is expressed in terms of money.

	Alt 2	Alt 3
Logging	**$3,747,341**	**$4,034,284**
Slash Disposal	**$627,245**	**$657,082**
Road Work	**$145,080**	**$145,080**
Reforestation	**$15,054**	**$15,054**
Sale Area Improvements (SAI)[15]	**$977,259**	**$977,259**
Total Cost	**$5,864,219**	**$6,180,999**
Cost/MBF	**$436**	**$460**
Cost/Acre	**$5,864**	**$6,181**
Net Present Value	**$266,338**	**-$14,258**
NPV/MBF	**$19.82**	**-$1.03**
NPV/Acre	**$266**	**-$14.26**
Stumpage	**$1,528,334**	**$1,211,554**
Return to the Treasury	**$536,022**	**$219,241**
B/C Ratio[16]	**1.05**	**1.00**

Forest Service planning costs are not included in the benefit/cost analysis since they are considered sunken (OMB A-94). It is estimated that this project has cost about $256,400 to plan over the last two years. Based on the expected return to the Federal government shown in Table 10, Alternative Two would be above cost. Alternative Three would be below cost due to more expensive helicopter logging costs. Alternative One (not displayed) is considered below-cost since there would be no return to the U.S. Treasury, with expenditures for planning of about $256,400.

Either action alternative would be marketed as two or more individual timber sales. These sales would be offered in a public auction to achieve the highest return possible[17]. It is anticipated that all post-sale requirements and sale area improvement work would be paid for by adequate stumpage[18] from the timber sales. Based on current log market conditions Alternative Two is positive and would be considered advantageous to the U.S. government from an economic standpoint. If log markets improve both action alternatives would be considered advantageous to the U.S. government from an economic standpoint.

Log prices fluctuate due to a variety of market forces, many of which are external to Lane County and Oregon. This analysis used log prices from the third quarter of 2007. The third quarter typically yields the lowest log prices of the year. Subsequent analysis for Alternative Two shows that NPV stays positive even if log prices were to drop by five

15 SAI are connected and similar actions (ref. Chapter Two)

16 B/C Ratio is the benefit/cost ratio, another standard criterion for economic efficiency. It is the product of the present value of benefits divided by the present value of costs.

17 Individual timber sales would be appraised and offered at fair market value, or the minimum to cover reforestation costs and a $0.50/ccf return to the Treasury, whichever is higher.

18 Stumpage is the value of the timber "on the stump." It is the timber sale contract minimum value and is determined by subtracting logging, road work, and slash disposal costs from the delivered log price. Timber sale purchasers may bid more in a competitive auction. The actual monetary return to the U.S. Treasury is determined by subtracting all post sale costs from the stumpage.

percent. Although log prices could drop that much during the timeframe of this project, it is unlikely. Log prices made a steady gain and peaked in 2006. Over the last two years the effects of a slowed housing market has negatively influenced the log market and prices have dropped dramatically. This trend appears to have stabilized with the potential for log values to increase over the next few years. This could improve the economic viability of both action alternatives and increase the positive return to the Federal government.

Economic Impact Analysis

The economic impact analysis using IMPLAN considers changes in employment and income due to changes in the economic activity of the county from each alternative. In past periods of non-declining, even-flow of timber from federal land, an individual timber sale may not have substantially changed the overall economic activity of the county, since the total amount of volume would be sold each year. The conditions today and into the foreseeable future are not the same. The Umpqua has not sold a consistent level of volume, or levels approaching the probable sale quantity (PSQ) in the Forest Plan since 1990, although over the last two years, timber sales have been offered at a level close to expected quantities. Overall, new timber sales can be treated as an actual increase in the raw material available for the local industry, allowing an increase in production up to the full level of mill capacity.

Table 11 displays the results of the economic impact analysis by alternative. In general, the increase in timber volume to the local economy would result in increased employment in the logging and wood products manufacturing sectors, increases in forestry services (slash treatment, planting, etc.) and indirect and induced increases in many other sectors. The business taxes paid to Federal, State, and local governments would also increase.

Other direct, indirect, and induced benefits are derived from road construction, reconstruction, decommissioning and other connected activities described in Chapter Two that would be funded by timber sale receipts. These work activities are treated as costs in the benefit/cost analysis since they reduce the revenue to the Treasury, but they have economic benefits to the local community since most are contracted services. These benefits are included in the economic impact analysis and in the numbers reported in Table 11. The spreadsheets that document the complete analysis by sector are kept on file at the Cottage Grove Ranger District Office.

The numbers in Table 11 are not intended to be absolute. The analysis should be used to compare the relative differences of the alternatives. The value of each activity included in the impact analysis was estimated from the cost and benefit analysis spreadsheets. An estimate was made of the percent of each activity's value that would be spent locally. The value to the wood products manufacturing sector was estimated to be 40% of the delivered log price, reflecting the difference between end product value and log cost to the mill. This difference can be widely variable based on mill efficiency and the choice of end products, but it approximates the value given for all of Oregon in 1998 (Gebert 2002). The percentage of value assigned to sawlog and veneer production is 95% and 5%, respectively, based on the 1998 data.

Table 11. Economic Impact Analysis

	Alt 2		Alt 3	
	Value*	%	Value*	%
% of County Mill	1.3%		1.3%	

	Alt 2		Alt 3	
	Value*	**%**	**Value***	**%**
Capacity				
Change in Total Industrial Output	**+$9,907**	**0.08**	**+$10,098**	**0.08**
Change in Employment	**+76**	**0.06**	**+80**	**0.06**
Change in Employee Income	**+$2,416**	**0.06**	**+$2,535**	**0.06**
Change in Proprietor Income	**-$758**	**0.20**	**-$772**	**0.20**
Change in Other Property Income	**+$1,250**	**0.07**	**+$1,250**	**0.07**
Change in Indirect Business Taxes	**+$220**	**0.05**	**+$225**	**0.05**

* Dollar values are in thousands of dollars. Employment is number of jobs.

Direct, Indirect, and Cumulative Effects

Alternative One is not shown in Table 11 since by definition it would not change the conditions or level of economic activity in the county. This alternative may, however, contribute to the decline in the local timber industry, since it would keep federal timber from the market, at least in the short-term. No attempt was made to quantify that impact, as it would be speculative to estimate the current and reasonably foreseeable timber supply in the local area.

Both action alternatives provide relatively small beneficial, direct effects to the local economy. The numbers shown for Proprietor Income indicate losses to the business owners, primarily in the veneer and plywood manufacturing sectors, since this timber supply would not contribute to those businesses due to the small size of the timber. These losses are expected to be reduced in future years as the economy improves and demand for wood remains high. In contrast, the action alternatives would have beneficial indirect effects to other local sectors, such as schools, through contributions in taxes to those sectors.

Implementation of the action alternatives may contribute to a beneficial cumulative effect to the local economy, depending on implementation timelines. This project, when combined with the overlapping implementation of the Umpqua National Forest's Crawdog, Dinner Thin, Curran Junetta and Tugboat Timber Sales, and the reasonably foreseeable Doris Timber Sale, may increase income and tax revenue to the Lane County and Cottage Grove area, which would help improve the economic outlook for the area.

The need to produce timber from the matrix land allocation was identified as an element of the purpose and need in Chapter One and is displayed in Table 4 in Chapter Two. Thousand board feet of timber produced was the measurement used to determine how each alternative meets the need. Table 10 displays the volume produced; both action alternatives remove identical amounts of timber: 13,440 thousand board feet – or 13.4 million board feet. By providing a supply of timber from matrix land, both action alternatives equally and fully meet the need for action. No timber would be produced

under Alternative One; therefore, this alternative would not meet the purpose and need

Both action alternatives would have a positive return to Lane County treasury. Alternative Two would generate $344,580 and Alternative Three would generate $274,430 in timber receipts for Lane County.

An additional measure of the Purpose and Need is the cost-efficiency (as measured by net present value and benefit/cost ratio) of the thinning. This cost-efficiency is also relevant in terms of the issue discussed in Chapter One (less temporary road building). Alternative One, as described above, only expends money (sunk costs) and has a negative net present value and benefit/cost ratio; therefore, Alternative One is not a cost-efficient alternative and does not meet the purpose and need. Alternative Two is cost efficient and thereby meets the purpose and need. Alternative Three is slightly below cost but if log values increase slightly, this alternative would be cost efficient as well. As displayed in Table 10, Alternative Two is more cost-efficient and has a higher net present value than Alternative Three. This efficiency is primarily because Alternative Two has lower costs associated with implementation, mostly due to fewer acres that would be thinned using a helicopter.

While both alternatives access the same number of acres for thinning, Alternative Two does so more efficiently and is likely to result in higher bid prices than Alternative Three. Jet fuel prices have risen substantially since April of 2005. According to the Department of Energy (DOE) Energy Information Administration website[19], current spot prices are 27% higher than April of 2005 (EIA/DOE). This dramatically affects the cost of helicopter logging. Alternative Three includes more helicopter logging than Alternative Two in order to avoid temporary road construction, and as such, would be more sensitive to increases in jet fuel prices. If fuel prices continue the current trend, Alternative Three may result in lower stumpage value and potentially no bids for the timber sale.

An analysis was completed that calculates the total amount of fuel consumed by equipment used in harvesting timber for both action alternatives. The analysis compared the fuel consumption of equipment specific to each alternative along with temporary road construction and obliteration. This analysis is located in the project record and is incorporated by reference at the Cottage Grove Ranger District. Both action alternatives would require considerable fuel consumption to implement the project on the ground. It is estimated that Alternative Three would consume approximately 13% more fuel than Alternative Two due to the increased acres of helicopter logging in Alternative Three. Generally, helicopter logging requires twice the amount of fuel consumption per thousand board foot (MBF) than conventional logging systems such as whole tree or skyline harvesting systems.

Terrestrial Environment

A detailed description of the terrestrial environment can be found in the Layng Creek Watershed Analysis (USDA, Umpqua NF 1995) and its 2005 iteration (USDA, Umpqua NF 2005). Site-specific field work and analysis for this project produced additional information, which is provided in the following sections.

19 EIA/DOE website at:

http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/weekly_petroleum_status_report/current/pdf/table15.pdf

FOREST VEGETATION

Two spatial scales are used in the following discussion: (1) the landscape-scale; and (2) the stand-scale. The landscape-scale focuses on larger scale conditions (such as forest vegetation patterns) as seen from an airplane. The stand-scale refers to an area of 20 to 200 acres in size. Stand exam and other field data were used to characterize stand-scale conditions. Existing and future conditions were quantified and modeled using the stand exam data and the Forest Vegetation Simulator Model (Donnelly and Johnson, 1997). Chapter One outlines the relevant WA recommendations.

Existing and Desired Landscape Conditions

Forest age classes that develop after disturbances such as wildfire or clearcutting are often used to characterize stages of forest structural conditions. Four such forest stages are:

1. Stand initiation – in this stage the stand is young and has an open canopy.
2. Stem exclusion – in this stage the stand has developed into a dense, closed canopy forest where new trees are prevented from establishing, and where existing live trees may die due to competition for sunlight, water, and nutrients.
3. Mature – in this stage the trees have reached their maximum height growth potential and are typically 80-150 years old. This stage includes the "understory re-initiation stage" where the understory begins to develop in response to small openings in the canopy (Oliver and Larson, 1990).
4. Old growth – in this stage the stand is typically over 150 years old and includes the "transition stage" and "shifting gap stage" as defined by the Northwest Forest Plan. Stand characteristics include large live trees, multiple canopy layers, coarse woody debris accumulation, and small gap-type disturbances. (USDA/USDI 1994)

Stands in the mature and old growth stage are often combined into a "late-successional stage" because natural stands of mixed ages make separation of these older stages difficult with remote sensing. For this analysis, late-successional stands are generally 80 years and older.

Today, late-successional forest occupies approximately 54% of the Layng Creek subwatershed[20]. It is composed of smaller patches, compared to the larger patches present in the 1930s. The smaller patches and the abundance of the stem exclusion stage reflect the pattern established by staggered small clearcuts that occurred from the 1940s through the 1980s. The action alternatives propose commercial thinning and gap creation in the stem exclusion stage stands (Figure 8).

20 The 1995 Layng Creek WA documents that late-successional forests encompass 37% of the subwatershed and used 1988-1989 aerial photos and other imagery available at the time. The 54% late-successional forests described for this document was derived using 1998 satellite imagery.

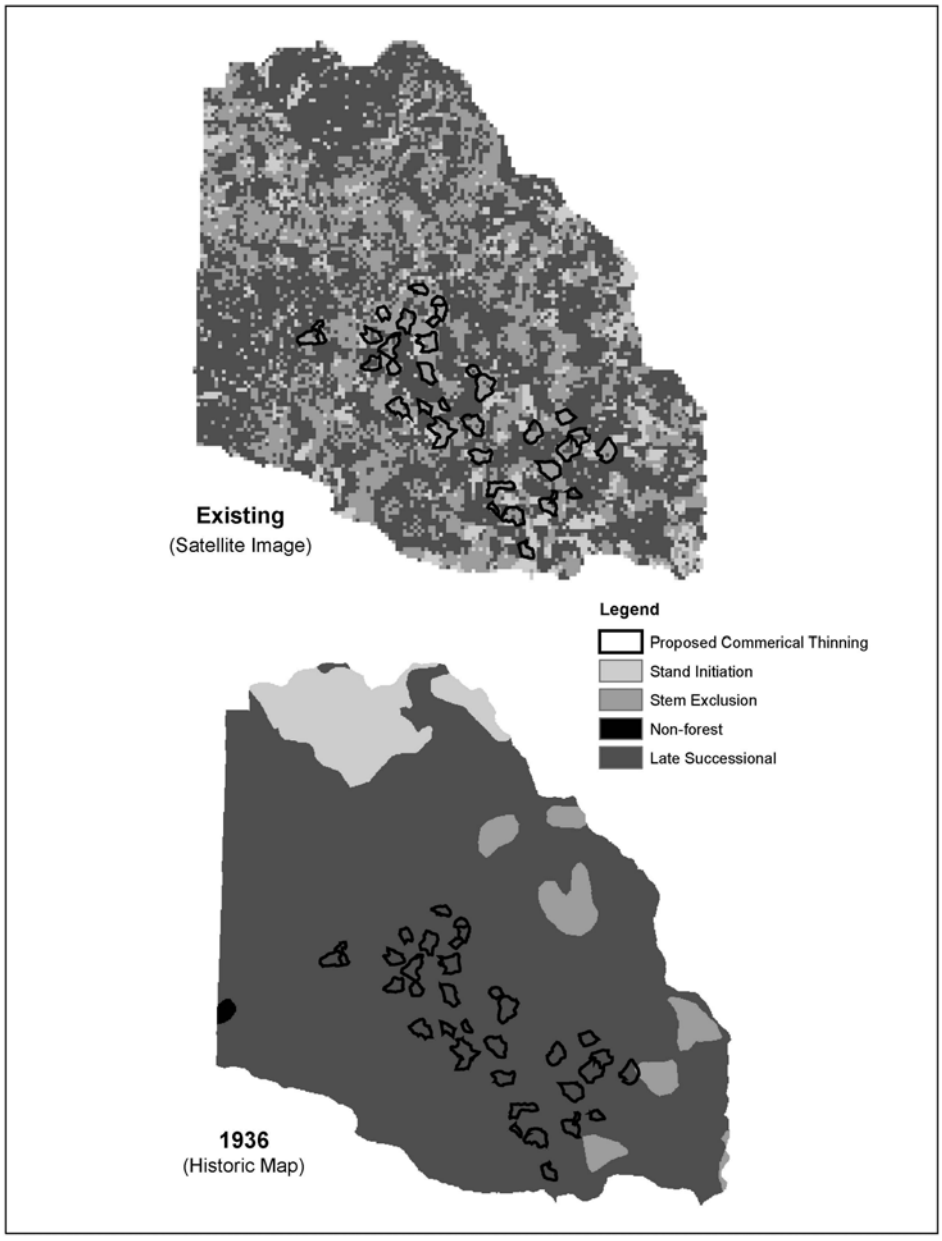

Figure 8. Existing (1998) and Historic Vegetation[21] .

As described in Chapter One, the Layng Creek subwatershed was stratified into four broad landscape areas based on relationships between forest vegetation, climate, and physiography (Figure 3). The landscape areas represent broad areas of land that tend to have similar vegetation types and disturbance processes. These landscape areas help place individual stands into a broader context. Silvicultural prescriptions can then be designed to approximate disturbance processes that operate at the larger scale.

The use of landscape areas in designing vegetation treatments is in keeping with the Aquatic Conservation Strategy of restoring disturbance regimes. It is also consistent with ACS objective #1, which calls for the restoration of the distribution, diversity, and

21 Existing (1998) and historic (1936 from Harrington, 2003) vegetation maps for the federal ownership in the Layng Creek subwatershed.

complexity of landscape scale features (such as vegetation patterns). In order to provide a context for the current vegetation patterns, a range of historic landscape patterns is useful. The use of reference ranges is based on the principle that when an ecosystem element moves outside its range the element, and those elements depending upon it, may not be sustainable naturally. The 1936 historic map and fire regime condition class data (FRCC) used in the 2005 Layng Creek watershed analysis iteration 1.1 provide a range of reference conditions for existing and historic vegetation (Figure 8). The concept of "improvement" under the Aquatic Conservation Strategy relates to restoring biological and physical processes within their ranges of natural variability (USDA/USDI, 1994. p. B-10).

Figure 9 shows that at the landscape scale, the stem exclusion stage covers proportionately more of the Layng Creek subwatershed than it did during the 1930s, but is still within the reference range. The amount of late-successional forest present today in the subwatershed is near the low end of the reference range in both the gentle mountain slope and gentle valley bottom landscapes.

The desired landscape condition would have larger patches in the different forest structure conditions compared to today's pattern. Desired patch sizes would approximate the historic fire events that covered thousands of acres. The desired pattern of vegetation patches would be less fragmented, as was produced by the moderate (or mixed) severity fire effects. This landscape desired condition is consistent with the 2005 WA recommendations listed in Chapter One, and with objective #1 of the Aquatic Conservation Strategy, which calls for the restoration of the diversity and complexity landscape scale features such as vegetation patterns.

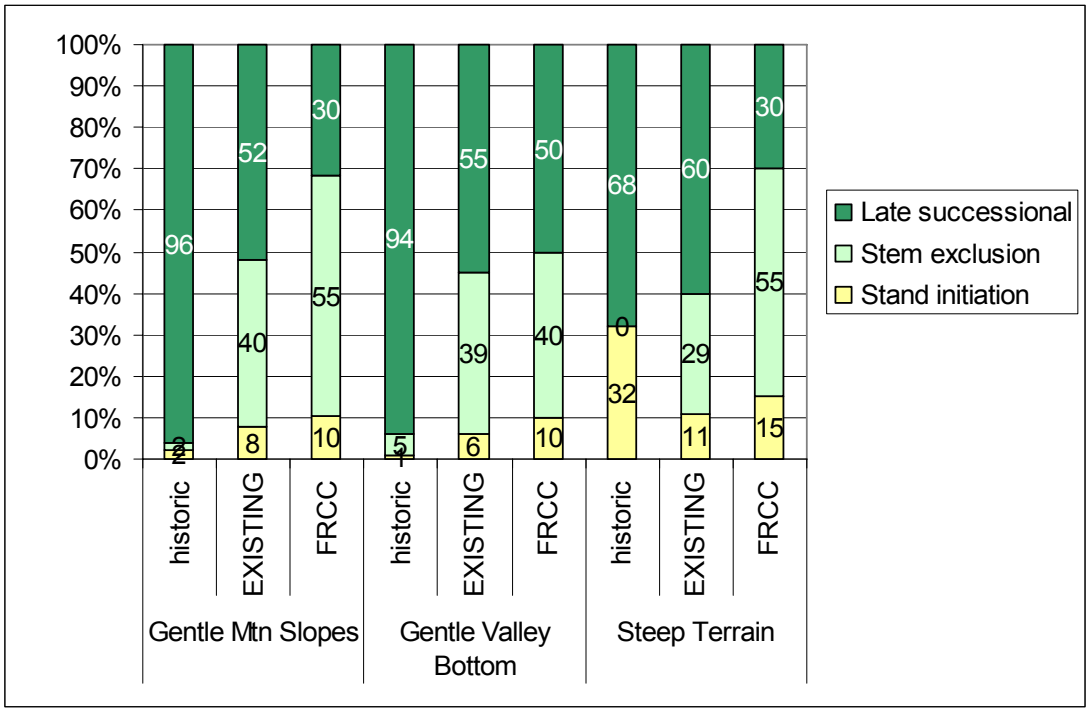

Figure 9. Distribution of Forest Age Classes[22] in Landscape Areas

22 Distribution of forest age classes in landscape areas of Layng Creek subwatershed (federal land). The existing condition for each landscape area is bracketed by a reference range. The historic bars are based on the 1936 vegetation pattern and the FRCC bars are based on a generalized historic disturbance of representative vegetation types.

Existing and Desired Stand Conditions

The proposed commercial thinning stands are Douglas-fir plantations created after clearcut harvesting 40-60 years ago. Most of the stands were pre-commercially thinned in the 1970's and 1980's and fertilized with nitrogen ten years later to promote tree growth. Today the stands are dense plantations of mostly Douglas-fir with scattered western hemlock, western redcedar and, to a lesser extent, incense-cedar in the understory. Hardwood trees are also scattered throughout the units. Red alder and bigleaf maple are dominant in many riparian areas, whereas golden chinquapin is common in drier areas. The shrub layer is dominated by vine maple, dwarf Oregon-grape, salal, rhododendron and swordfern. Scattered small gaps, created by root rot pockets and snow down, can be found in the units. Suppression mortality of the smaller diameter trees is beginning to occur, generally in trees six to ten inches in diameter, and at an average of seven trees per acre. The stands range in elevation from 1600 to 3600 feet within the moist, mild western hemlock zone which dominates the Westside Cascades of Northwest Oregon. Average stand conditions can be found in Table 12 below.

Table 12. Doris Stand Conditions

	Age	Diameter (inches)	Height (feet)	Trees Per Acre (TPA ≥7" dbh)	Total TPA	Total Canopy Closure
Average	52	12	83	238	310	77%
Range	38-58	7-22	50-113	148-309	249-1000+	54-80%

In general, the stands proposed for commercial thinning are homogenous, even-age stands of Douglas-fir. Thirty of the 35 stands have most or some part of the stand facing north and have either warm moist or warm dry stand moisture conditions. They differ mostly with respect to the condition of the understory tree and shrub layers (Table 13).

Table 13. Stand Summary for Proposed Doris Harvest Units.

Unit(s)	Landscape Area	Potential vegetation	Elevation (feet)
10,11,12,14, 22,23,31,35	Gentle Valley Bottom	Western hemlock / swordfern & Western hemlock / salal / swordfern	1600 to 3400

Unit(s)	Landscape Area	Potential vegetation	Elevation (feet)
1,2,3,4,6,7,8, 13,15,16,17, 18,19,20,21, 24,25,26,28, 29,30,32,33, 34	Gentle Mountain Slope	Western hemlock/ Oregon grape *&* Western hemlock / Rhododendron-salal & Western hemlock / redcedar/Rhododendron	1800 to 3600
5,9,27	Steep	Western hemlock/ Oregon grape *&* Western hemlock / Oregon grape–salal	2000 to 3400

As shown in Table 13, the stands fall into three of the four landscape areas described in Chapter One. These landscapes areas were delineated using broad scale mapping, and many of the stands fall into multiple areas. As an example, Unit 8 was mapped as laying within three of the landscape areas. Stands were ultimately classified into only one landscape area, based on field knowledge and the landscape area in which the majority of the stand lays. Also, portions of five stands fell within high elevation mapping designation but, at 3600 feet, they are clearly not high elevation. For example, no high elevation species such as sub-alpine fir, Pacific silver fir or mountain hemlock are present. Potential vegetation is named for the most shade tolerant tree species on the site that would dominate the stand in the absence of disturbance over a long period of time. Groups of the most commonly occurring plant associations (Hemstrom 1987) in proposed harvest units are listed in order of abundance. Plant Associations (PA) also include site index which measures forest site productivity expressed as the average height of the tallest trees in the stand at a defined age. The Western hemlock/ Oregon grape PA site index for Douglas-fir is 139 feet tall at 100 years.

Recent studies of old growth forest development in western Oregon suggest that today's young managed stands are much denser than most historic early seral stands. The dominant old growth trees originally developed in stands of lower tree densities, allowing them to develop old-growth structural conditions sooner than if they had developed under more crowded conditions. The fast growing young trees that eventually became the dominant trees in the old growth study stands developed at densities of about 40 to 50 trees per acre (Poage and Tappeiner, 2002). The old growth study stands also developed by a gradual establishment of trees over time, probably in conjunction with intermittent disturbance. Thus, under historic conditions evidence indicates that the regeneration of old growth in western Oregon occurred over a prolonged period, at lower tree densities, and with less self-thinning than managed stands today (Tappeiner et al, 1997).

In an inventory of late-successional stands on the Cottage Grove Ranger District, Zenner (2005) found that canopy gaps tended to be created by partial stand replacement fire effects in the past. In his model of forest succession, understory re-

initiation in tree-size gaps of mature Douglas-fir stands was largely driven by wildfire events. Zenner's premise is that in a moderate fire severity regime, fire was the primary disturbance agent that historically created gaps in older forests.

Desired stand conditions would include more open canopies and larger, more fire-resilient trees. The added light would accelerate tree growth and understory development. Different thinning intensities and fuel treatments would restore the stand structure characteristic of a moderate severity fire regime. In about fifty years, two-layer stands and multi-age structure would result from the proposed treatments (Figure 10).

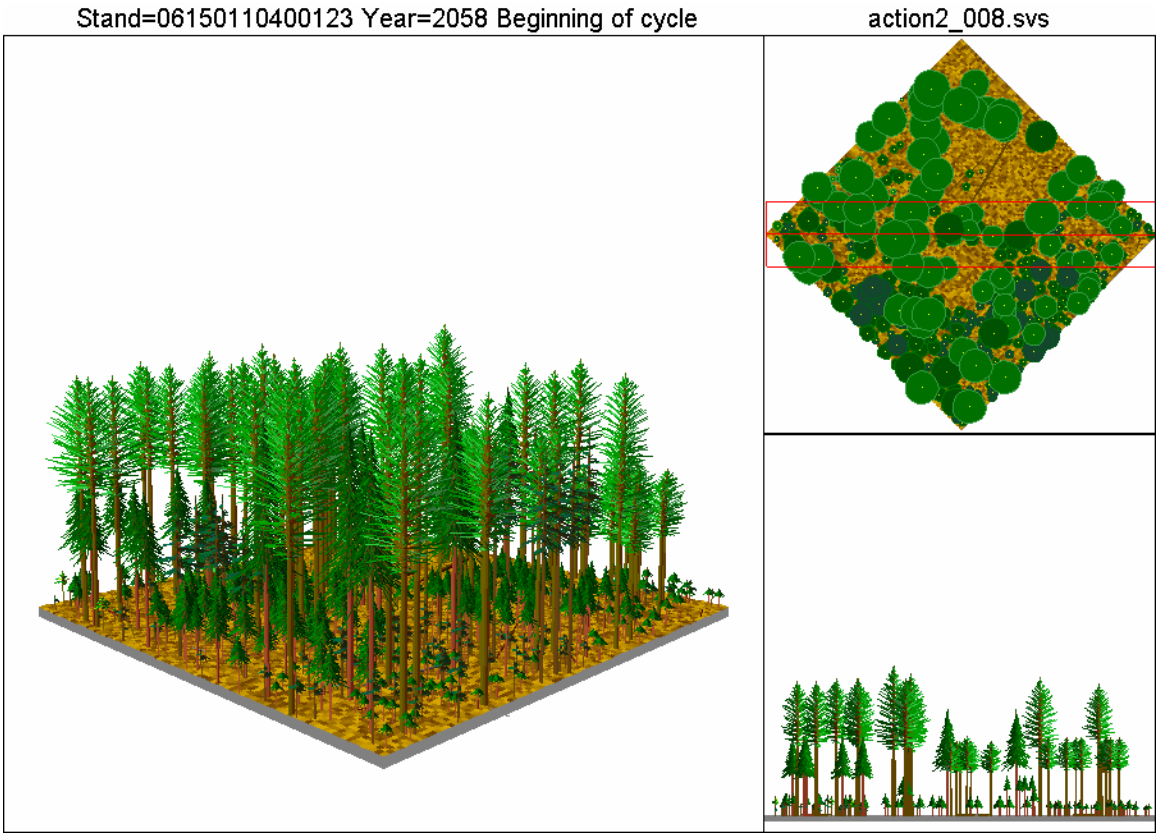

Figure 10. Desired Stand Conditions in 50 Years

Proposed Thinning and Gap Treatments

Commercial thinning within the thirty-five managed stands is proposed to meet the purpose and need, achieve desired conditions, and fulfill several watershed analysis recommendations (as described above and summarized in Chapter One). The proposed thinning is designed to set a course for stand development that mimics fire disturbance and natural successional development. The use of landscape areas helps to tie to those disturbance processes and vegetation potentials. Emphasis is placed upon the creation of an uneven structure using canopy gaps, no-thin areas, and thinning areas to diversify homogenous stands.

These types of treatments set the stage for the development of late-successional conditions in the riparian reserves, begin a trend toward species and structural diversity in the matrix land allocation, and help provide for important ecological functions in the

future as well as timber production in accordance with the Northwest Forest Plan direction (USDA, 1994).

Three treatments are proposed to reduce tree density and increase species and structural diversity (see Table 14 for integrated unit prescriptions):

1. Moderate thinning from below (70-90 trees per acre) with ¼ acre gaps
2. Heavy thinning from below (40-60 trees per acre) with 1 acre gaps
3. Heavy thinning from below (40-60 trees per acre) with no gaps

Gaps are prescribed in 17 of the 35 stands at an intensity of ten percent of thinned acres because they are important structural components in older, natural stands (Coates et al., 1997). They are a tool that can be used to promote diversity by providing variable density across the stands and allow for understory development. Gap characteristics would vary among prescriptions in the following ways:

1. Two sizes of canopy gaps, ¼ and 1-acre, are prescribed for the action alternatives to mimic natural variation in gap sizes across the landscape.
2. Within each 1 acre gap, ten trees are retained in the center to create (by burning) snags for wildlife use; the remainder of the opening will be planted after burning with minor species such as incense-cedar to promote species diversity.
3. Within each ¼ acre gap, one dominant tree is retained to promote the development of large diameter trees with deep crowns.

Table 14. Integrated Unit Prescriptions

Prescriptions	Units	Acres
40-60 TPA - no gaps	3,4,7,8,13,16-18,24,27-35	464
40-60 TPA -10% 1 ac gaps	1,2,25	138
70-90 TPA -10% ¼ ac gaps	5,6,9-12,14,15,19-23,26	398
	Total	**1,000**

Landscape, silvicultural and other resource objectives were incorporated into the thinning treatments. See the other resource sections for specific information. Key considerations for integrated thinning treatments are:

1. Tie prescriptions to landscape disturbance process as identified in watershed analysis. Desired stand conditions would have lower and more variable densities.
2. Gentle Valley Bottom is lower on the slope, and generally a refuge from intense fire and where surface fires would occur. Small disturbances consist of root rot pockets and snow-down. Retain 70-90 trees per acre (TPA).
3. Gentle Mountain Slope is mid slope, relatively drier, and where there are fewer barriers to fire. Retain 40-60 TPA.
4. Steep terrain is where fire intensity is greater. Ridge-tops, while generally steep, can be also be flat and may be useful as fuels breaks. Retain 40-60 TPA.
5. Dominant tree release in ¼ acre gaps replicate small disturbances and increase structural variability.
6. Create snag patches within one acre gaps; retain ten trees in center and underburn to create snags and reduce the number of inoculated created snags as discussed in the Coarse Woody Debris section. Plan in units 1, 2, & 25.
7. Within ½ mile of owl core maintain a higher residual canopy to maintain canopy closure and reduce owl susceptibility to predation. Retain 70-90 TPA.

8. Where underburn/jackpot burning, retain lower residual densities to insure retention success, where not in conflict with resource objectives.
9. Apply no-cut buffers to all perennial streams following guidance from the NW Forest Plan TMDL Strategies. This equates to 50-60 foot buffers, depending on slope. Intermittent streams with stability concerns will have buffers as needed. Wet areas will have 50' buffers.
10. Threatened and endangered species and Special Habitats will have buffers as appropriate.
11. Silvicultural and implementation considerations are to place ¼ acre gaps in stands with higher retention of 70-90 TPA at 10% intensity; assign same prescription for adjacent units if suitable, and thin heavier in younger stands.

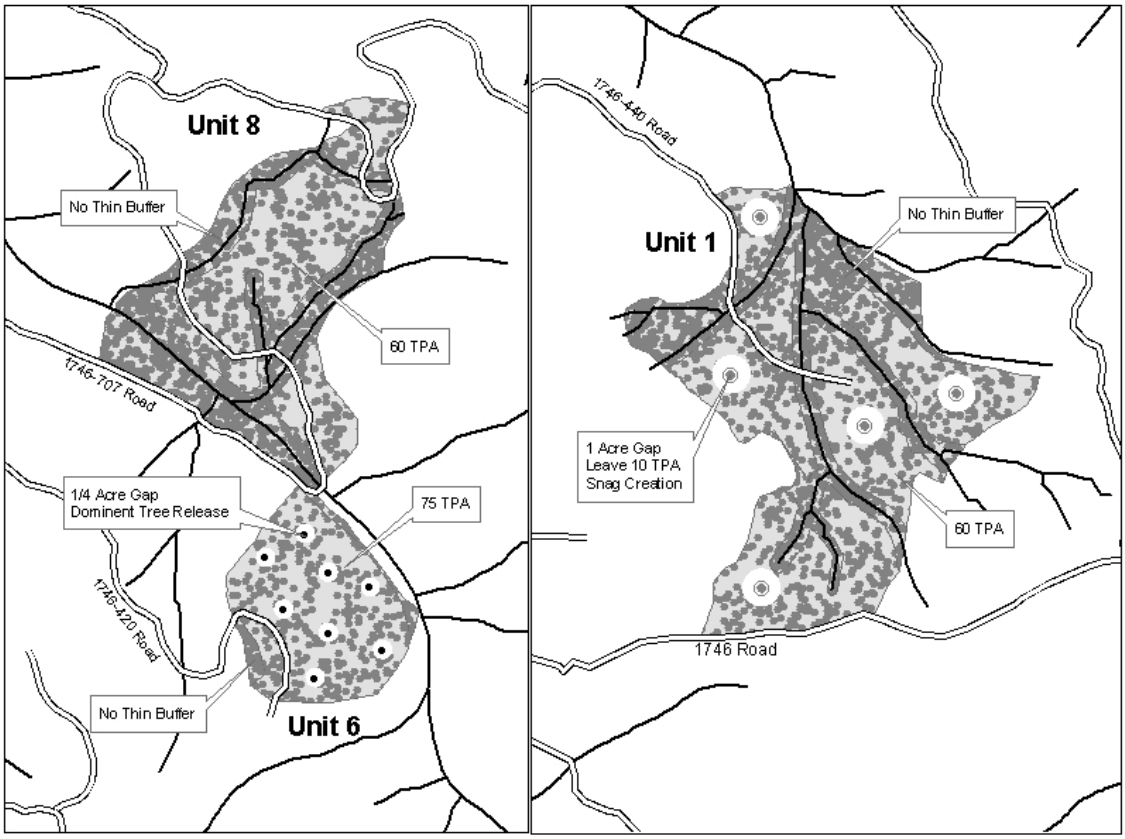

Figure 11. Unit 1, 6, and 8 Depiction of Thinning[23]

A mixture of thinning intensities and gaps would diversify existing stand structure and species composition across the stands, and would provide diversity at the broader, landscape scale. Figure 11 displays the proposed treatments for Units1, 6 and 8 and is an example of the three types of integrated thinning treatments.

23 Unit depiction of thinning represents three types of integrated unit prescriptions.

Direct and Indirect Effects

The immediate direct effects of the action alternatives would include reduced stand densities and canopy closure. Average stand canopy closure in the treated areas would move from an existing range of 54 to 80% in Alternative One to a range of 35 to 55% in Alternatives Two and Three. In order to meet the Watershed Analysis Iteration 1.1 recommendation to enlarge landscape patches where appropriate, units adjacent to each other are prescribed the same thinning tree retention. To remain economically viable, four of the youngest stands with smaller mean diameters are prescribed 60 trees per acre retention. Average canopy closure for all units thinned to 60 trees per acre is 44%. Thinned overstory canopies begin to close at an average of two percent per year (Chan, et al. 2006).

The action alternatives would increase variation in stand densities within and between stands, meeting element one of the purpose and need (Table 4) "to improve conditions for species and structural diversity and establish stand trajectories to meet desired conditions." The effects of Alternatives Two and Three would be the same because the vegetation management prescriptions and treatment acres are the same.

The long-term indirect effects of the action alternatives would include accelerated growth of residual vegetation and altered stand structure. Indirect effects are evaluated over the next 20 to100 years. The average age of the stands proposed for thinning and gap treatment is currently 52 years. During the next 30 to 100 years, stands of this age would typically transition from stem exclusion to late-successional stands.

Modeled at age 80, Table 15 uses Unit 32 as an example of the better than average overstory stand diameter growth between the no thinning and the thinning treatments. Unit 32 is used as a sample stand because it is considered representative of the other 34 stands in terms of species composition, tree size, and tree density. This table shows that diameter growth rates would increase as a direct effect of thinning. Reducing overstory tree density through thinning and gaps would also allow more light to reach the understory, which would to promote understory development.

Table 15. Unit Prescriptions by Landscape Area

Unit 32	No thin (172 trees per acre)	Moderate thin (75 trees per acre)	Heavy thin (60 trees per acre)
At age 53 in 2007	15.3" DBH	17.8" DBH	18.2" DBH
At age 83 in 2039	19.1" DBH	21.7" DBH	22.0" DBH

At the landscape scale, the treatments would have the indirect effect of accelerating the development of late-successional structures, and would shift the landscape pattern of vegetation toward larger, late-successional patches. Unit 19 a relatively average stand, was modeled over 100 years to show differences between the no thinning and thinning treatments in the development of four key attributes called a late-successional structure index (see Table 16 for definition). Figure 12, using a late-successional structure index, shows that reducing stand density accelerates the development of late-successional structures. Over the 100 year analysis period, both thinning options of the action alternatives obtain all four key attributes; the no action alternative does not develop the

multiple canopy layer attribute, and only obtains three of the four attributes.

Table 16. Definition of late-successional structure index[24]

Key Attribute	Definition for Modeling	Reference
Large diameter living trees	At least 8 trees per acre >31" in diameter	Franklin J.F. et al, 1986. Research Note PNW-447
Multiple canopy layers	At least 20 trees per acre of western hemlock or western redcedar >7" in diameter	Andrews, L.S. et al, 2005
Large dead trees	At least 5 snags (>5 meters in height) greater than 10" in diameter and at least 5 snags (>5 meters in height) greater than 20" in diameter	Mellen, et al, 2005 DecAID
Large woody material on the forest floor	Greater than 20 tons/acre of large wood that is >3" diameter	Mellen, et al, 2005 DecAID

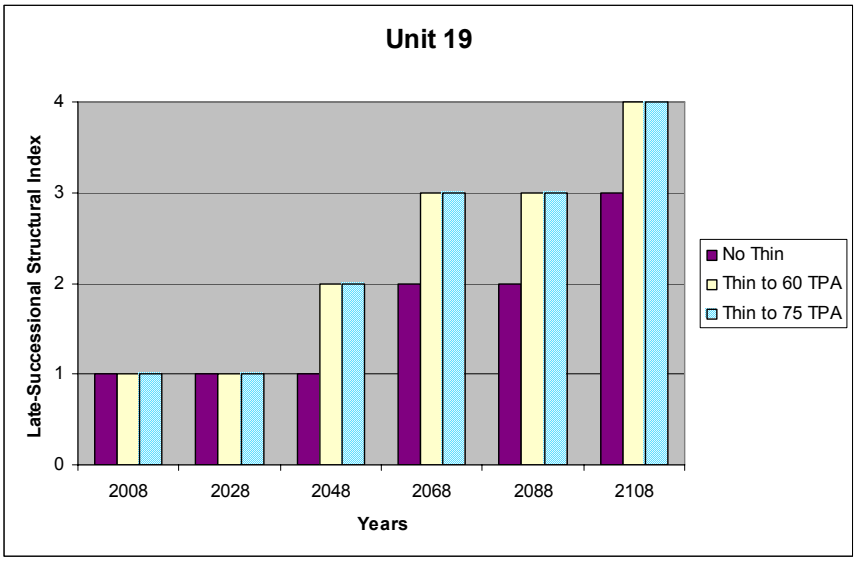

Figure 12. Comparison of Development of Late-successional Attributes over Time[25]

Under the action alternatives, the variation in thinning intensity and gap sizes would create variability in stand density and structure in the landscape. Alternative One (no action) would not accelerate the successional development needed to attain desired stand or landscape conditions, nor would it meet element one of the purpose and need (Ref. Ch. 1) to improve conditions for species and structural diversity. Under Alternative One, stands would remain densely stocked with a high level of canopy closure. There

24 The late-successional structure index is used for stand modeling.

[25] Comparison of the development of late-successional attributes over time in Unit 19 between the no thinning and thinning treatments. The bars reaching the top of the graph attain all four attributes described in Table E. Thinning accelerates the development of these late-successional attributes.

would be little change in species and structural diversity in the near-term and over the long term, the rate of individual tree growth would continue to decline.

Cumulative Effects

Cumulative effects to forest vegetation are addressed at the scale of the Layng Creek subwatershed. The current distribution of age classes in the various landscape areas of the Doris planning area is similar to what is found in the larger Layng Creek subwatershed (Figure 9). Based on the information presented in Tables 6, 7, and 8, which show past, present, and reasonably foreseeable activities, approximately 40% of Layng Creek has had or would have a regeneration harvest since the 1940s, and is in the stem exclusion stage. Approximately 17% more of Layng Creek has had or would have a regeneration harvest since the 1980s and is in the stand initiation stage (see Forest Vegetation section for vegetation stages).

The current distribution of vegetation stages in Layng Creek is considered within the range of natural variability as established by historic and fire regime condition class references (Figure 9). However, without thinning treatments, the area in the stem exclusion stage would approach the upper end and likely exceed the boundaries of the natural range of variability within several decades, because the stand initiation stands would enter the stem exclusion stage while existing stem exclusion stands would not mature into the next stage in the same time period. The action alternatives were designed, in part, to advance stem exclusion vegetation toward mature stages and to accomplish broad landscape objectives that consider natural disturbances. The action alternatives would reduce the existing stem exclusion vegetation by five to ten percent in the next several decades, and would help maintain the amount of stem exclusion within that natural range of variability when combined with other thinning projects such as Dinner, Curran Junetta and the proposed Holland Moonsalt.

Aquatic Conservation Strategy

As disclosed in the section on Forest Vegetation, the action alternatives would move landscape patterns toward the natural range of variability by helping to advance an over-abundance of stem exclusion vegetation toward mature vegetation. As such, the action alternatives are consistent with objective #1 of the Aquatic Conservation Strategy of restoring landscape-scale features such as landscape patterns.

FUELS

Existing Condition

Layng Creek is best described as having a moderate severity fire regime, which is characterized by having infrequent fires (25-100 year intervals) that are generally partial stand replacing (i.e. fire creates a mosaic of low, medium and high severity fire effects). The mean fire return interval in Layng Creek is approximately 26 years, with a natural fire rotation of 71 years (Layng Creek WA, 1995).

Portions of the watershed have, over time, been accumulating fuels, primarily due to past fire suppression practices and a lack of prescribed fire. As a result, the potential fire effects in parts of this watershed would resemble those of a high fire severity regime; more intense, stand replacing events may occur than what would be expected in a moderate severity regime. Increasing surface and crown fuel loads are creating conditions that make stands more susceptible to stand replacement fire.

Current policies applicable to this watershed do not address the management of naturally occurring (lightning) fires under previously prescribed conditions. Over the past century, slash burning (prescribed management ignited fire) has occurred after logging[26], but not to the extent that it has effectively reduced fuels at the landscape scale. Because fire has either been suppressed or conservatively applied after logging, the results of fires occurring today can be expected to be of higher severity, and would likely occur over a greater area of the watershed, than what occurred in the past. This would be especially true if initial suppression efforts on a summer wildfire were not effective (i.e. the fire escaped control).

Fire played a major role in structural development and ecosystem processes. The Layng Creek WA "fire episodes" maps indicate large areas where partial stand replacement fires burned, as well as several areas where stand replacement fires occurred. Very little of the subwatershed was left unburned between 1600 and 1900.

The Umpqua National Forest Hazard Reduction Standards (1990) recommends a hazardous fuel loading of 12-21 tons/acre across the landscape. This guideline was based on nationally standardized fire behavior models. By staying within these guidelines, the Forest Service manages for conditions that would exhibit a low intensity and safely controllable wildfire, while retaining enough biomass for site productivity. Note that these standards only incorporate the 0-8" fuel size classes.

As there is no statistical variance between units based on land type, aspect, or slope, fuel loading levels currently exist or would be generated fairly uniformly across the planning area.

Currently, all of the stands proposed for harvest in Doris are within the Hazard Reduction Standard's fuel loading ranges prior to harvest. Seven of the units are actually below that threshold, sixteen are midrange, and the remaining twelve are bumping up to the upper limit of 21 tons per acre. Harvest activities can be expected to contribute an average of 16-25 tons per acre of 0-8" activity fuels in addition to the pre-harvest loadings of 6-20 tons/acre. These units have an additional 3-31 tons per acre of larger (greater than eight inches) coarse woody debris, much of which is considered down woody debris for forest productivity. Total post-harvest fuel loadings are expected to range from 20-68 tons per acre.

Fire regime condition classes[27] (FRCC) are *coarse-scale* measures of the degree of departure from the natural fire regime (USDA/USDI 2005). This departure results in changes to one or more of the following ecological components: vegetation characteristics; fuel composition; fire frequency, fire severity and pattern; or other associated disturbances processes. Departure is measured in three broad classes: low (FRCC 1), moderate (FRCC 2) and high (FRCC 3) departure from the natural or historic regime. Low departure is considered to be within the natural range of variability, while moderate and high departures are outside of that range. In both FRCC 2 and FRCC 3, one or more fire return intervals have typically been missed. Areas of high departure increase the risk of losing key ecosystem components due to fire effects. It must be noted that the condition class system is of such coarse scale that it was never intended to be used at a local level. To do so at a project level scale, much finer spatial scales are necessary (Stephens, 2005).

The delineation of fire regime condition classes for Layng Creek established that there are no areas of high departure (FRCC 3). Both the gentle mountain slopes and steep

[26] Slash burning (primarily broadcast burning) has occurred on about 17,155 acres (40% of the watershed) in Layng Creek since 1900 (Table 6).
[27] The use of FRCC in planning is a requirement of the 2003 Healthy Forest Restoration Act (HFRA); it allows agencies to compare landscapes based on a standardized nation-wide process.

landscape areas show moderate degrees of departure, and are classified as FRCC 2 (Table 17). Because these two landscape areas have moderate departures from reference conditions, these areas have the greatest need for thinning treatments. Thinning within the gentle valley bottom landscape area would help maintain the current FRCC 1 rating.

Table 17. FRCC ratings for Layng Creek based on Landscape Areas.

Landscape Area	Layng Creek Acres	Doris Planning Area Units within the Landscape Area	Doris Planning Area Acres Thinned Under Alternatives 2 and 3	Alt. 2 Doris Planning Area Acres Receiving Fuels Treatment	Alt. 3 Doris Planning Area Acres Receiving Fuels Treatment	Current FRCC Rating
Gentle Valley Bottom	12,650	10,11,12,14,22, 23, 31,32,34,35.	315	154	147	FRCC 1
Gentle Mountain Slopes	15,179	1,2,3,4,6,7,8,13 ,15,16,17,18,19 ,20,21, 24,25,26,28,29, 30, 33.	589	362	358	FRCC 2
Steep	4,216	5,9,27	96	92	92	FRCC 2

The land allocations for this area are Matrix and Riparian Reserves. The planning area is entirely within the Detection Zone for the municipal watershed's intake system. In the Detection Zone, routine activities are acceptable provided that water contamination is avoided. There is a high probability that retardant drops from aircraft would reach the intakes in detectable quantities. In the case of wildfire suppression activities, this kind of risk has a high probability of occurrence.

Fires beginning in, or entering, portions of the planning area with minimal roads would burn at high intensities. Fires of any size have been very infrequent here (>100 years apart) and when they did occur, tended to be intense stand replacement events. Fuel loadings are very heavy in some parts of this steep topography. Treatment alternatives for this planning area should be designed so that in the future, fires that may start in the Doris planning area are less likely to spread into these fuels.

Desired Condition

The desired fuels condition at the stand scale would be fire resilient stands of Fuel Model (FM) 8, which describes a closed canopy short needle conifer stand with expected total fuel loading of five tons/acre that would cover approximately 60-80% of the area and result in slow-burning surface fires with low flame lengths. The remaining area would be represented by FM 10 (over mature stands with heavy dead and down material with a total fuel loading of 12 tons/acre) which would result in surface fires burning with greater intensity and which produces increased small-scale stand replacement patches (Anderson 1982). Today, the majority of the area is technically represented by timber FM 10. However, the accumulated fuel loadings in the planning area would produce fire intensities that are similar to the intensities of fires burning in

slash Fuel Models 11 or 12 (heavy logging slash).

Effective techniques for increasing stand resilience to wildfire include reducing the potential for crown-fires and extreme fire behavior. To accomplish this, management activities can (1) reduce surface fuels, (2) increase canopy base height, (3) reduce canopy bulk densities, and (4) reduce forest canopy continuity (Peterson et al. 2005). These four factors determine the ability of ground fires to reach tree crowns, spread from crown-to-crown, and become stand-replacing fires.

The desired condition at the landscape scale is a vegetative and fuels pattern that approximates potential fire conditions typically found in a moderate severity fire regime (as described above).

Direct Effects (Stand Scale)

For fire and fuels, direct effects are those that would occur at the stand scale in the short term.

Thinning would reduce canopy bulk density and continuity. In addition, current commercial thinning strategies leave the largest trees in a stand which by nature raises the canopy base height. This results in less chance for a ground fire to climb up into the canopy via the lowest limbs. Surface fuels can be reduced to a more desirable fuel loading range by treating fuels after commercial thinning activities are completed (i.e. via manipulation or removal of fuels by prescribed fire or mechanical means.) While thinning treatments alone can effectively reduce ladder and crown fuels, if logging residues are left untreated post harvest the potential fire behavior and fire effects will be similar to or more extreme than the untreated stand (Stephens and Ruth, 2005).

Using the Fuels Characteristic Classification System (Ottmar et al 2007) and Consume 3.0 (Ottmar et al 2006), several of the stands were modeled for predicted fire behavior under the following conditions; current, post-harvest and prior to fuels treatment, post harvest with no treatment 20 years later, and post-harvest with fuels treatment. Several assumptions are made in this model including a four mile per hour (MPH) midflame wind speed, no slope, fuel moistures typical to the area in August and September, and ignition randomly started by lightning. The results varied across the implementation area.

Currently these stands face a low to moderate level of fire behavior potential, a high level of available fuel potential and, a moderate crown fire potential. Flame lengths of 4-12 feet and rates of spread (ROS[28]) of 8-21 feet per minute were also predicted. In addition, one third of the canopy (live trees) loading was consumed. While this is much higher than would be expected for a FM 8 or FM 10, with the additional accumulation of fuels over the past several decades, the earlier statement indicating that the fire intensities would be more like that of a slash model is supported. Figure 13 shows the results of a wildfire burning through a managed stand prior to any harvest or fuels treatment. Notice the lack of canopy foliage and number of bare limbs. Only approximately five percent of the green foliage remained at the time the photo was taken. Most of the larger logs were consumed, and there is no effective ground cover remaining.

Post-harvest and prior to fuels treatment, fire behavior potential and available fuels potentials are high. However through the commercial thinning alone the crown fire potential has shifted to a low or moderate risk. The other factors vary, which can be expected as there are a variety of harvest prescriptions which would impact the amount of fuel on the ground. Flame lengths vary from 34-71 feet, and rates of spread vary from

28Rate of Spread measures how many feet per hour the fire would spread at its head.

56-128 feet per minute. Again, about one third of the canopy would be consumed. While it might be expected that more would be consumed with the increased ground fuels loading, with less standing trees there is more space between canopies, thereby reducing the chance of crown to crown fire spread. In addition, the chance of crown fire initiation is reduced through the elimination of much of the ladder fuels that allow the transition from a surface fire to crown fire.

Twenty years after harvest, with no fuels treatment, risk levels would still be elevated within these stands. Available fuel potential is still high, crown fire potential is low to moderate, and fire behavior potential is moderate to high. With some reduction of the fine fuels due to decomposition, lower flame lengths of 8-34 feet and rates of spread of 12-75 feet per minute would be expected. Even now we can expect a large portion of the canopy to be consumed.

Finally, stands were evaluated for potential effects of a fire occurring after fuels treatment had eliminated most of the fines and some of the larger fuels. As can be expected, fire behavior potential is low, and crown fire behavior potentials are low to moderate. Available fuel potential is still high, though. This is partially due to the fact that when jackpot burning[29] of fuels occurs, not all of the available fuels are consumed; only the larger accumulations are targeted. In addition, when part of the overstory is removed, shading is reduced, which triggers a growth flush of forbs and herbaceous plants. As they dry during summer months, they contribute to the amount of fine fuel loadings that sustain fire spread.

Flame lengths are a manageable 2-8 feet in these treated stands, and rates of spread range from 6-21 feet per minute. This behavior is typical of the type of fire that can usually be handled by ground crews within relatively short containment times. It poses minimal danger of resulting in a large fire complex that would burn thousands of acres and cost millions of dollars. Canopy consumption is slightly lower at this stage. Figure 14 shows the results of the same wildfire as in Figure 13 but in this case, the fire burned through a stand that had received post-harvest fuels treatment. Both photos were taken at the same fire site and on the same day. Notice the remaining green foliage on the trees in Figure 14. This stand suffered approximately 25% mortality of the smallest trees. The scorching of larger trees burned off the lower limbs[30] but did not kill the trees. Overall, more of the ground cover was unaffected, and larger quantities of coarse woody debris remain.

29 Jackpot burning is a variation of underburning, where only accumulations of fuels are targeted, rather than applying fire uniformly across the area to be burned.

30 The lower limbs of trees are often referred to as ladder fuels, because they supply a way, or “ladder”, for fire to move up into tree crowns.

Figure 13. Herman Fire in Untreated Fuels

This portion of the 2006 Herman Fire burned through a previously untreated stand directly adjacent to Herman Thin Unit #8. Notice the high mortality and lack of residual ground cover.

Figure 14. Herman Fire in Treated Fuels

This portion of the 2006 Herman Fire burned through a previously harvested stand that was also treated to reduce fuels (Herman Thin Unit #8).

As Alternative One would not change the current fuels situation, there is no direct effect.

Both action alternatives would thin and remove trees from the stand, thus reducing canopy continuity and the potential for crown fire spread. The action alternatives would have a direct effect of consuming surface fuels (Table 18), including portions of the litter, duff, 0-3” material, >3” material, and some of the herb and shrub components.

The various fuel treatments would reduce potential fire intensities and increase stand resiliency to fire as the trees grow larger and bark thickness increases. Crown fire

potential would be reduced by removing ladder fuels, by reducing crown bulk density, and by increasing crown base height of the stand. In addition tree mortality will occur in both the underburn and some of the machine pile areas due to scorch, which will aid in snag recruitment for wildlife benefit.

The direct effect of not treating activity-generated fuels would be to leave an increased loading of surface fuels in the harvested stands. This fuel loading would present a higher risk (in terms of potential fire intensity and spread) for at least 20 years after harvest.

In the action alternatives, after harvest the fuel models of the Doris stands would be modified either to a FM 8 with the fuels treatments, or to a FM 11 or 12 in areas where thinning but no slash treatment occurs (Table 18). The result of this change in fuel models in untreated stands would be a potential increase in surface fire behavior at the stand scale and an overall reduction in fire resiliency. Regardless of whether surface fuels were treated, the thinning and removal of trees would reduce canopy continuity and crown bulk density, which would in turn reduce the potential for crown fire spread. In every case modeled, should underburning occur post harvest in a controlled environment, the 0-8 inch fuels would be reduced to acceptable levels as specified by The Umpqua National Forest Hazard Reduction Standards (1990) of 12-21 tons per acre.

Both action alternatives would create one acre and ¼ acre gaps. If slash is not treated (i.e. jackpot burned) within units containing these gaps, higher fuel loads would exist for at least 20 years in much greater amounts and concentrations than in the rest of the units (which have no gaps). To reduce fire risk, the units containing the one acre gaps would be burned. Some of the units with the ¼ acre gaps are also scheduled to either be underburned or machine piled and burned. The direct effects of burning these piles would be to reduce the 0-3" surface fuels, which in turn reduces the potential fire behavior of future fires. However some of these units (see Table 1) are not scheduled for any treatment due to budgetary constraints. Rapid fire growth can be expected, along with high tree mortality, and a high degree of difficulty of attaining containment should a fire occur within one of these stands over the next twenty years.

Fuels would be hand piled along strategic sections of the 1746, 1746-763 and 1746- roads. Burning these piles would reduce fuels and potential fire intensity and spread from fires that may start along travel routes or that move onto the Forest from adjacent private lands.

Table 18. Summary of fuel treatment acres and effects by Alternative.

Treatment type	Alt. 1 Acres	Alt. 2 Acres	Alt. 3 Acres	Effects
Jackpot Burn (Underburn)	0	237	237	Beneficial - reduced 0-3" surface fuels both for the short-term (up to 5 years) and the long-term (greater than 5 years); increased stand resiliency to potential wildfire effects.

Treatment type	Alt. 1 Acres	Alt. 2 Acres	Alt. 3 Acres	Effects
Thinning & No Fuel Treatment	0	672	683	Beneficial - Reduction of standing fuels; separation of crown layers; short and long-term effect of reducing crown fire potential; long-term benefit of increased fire resiliency against crown fire. Adverse - increase in the 0-3" surface fuels with a short-term increased risk for loss due to potential wildfire.
Machine Pile & Burn	0	349	338	Beneficial - reduced 0-3" surface fuels both for the short-term (up to 5 years) and the long-term (greater 5 years) and increased stand resiliency to potential wildfire effects.
Hand Pile & Burn	0	23	23	Beneficial - reduced 0-3" surface fuels both for the short-term (up to 5 years) and the long-term (greater than 5 years) and increased stand resiliency to potential wildfire effects.

As a connected action, about 70 acres of pre-commercial thinning (PCT) is proposed to occur within the planning area. The direct effect of the PCT treatments would be a short-term increase in surface fuels (4-25 tons/ac of <3" material) for a period of at least 20 years. Over the long term, however, risk of tree and stand mortality would decrease as remaining trees grow and the slash created by pre-commercial thinning decays.

Indirect Effects (Landscape Scale)

Indirect effects are those that would occur at the landscape scale and later in time. In modeling future fire behavior, 50-100 years was used, based on the findings of the Layng Creek Watershed Analysis fire history study that best represents historic fire return intervals for the planning area.

Thinning and fuels treatment in the Doris stands would help reduce the current moderate risk of landscape-scale fire and improve the fire resiliency of the stand over the long-term.

Purpose and Need Element #1 in Chapter One is measured by acres of improved stand fire resiliency in both the gentle mountain slopes and steep landscape areas. In response to Element #1, Table 17 shows that for the action alternatives, the gentle mountain slopes and steep landscape areas are moved towards a more fire resilient level within these moderate departure areas through a combination of harvest and fuels treatment. Without pre-commercial and commercial thinning and fuels treatments (i.e. no action), a fire occurring under extreme weather conditions would likely result in a mosaic pattern of under story, partial-stand replacing and stand replacement fires.

Under Alternative One, this area would remain at a moderate to high risk for losses to key ecosystem processes from wildfire, as compared to a low to moderate risk for loss if Alternatives Two or Three were implemented.

Pre-commercial thinning would help improve resiliency to wildfire in the vicinity of the planning area. In the gentle valley bottom landscape area, pre-commercial and commercial thinning satisfies the purpose and need by maintaining FRCC #1 conditions.

Both action alternatives reduce surface fuels over about 47% of the 1,236 acres of the Doris project, which would effectively reduce fire behavior intensity and severity over the 50-year period of time analyzed.

As a whole, the proposed fuel treatments would reduce fire risk and improve fire resiliency, though when evaluated separately each treatment's effectiveness over time and at the stand and landscape scales would vary. Jackpot burning is the most effective treatment for reducing 0-3" surface fuels, and the changes in fuel loadings within the stands would moderate future landscape fire behavior over the next 50 years. The action alternatives would also increase canopy base height[31] by several feet following harvest, thus resulting in lower crown fire potential over time, when compared to Alternative One.

Cumulative Effects

The analysis area for fuels is the 42,195 acre Layng Creek subwatershed, and is of sufficient size to characterize landscape-level fire behavior and events.

Between the 1920's and present, there have been about 17,155 acres of the subwatershed (about 40%) that have been burned after harvest operations (Table 6). The effect of the past burning treatments was to reduce the total surface fuel loads on those sites.

Between 1960 and present, there have been about 10,903 acres of pre-commercial thinning (PCT) within Layng Creek (Table 6). Pre-commercial thinning reallocated growing space to fewer individual trees, increased the horizontal distance between tree crowns, and increased the vertical distance between tree crowns and the existing ground fuels.

These past practices have reduced fuel loadings over much of the drainage, reducing the risk of stand loss to potential wildfires, and changing the baseline surface fuel conditions of the managed stands.

If implemented, the action alternatives would overlap in time and space with one potential future project (Holland/Moonsalt Timber Sale, Table 8). In addition the actions associated with the sold and ongoing Dinner/Dessert and Curran Junetta sales may see some overlap. This project would be similar in size to each of these projects, and is scheduled to occur within the next three to five years. Together, these projects would have the beneficial cumulative effect of reducing surface and standing fuels, reducing fire risk, increasing stand resiliency to fire, and moderating future fire behavior potential on about 3600 acres (or about 12%) of the Layng Creek subwatershed. Alternative One would not contribute to this beneficial cumulative effect of reducing fuels across the landscape, as no treatment would occur. When taken together with the 1,558 acres of treatment that have occurred with the recent Judy, Salty, Herman, and Blim Commercial Thins, the current 1001 acre Dinner/Desert and 1200 acre Curran/Junetta commercial thinning sales, the FRCC would substantially improve at the Watershed scale.

31 Canopy base height (CBH) is the lowest height above the forest floor at which there is enough canopy fuel to move the fire from the ground and into the canopy (Scott and Reinhardt 2001). The existing CBH for the stem exclusion/mature stands is about 5-6 feet; to moderate future crown fire potential, these levels would need to be raised several feet.

COARSE WOODY DEBRIS

Relevant Standards and Guidelines

The standards and guidelines in the Northwest Forest Plan were designed, in part, to maintain ecological components such as down logs, snags, and large trees (ROD B-2) through time. The goal for management of forest stands in the matrix land allocation is for timber and other commodity production while maintaining these ecological components at appropriate levels (ROD B-6) and well distributed throughout the landscape (ROD C-40). Provisions for retention of snags and logs should normally be made, at least until the new stand begins to contribute coarse woody debris (ROD B-8).

When the Northwest Forest Plan was implemented in 1994, the standards and guidelines for snags and logs were meant to provide initial guidance (ROD C-41). Future refinement of standards and guidelines was expected as new information became available (ROD C- 42, E-12). More current information (Rose et al. 2001, Mellen et al. 2005) indicates that the biological population potential models (dating back to the 1970s and 80s), that most standard and guidelines were based on, may now be out of date.

The Northwest Forest Plan requires site-specific analysis and the application of models for computing down wood information (ROD C-40) and snag recruitment (ROD C-46) to take into account tree species, diameters, and falling and decay rates, to determine appropriate tree and snag species mixes and densities to achieve the objectives stated above. The Fire and Fuels Extension to the Forest Vegetation Simulator model (FVS v6.21, revision 1/19/06) was used to analyze existing and future levels of snags and down wood. This model recently incorporated the latest information on snag fall rates, decay rates, and height loss rates for the western Cascades.

DecAID (Mellen et al. 2005) was used to determine what levels would be ecologically appropriate for the specific habitat and structure types in the proposed harvest units. DecAID is an internet-based synthesis and summary of the published scientific literature, research data, wildlife databases, forest inventory databases, and expert judgment and experience concerning snags and down wood. It provides information on estimating or evaluating sizes and densities or amounts of dead wood that provide habitat for many species and ecological processes (Mellen et al. 2005). DecAID provides three tolerance levels (30%, 50% and 80%) for snag and down wood sizes, densities and percent ground cover used by wildlife species. Tolerance levels indicate a level of assurance for providing habitat that meets the needs of the species. The higher the tolerance level for the species, the more individuals in the population being provided habitat.

Watershed Analysis Recommendations

To supplement the Forest Plan standards and guidelines with more site-specific data, a snag and log inventory was conducted in the Layng Creek subwatershed (USDA, Umpqua NF, 2005a). The results of this inventory are used to refine management of coarse woody debris (CWD) in this area in accordance with the standards and guidelines in the Northwest Forest Plan (ROD C-41).

Existing and Desired Conditions

The abundance of snags and logs varies substantially across forested landscapes in the Pacific Northwest (Ohmann and Waddell 2002). While the majority of the landscape usually supports moderate levels of snags and logs (Mellen et al. 2005), a fairly large portion (about one-third of the landscape in the Western Cascades of Oregon) can have

little to no dead wood, while a smaller portion would have a great deal (White et al. 2002, Ohmann and Waddell 2002). The Layng Creek inventory showed similar trends.

The results of the Layng Creek inventory show 22% of the local landscape is devoid of snags ≥10 inch dbh and about 3% of the landscape has snag densities ≥18 snags/acre. There is currently an excess of forested land in this area without snags (roughly 5 times higher than what DecAID recommends) and a deficiency in areas with high snag densities (roughly 12% of what DecAID recommends). Management prescriptions should allow for these extremes because they are ecologically important (White et al. 2002, Mellen et al. 2005). Common natural disturbances that produce areas with high levels of dead wood include wildfire, insects and disease, and wind (blow down) events.

Within the harvest units, both inventory and stand exam data show current average snag densities between 1.8 to 3.4 snags/acre (90% confidence interval) for snags ≥10 inch dbh and 0.5 to 1.5 snags/acre for larger snags (≥20 inch dbh). Down wood levels are between 3.3 to 9.6 percent ground cover (90% CI), with an average ground cover of 6.4 percent. When compared to local inventory data in unmanaged stands of similar age, levels of CWD in the harvest units were about 75% less than what was found for snags in the unmanaged stands, and the amount of down wood was twice that of the unmanaged stands (USDA, Umpqua NF, 2005a). In summary, when compared to the advice in DecAID, current snag levels are low, but down wood (percent cover) is within the appropriate range.

Direct and Indirect Effects

The direct and indirect effects to CWD are analyzed at two scales: 1) within the stands being thinned (stand-scale), and 2) within the landscape of Layng Creek as described in the snag and log inventory (landscape-scale). The direct effects are the immediate changes that occur at these two scales. The indirect effects focus on how the alternatives would modify the stand CWD dynamics over the next 100 years. The actions that would have the largest effect on CWD are thinning and post harvest fuel reduction treatments.

The action alternatives cause a decrease in stand levels of snags and down wood caused by incidental falling of snags for logging or safety reasons, and by consumption of down wood during the fuels reduction treatments. Thinning would reduce the amount of suppression mortality within the thinned portions of stands, indirectly affecting future recruitment of CWD. Existing snags and logs would be protected to the extent practical and safe. However, it is probable that the action alternatives would lower levels of these structures (to approximately one to two snags per acre) through mechanical disturbance from tree falling and harvesting. This project would affect dead wood mainly in the small tree structural conditions. It is estimated that an average of approximately three snags > 10 inches would be created from fire and damage from harvest operation within the harvest units during and after treatment. All trees damaged during harvest operation, such as intermediate support trees or line damaged trees, would be retained to mitigate the decreased rate of snags caused by thinning and harvest activities.

To mitigate for effects on large snags, the action alternatives would include the inoculation of two trees per acre on 935 acres with locally collected native heart rot fungus. Inoculated trees begin to develop heart rot within five years as they continue to grow (Duncan, 1999), eventually producing larger trees with cavities, and future snags, that remain standing longer than if girdled. Inoculation is a management tool being used to offset the reduction of suppression mortality caused by thinning and to maintain a component of decadence within these managed stands. Additional snag mitigation

would occur within thirteen one-acre gaps; ten snags per acre would be created by fire during fuels reduction activities.

The changes to levels of snags and down wood at the stand-scale are shown in Figures 15 -17. These graphs show how the alternatives would change CWD trajectories over the next 100 years using the latest models. The changes vary with treatment type; the levels shown in these graphs are stand averages.

Under the action alternatives, levels of CWD are not predicted to drop below the 30% tolerance level as advised in DecAID (the bottom edge of the gray band) for the next 100 years. Over the next 100 years, the CWD levels would begin to change into a larger diameter class with a reduction in smaller diameter CWD. The models indicate that snag and down wood levels remain within the levels advised for by DecAID, and are consistent with CWD levels found in Layng Creek. The action alternatives, with mitigation, would have the effect of maintaining suitable habitat for wildlife, plants, fungi, liverworts, mosses, lichens, and ecological processes that require CWD.

Large snag (≥20" DBH) densities within the stands are currently below the levels advised for in DecAID (4.7 snags/acre, 30% tolerance level). Under the no action alternative, this level of snags would not be achieved for another four decades (Figure 16). The action alternatives would delay reaching this level by an additional 20 years. However, green trees inoculated to mitigate a portion of the impacts to large diameter snags over time should begin to provide cavity habitat within 30 to 40 years after inoculation. The mitigation of two inoculated trees per acre was incorporated in the action alternatives (graphed line between 30 and 40 years in Figure16). These inoculated green trees may not be true snags (dead trees) but should provide some of the same functions as cavities and foraging habitat for many associated snag dependent species. Additionally, the action alternatives would provide other ecological benefits by allowing trees to grow larger and faster, and to develop other suitable wildlife habitat characteristics (e.g., large limbs, crowns, etc.). The gray areas on the graphs below represent the 30 to 80% tolerance levels from DecAID.

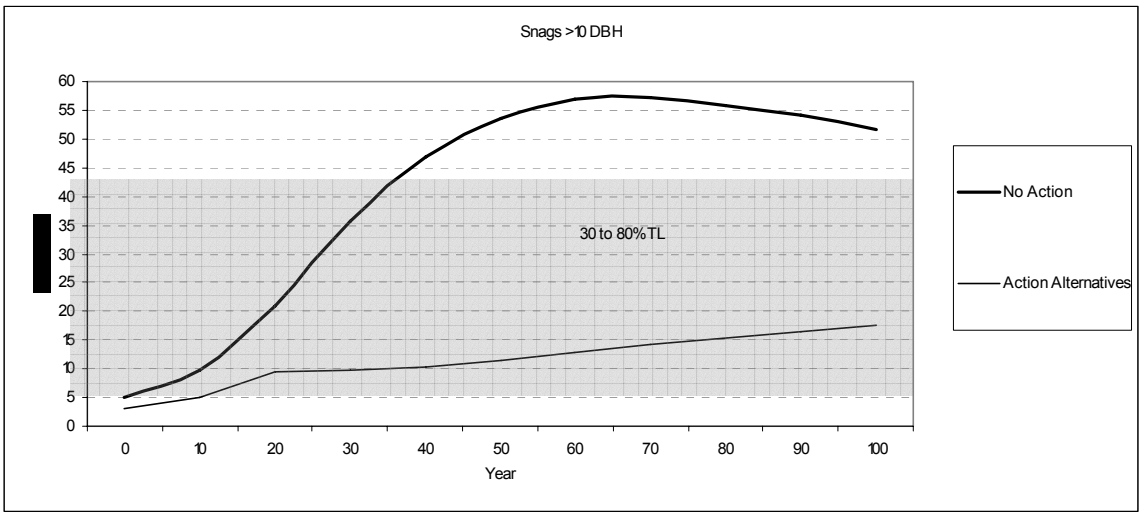

Figure 15. Short and long-term changes to ≥10" dbh snags (Snags/Acre by Year).

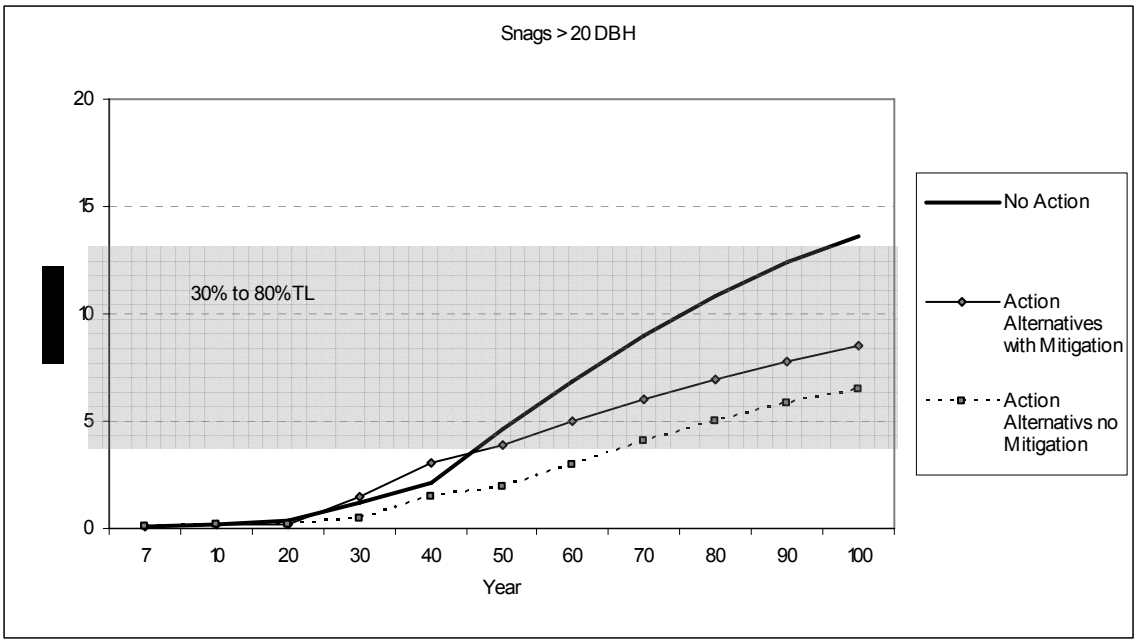

Figure 16. Short and long-term changes to ≥20" dbh snags (Snags/Acre by Year).

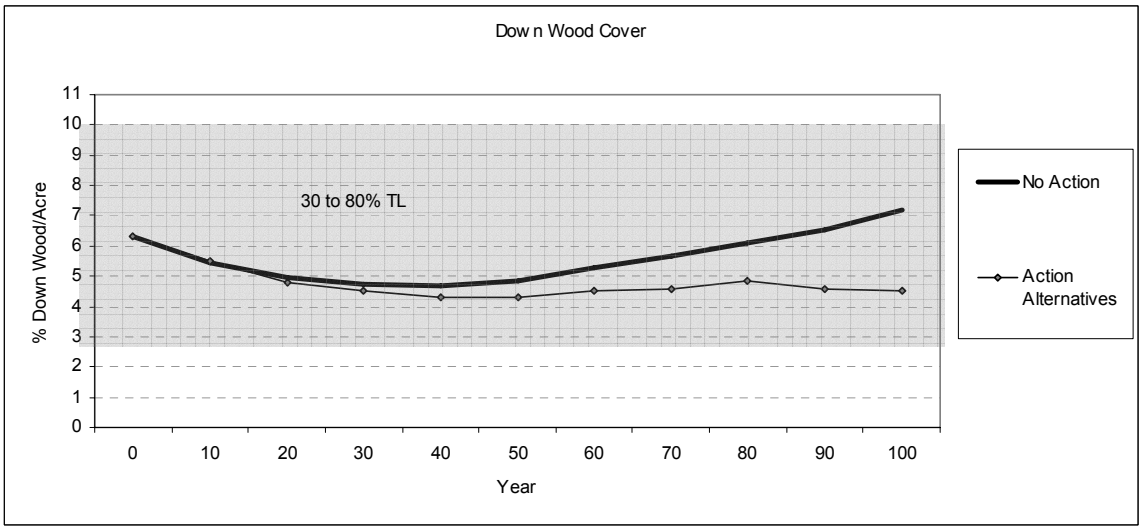

Figure 17. Short and long-term changes to ≥6" diameter down wood.

Cumulative Effects

Substantial adverse impacts to levels of CWD at both the stand and landscape-scale have resulted from past clearcut timber harvesting, road building, roadside salvage and fire exclusion. The Layng Creek inventory showed an overabundance of land area with no snags, and a deficit of land area with high snag densities. It would take several decades to restore snag and log conditions to within the ranges advised for in DecAID at these two extreme ends of the range of CWD.

Down wood levels will vary both in time and across the land, but should remain within the reference range. The action alternatives do not add to this existing condition at the stand level because they maintain snag and down wood levels within natural ranges as identified in DecAID and the Layng Creek inventory. At the landscape-scale, including past, current and future projects such as Dinner, Curran Junetta, and Holland Moonsalt,

the action alternatives do not add to the cumulative loss of snags.

SOIL PRODUCTIVITY

The maintenance of soil productivity during forest management activities is critical to maintaining a healthy forest. Consequently, soil productivity is addressed in the Umpqua Land and Resource Management Plan (LRMP) with several standards and guidelines. The primary focus of this analysis centers on past and predicted soil disturbances and the maintenance of ground cover.

Relevant Standards and Guidelines

The most relevant standard and guidelines from the Umpqua Land Resource Management Plan (LRMP) related to soil productivity include:

Soil Productivity S&G #1, p IV-67: Requires that the combined total amount of unacceptable soil conditions in proposed activity areas (compaction, displacement of surface soil and severe burning) would not exceed 20 percent, including areas in roads and landings.

Soil Productivity S&G #2, p IV-68: Requires maintenance of ≥25% effective ground cover on areas with low erosion hazards and ≥45% in areas with moderate erosion hazards to prevent loss of topsoil through erosion.

Soil Productivity S&G #3, p IV-68: Requires maintenance of ≥65% ground cover for surface organic material (defined as litter, duff and wood) on mineral soils with cold climatic conditions, low nutrient levels, and/or low water holding capacities.

Soil productivity standards 4, 5, 10, 11, and 12 and other NWFP requirements also apply and are described in this section or are listed as mitigation measures or monitoring requirements in Chapter Two.

Existing and Desired Conditions

Past timber harvest activities (prior to 1975) primarily utilized ground skidding using tractor and highlead yarding methods. During highlead operations logs were yarded both down and uphill without suspension and often resulted in severe soil displacement. Tractor yarding on the moderate slopes (35-55%) typically disturbed about 30-40% of the ground, and required cutting skid trails into the slope. These skid trails often crossed swales where ground water could be intercepted and redistributed as surface flow, which down-cut new channels. In many cases skid trails and smaller haul roads were placed across swales that contained buried streams, which later opened up and are now stream channels. Slash treatment following harvest often resulted in relatively high intensity fires that left the upper slopes bare. Generally, all non-merchantable material remained on-site, accumulating in large concentrations in swales and the lower third of steeper harvest units.

Around 1975, skyline harvest was primarily used to harvest the moderate to steeper slopes in the subwatershed, greatly reducing the soil disturbance to three percent or less of the harvest area, as well as reducing soil compaction (monitoring records). The effects of tractor yarding were also reduced after 1985 by restricting ground skidding to designated skid trails over approximately 15% of the area harvested. Skid trails were also designated away from streams during this period.

Soil interpretations for the planning area were made using the Umpqua Soil Resource Inventory (USDA 1976) and field review. This inventory provides landscape-scale soils information on broadly mapped areas (average size = 250 acres) that have distinctly

unique geology, landform and soils that affect the growth and development of forest vegetation. This information was reviewed for each landform and provides useful information for sale planning. The geology of Layng Creek is associated with rock units of the Western Cascades, general consisting of a complex mixture of volcanic and sedimentary units (Layng Creek WA, 1995). Approximately 95% of the proposed units are located on soils that have a moderately high to high resiliency to soil disturbance.

The desired condition for soils is to keep compaction and displacement to less than 20% of the treatment area and to maintain at least 65% effective ground cover of surface organic material for soil productivity.

Direct and Indirect Effects

The direct and indirect effects are discussed at the scale of the treatment units (1,282 acres). Direct effects would occur immediately as a result of thinning, fuels treatment, and road work while indirect effects would occur in the future as a result of potential wildfires.

Under Alternative One, legacy soil displacement and compaction would remain unchanged at around 97 acres (9%) of the treatment units (Table 19). The action alternatives would use previously compacted temporary roads, along with many of the pre-existing skid trails and landings. Consequently, Alternatives Two and Three are estimated to result in a relatively low amount of new soil disturbance (approximately 4.3 and 0.4 acres, respectively). Mitigation would include subsoiling of approximately ten acres. Concentrated areas of legacy soil compaction were given priority for subsoiling. The increase of four acres of disturbed soil in Alternative Two and 0.4 acres in Alternative Three (from the proposed new temporary road construction) will be mitigated by outsloping, subsoiling, and covering with slash, and would not be expected to increase the risk of sediment delivery to streams.

The mitigation measure for compaction using subsoiling has the direct effect of reducing disturbance, improving water infiltration, and decreasing the risk of erosion. Both temporary roads and ground-based yarding skid trails would be laid on top of the older skid trails. These legacy skid trails currently exceed standards and guidelines for disturbance by as much as 12% in some areas (LRMP pp. IV-68). Following harvest and subsoiling, all units would meet soil standards and guidelines for unacceptable soil disturbance for both compaction and effective ground cover, thus complying with soils S&G #1 and erosion risk S&G #2 (LRMP pp 67-68).

Table 19. Unacceptable soil disturbance estimates.

Type of Soil Disturbance	Alt 1	Alt 2	Alt 3
Legacy Compaction	97 ac	97 ac	97 ac
New Compaction (perm roads)	0	0 ac	0
New Compaction (harvest, landings, roads)	0	4.3 ac	.4 ac
Subsoiling (mitigation)	0	-10.5 ac	-10 ac
Estimated total compaction after subsoiling	**97 ac**	**91 ac**	**88 ac**
Severely Burned Soils (fuel treatments)	0	23 ac	14 ac
Severely Burned Soils (modeled wildfire)	192 ac (15%)	96 ac (8%)	96 ac (8%)

Table 19 assumes the fuels treatments would occur during spring like conditions. Under

these conditions machine piles would potentially expose 4% of the treated area and result in severely burned soil conditions over 2% of the area treated while broadcast underburns would potentially expose 18% of the area and result in severely burned soil conditions over 3% of the treated area. Alternative 2 which would underburn 352 acres and machine pile 607 acres would potentially expose 87 acres of bare soil. Alternative 3 would underburn 237 acres and machine pile 338 acres with the potential to expose 57 acres of bare soil (Table 20[32]). Fuel treatments for Alternatives Two and Three would potentially result severely burned soils over approximately 30 to 33 acres. Temporary access roads, landings, and skid trails would be placed on legacy disturbance where possible; only four acres of new soil compaction disturbance would be expected under both Alternatives Two and Three.

Together, harvest and fuel treatments would maintain 86% to 89% effective ground cover and result in 8% to 9% of the harvest units in an unacceptable soil condition. Under the no action alternative 7% of the area would remain in an unacceptable soil condition. These deep soils, scattered throughout the harvest and fuels treatment areas, are highly resilient and expected to recover soil permeability, tilth, and ground cover in less than two years. Soil compaction would remain as a long-term effect (>50 years) if not treated. Decompacting damaged soil through subsoiling temporary roads, landings, and skid trails would increase the soils permeability, and help to disperse surface water runoff to decrease erosion delivery potential. However, full recovery of soil productivity on these sites is a biological process that takes time (10+ years).

The action alternatives would result in a long term (> 10 years) benefit of reducing severely burned soil from potential wildfires. This reduction is primarily due to effective treatments such as machine pile burning and underburning. Hand piling, and areas with no fuels treatment, would not be considered effective measures. Treatments such as hand piling and thinning can be effective in reducing the spread of wildfire, but would not adequately reduce fuel loading to prevent wildfire effects to soil from ground fire effects. Alternatives Two and Three would effectively treat more acres and therefore would have a higher potential long-term (10-year) benefit for reducing soil effects from future wildfire.

Effective ground cover (EGC) is defined as all herbaceous or dead woody materials, synthetic materials and rock fragments >0.75” diameter that cover the surface of the ground and prevent soil surface erosion (LRMP IV-68). Minimum ground cover recommendations have been prescribed to address both the risk of soil erosion (LRMP IV-68 S&Gs #2 and #3) and the need to maintain soil organic matter for long-term site productivity.

Carbon (standing and down woody material, litter, soil organic matter) is a critical element to site productivity and soil development. Most plant available nutrients are retained by the organic fraction in the upper ten inches of forest soils. Fine roots and mycorhizal fungi activity occurs at the litter-soil interface and in the surface two inches of soil. Fine root development plays an important role in soil carbon sequestration (Lal, 2005) and long-term soil fertility. Forest soils that are low in organic matter are also less productive. Increased carbon storage in forest soils can be achieved through forest management including site preparation, fire management, and species management and selection.

Table 20 displays effective ground cover predictions. When comparing action alternatives, the additional 2.2 acres from new temporary road construction in Alternative Two is too minor to result in a measurable difference. Consequently both action alternatives have a similar effect. The combined effects of harvest, landings, and fuels

32 These percentage estimates were derived from the First Order Fire Effects Model used in the Dinner Thin EA which analyzed the Layng Subwatershed.

treatment would potentially expose soil at an average of 21% of the unit acres. This amount of disturbance would be considered acceptable for maintaining long-term soil productivity (LMRP IV-68). The action alternatives are expected to result in little to no effect on soil carbon. Therefore disruption of natural processes would not be expected to occur under any of the action alternatives.

The risk of wildfire would be a potential indirect effect of maintaining fine fuels and litter. Under Alternative One, a future wildfire would potentially reduce the effective ground cover by 72% (Table 20). This would increase the possibility for erosion and would potentially reduce long-term site productivity on less resilient sites such as portions of the steep side slopes with shallow soils. This risk is lower for the action alternatives.

Table 20. Summary of effective ground cover predictions.

	Alt 1	Alt 2 & 3
Exposed Soil from Harvest and Fuel Treatments	0	266 ac
Exposed Soil from New Permanent Road	0	0 ac
Total acres of Exposed Soil		**266 ac (21%)**
% Effective Ground Cover	100%	79%
Predicted Exposed soil from a Wildfire	923* ac (72%)	530 ac (41%)

Alternative One may result in a larger and possibly more severe future wildfire. Instead of storing carbon and maintaining soil organic matter, a wildfire would release carbon into the atmosphere. A potential wildfire would be expected to consume greater than 80% of the litter and duff layer over 28% to 40% of the burn area, and may expose 60% to 72%[33] of the soils. Depth-of-mortality[34] (60°C) would be expected to reach a depth of three inches of the soil surface with mixed severity. This type of fire, occurring in the steeper landscapes with shallower soils, would have a detrimental effect on soil organic matter due to increased soil loss through erosion (Hatten et al. 2005).

There are no direct or indirect effects associated with connected actions.

Cumulative Effects

The Doris planning area is in a moderate severity fire regime dominated by soils that are relatively resilient to disturbance. All action alternatives are within the parameters of acceptable disturbance and therefore would not add to any past soil impacts that result in any adverse cumulative effects to soil.

Considering recent and foreseeable activities in the Layng Creek subwatershed, there would be a cumulative net beneficial effect to long-term soil productivity. Other sales that have been implemented in the subwatershed in the past ten years have addressed existing levels of legacy compaction, including decommissioning and subsoiling. In addition, fuels treatments have resulted in low impact, low intensity, and short duration

33 First Order Fire Effects results using 6% soil moisture and 20% duff on SAF-Douglas-fir – western hemlock.

34 Depth of mortality can be defined as the depth of soil heating where the soil reaches 60oC, which is a generalized temperature used to estimate tissue death and provide an indicator of potential soil effect.

burns that result in acceptable levels of soil disturbance[35] while reducing the future potential wildfire risk.

The action alternatives, along with other present, recent past and reasonably foreseeable timber sale thinning and fuels management activities within the Layng Creek subwatershed (Tables 6, 7 and 8), reduce the risk of severe wildfire effects to soils and result in a beneficial cumulative effect. Conversely, because Alternative One has the potential to result in severe soil effects from a wildfire, it may cumulatively add to adverse soil impacts in the Layng subwatershed.

FOREST WILDLIFE

LANDBIRDS

Population declines of some landbirds have resulted in a Landbird Strategic Plan (USDA 2000) that sets management goals and actions for providing sustainable landbird habitat. A conservation strategy for landbirds in coniferous forests of western Oregon and Washington was developed to guide land management planning efforts and to help ensure functional ecosystems with healthy populations of landbirds (Altman, 2000). These plans and strategy documents are not regulatory, but provide management recommendations for reversing declining population trends and achieving stable or increasing trends within the next couple of decades. A Presidential Executive Order (signed January 10, 2001) required the Forest Service to enter into a memorandum of understanding with the US Fish and Wildlife Service (signed January 17, 2001) to incorporate recommendations from these types of landbird conservation plans into forest planning. The species listed in Table 21 are the focal species described in the USFS Landbird Strategic Plan that are suspected to occur within the Layng Creek watershed. Their preferred habitat attributes and forest condition are shown.

Table 21. Focal Species in the USFS Landbird Strategic Plan

Forest Condition	Habitat Attribute	Focal Species
Old-growth/Mature Forest (Multi-layered)	Large snags and trees, Deciduous canopy trees, Mid-story tree layers, Conifer cones	Pileated Woodpecker Brown Creeper Pacific-slope flycatcher Varied thrush, Red crossbill
Mature/Young Forest (Multi-layered/Open mid-story Understory Reinitiating)	Closed Canopy Deciduous understory Forest floor complexity	Hermit warbler Hammond's flycatcher Wilson's warbler Winter wren
Young/Pole Forest (Understory Reinitiating/Stem Exclusion	Deciduous canopy trees Deciduous subcanopy/understory	Black-throated gray warbler Hutton's vireo
Early-Seral Forest (Stand Initiation)	Residual canopy trees Snags Deciduous vegetation Interspersion of shrubs/ Herbaceous openings	Olive-sided flycatcher Western bluebird Orange-crowned warbler Mountain quail Rufous hummingbird

35 Fuel Monitoring soil summaries, 1998. Umpqua National Forest.

	Nectar-producing plants	
Forest Condition	**Habitat Attribute**	**Focal Species**
Riparian	Instream and stream bank	American dipper Harlequin duck
Forest Inclusions/ Unique habitats	High elevation meadows Berry-producing shrubs Large hollow snags Mosaic forest meadows Alpine	Lincoln's sparrow Band-tailed pigeon Vaux's swift Blue grouse American pipit

The Forest Plan has no specific recommendations for landbirds other than for cavity nesters (discussed in the next section), raptors (which are protected from human disturbance until nesting and fledging is complete), and federal laws that govern threatened or endangered bird species.

Watershed Analysis Recommendations

There are no specific recommendations for landbirds in the Layng Creek Watershed Analysis.

Existing Conditions

The scope for analyzing effects to landbirds is at the Layng Creek subwatershed scale. There are two Cascade Mountain breeding bird survey (BBS) routes in this general area that have been used to monitor landbirds on an annual basis for many years. The Winberry BBS Route (69019) is located about 12 miles north of the Layng Creek watershed and has been monitored since 1968. The Warner Mountain BBS Route (69219), which is located about 14 miles to the southeast, has been monitored annually since 1992.

The conservation strategy for the coniferous forests of western Oregon and Washington describes the conditions found within the proposed harvest stands as "pole forest - stem exclusion" as described below (Altman, 2000):

> "These forest conditions are structurally simple and characterized by an even-aged, single-layered, closed-canopy with little or no understory development. Where understory vegetation exists, it is generally low growing and dominated by one or two shade-tolerant species. Stands may range from sapling trees with high foliage ratios that have attained canopy closure, to large pole trees that are densely stocked and have low foliage ratios and a high degree of canopy lift. These forest conditions are relatively depauperate in land bird species composition and richness".

The conservation strategy identifies two focal bird species for this forest type; the black-throated gray warbler and Hutton's vireo (Table 21). It also identifies the hermit warbler as a younger forest, closed-canopy associated species. Monitoring data from the local BBS routes show increasing trends for the warblers and a stable to decreasing trend for the vireo in this area. Long-term (1966-2006) and short-term (1980-2006) population trends for the Cascade Mountains show stable populations for the warblers, and increasing population trends for the vireo.

Direct and Indirect Effects

The black-throated gray warbler, one of the two focal species for this habitat type, is associated with overstory deciduous trees. This species can be highly associated with this forest condition if there are deciduous canopy trees and deciduous subcanopy/understory shrubs present. The stands proposed for thinning are even-aged Douglas-fir trees, single-layered and closed-canopy with little or no understory development or deciduous canopy trees.

The black-throated gray warbler is a long-distance, neotropical migrant that breeds throughout coniferous forests of western Oregon and Washington, primarily at low to moderate elevations (<3,500 ft). It is most abundant in young (40-80 years) stands with broadleaf trees (Gilbert and Allwine 1991). In Douglas-fir/oak dominated forests at the interface of the Willamette Valley and Oregon Coast Range, it is highly associated with areas of relatively high oak cover (Morrison 1982).

Like the vireo, it is also more abundant in unthinned (198 trees/ac) than moderately thinned (146 trees/ac) 40-55 year-old Douglas fir stands 5-15 years post-harvest in managed stands in the central and northern Oregon Coast Range (Hagar et al. 1996). The conservation plan for this species is to retain deciduous trees and/or conduct thinning to open-up the canopy and allow for development of deciduous trees where appropriate (e.g., wet sites). Thinning should occur in patches and be variable-spaced rather than uniform to minimize negative effects of reduced overstory canopy closure by maintaining some areas with high canopy closure. (e.g., riparian no-cut buffers).

The Layng Creek subwatershed supports few deciduous trees, and where small stands occur they are considered a unique feature/habitat. Douglas-fir/oak dominated forests occur outside the District boundary, interfacing with private ownership. Most of the deciduous trees are located within the floodplain of Layng Creek, with a composition of big-leaf maple, black cottonwood, red alder and Oregon ash. Red alder and Oregon ash are found in wet slumps dispersed throughout the watershed, and clumps of chinquapin and red alder can be found in upland areas. Within this watershed deciduous trees can be prominent during early seral development, but may only exist for fifty to sixty years because Douglas-fir out compete and overshadow them. Thinning of Douglas-fir can temporarily maintain their presence, if they are not destroyed during harvest, or if they are included as a dominate tree in a created gap.

Thinning accelerates the growth of Douglas-fir by reducing competition between them. Accelerating the growth of Douglas-fir ultimately has an adverse affect on existing hardwoods trees within the stand. However, the proposed thinning of 398 acres to 70-90 trees per acre may have some benefit to this species. Provided existing deciduous trees are not destroyed during harvest they should also benefit from thinning adjacent trees. The benefits of thinning are expected to be short-term (10 to 20 years); the ¼ to one acre gaps would begin to close in by that time and Douglas-fir trees would begin to over shadow deciduous hardwoods trees within the stands. Thinning to 40 to 60 trees on 602 acres would afford a greater opportunity for deciduous hardwoods trees to be maintained within the stand and may provide for suitable habitat in the future after a component of the canopy closure regains itself.

The Hutton's vireo, the other focal species for this stand type, is associated with the understory shrubs. Hutton’s vireo is a resident species that breeds throughout coniferous forests in western Oregon and Washington, primarily below 2,000 feet elevation and predominantly in coastal forests. A light thinning that allows for understory development yet retains a relatively dense overstory would provide suitable habitat for this species

(Altman 2000). The proposed thinning of 389 acres to 70-90 trees per acre would eventually develop a shrubby understory while still providing a relatively dense overstory canopy. This will result in indirect benefits to this species. Within the watershed, stands previously thinned in the late 1980s with a similar prescription are still providing a robust deciduous understory.

Approximately 602 acres would be thinned to 40 to 60 trees per acre. A thinning with this prescription would reduce the existing canopy closure to approximately 44% canopy closure (see Forest Vegetation, Direct and Indirect Effects). This reduction would have immediate short term direct adverse effects to this species. The effect would last approximate 10 years. After harvest there would be an expected two percent gain in canopy closure per year after thinning (Chan, et al. 2006). It would take approximately 10 years before the canopy would regain its current average canopy closure of approximately 65%. Within that time the stand would be expected to have a well developed understory of deciduous shrubby species favoring the Hutton's vireo.

Hayes et al. (2003) and Hagar et al. (2004) have recorded declines (but not extirpations) in both black-throated gray warblers and Hutton's vireo after commercial thinning. Therefore, it is assumed that the action alternatives would likely cause short-term declines in these species over the next five years, because timber harvesting and fuel reduction treatments would have a physically negative impact on deciduous shrubs and tree canopy closure shortly following the treatments. Over time, however, shrubs and trees would respond positively to the more open and less dense stand conditions and begin to recover. As this recovery occurs, it is expected that both these species would benefit and begin to increase in local numbers over the next 20 years. To help mitigate the short-term impact, deciduous hardwoods trees would be retained in the silvicultural marking guide as feasible.

Direct Effects from Disturbance

Some proposed activities would likely occur during the breeding season for these species. Direct effects from logging activity on nesting birds may cause some localized disruption of nesting on 1,000 acres for one or more breeding seasons. There is an expected negative effect from habitat modification such as temporary loss of some potential nesting habitat. Other short term (one or two days at a site) disturbance activities associated with action alternatives that will temporary displace individuals or their prey are:

- Treating activity-created fuels on approximately 600 of the thinned acres by underburning, machine piling, and hand pile and burning.
- Building new landings for helicopter logging.
- In Alternative Two, 2.2 miles of temporary roads would be created then obliterated after use. In Alternative Three, 0.2 miles of temporary roads would be created then obliterated after use.
- Road work includes replacement of twenty-six 18-inch ditch relief culverts and eleven stream crossing culverts. Road grading and ditch line maintenance would occur on 38 miles of existing road.
- Utilizing the existing Silverstairs rock pit as the rock source for the roadwork.
- Implementing numerous similar and connected actions such as tree planting in the larger canopy gaps, precommercial thinning, road inactivation, rehabilitation

of compacted soil, snag creation, invasive weed management, replacement of the Harvey Creek culvert and modification of the pump chance to provide fish passage.

The number of individuals or species potentially affected by proposed activities is unknown and is considered unquantifiable without reliable survey data and a known/restricted activity implementation plan. The proposed activities from this project are not expected to affect this group of species such that their ability to persist in the vicinity of the project area or throughout their ranges would be compromised.

Cumulative Effects

Given the broad geographic range of some of these landbird species, it is difficult to determine the cumulative impact this and other projects would have on them. The foreseeable future activity in Layng Creek subwatershed that would impact landbird habitat on federal land similar to this project in scale and impacts is the Holland/Moonsalt Timber Sale. Forest management on private industry lands would continue to provide habitat for younger forest species and grass/forbs/shrub species. The action alternatives provide direct and indirect effects that are consistent with landbird conservation management strategies and would improve habitat conditions. Therefore there are no cumulative effects.

MANAGEMENT INDICATOR SPECIES

The Umpqua National Forest Land and Resource Management Plan (LRMP) (USDA, Forest Service 1990) has identified a number of terrestrial wildlife species with habitat needs that are representative of other wildlife species with similar habitat requirements for survival and reproduction. The LRMP identified the following species/groups as management indicator species (MIS) for various forest habitats: northern spotted owl, bald eagle, peregrine falcon, Roosevelt elk, black-tailed deer, pine marten, pileated woodpecker and primary cavity excavators. The northern spotted owl, pine marten, and pileated woodpecker represent mature and old growth conifer habitats. Primary cavity excavators represent the dead and defective tree habitat. Big game winter range is represented by Roosevelt elk and the black-tailed deer. The bald eagle and peregrine falcon are sensitive species that require special management; however, they are not present in the planning area and this project does not impact their habitat. Therefore, they are not discussed further. Effects to northern spotted owls are discussed under the Biological Evaluation of Wildlife Species section and are not repeated here. The planning area is located in the lower elevations of the forest and generally has a north aspect. Pine marten occur in the higher elevations and true-fir, mountain hemlock and lodgepole pine forest types and big game winter range occur on southerly aspects; therefore, because their habitat is not affected by this project, the pine marten and Roosevelt elk and the black-tailed deer are not discussed further.

PRIMARY CAVITY EXCAVATORS

Primary cavity excavators are defined as bird species that actually construct, forage, or create nesting cavities in snags and large trees.

Relevant Standards and Guidelines

Several Forest Plan standards and guidelines apply to primary cavity excavators and snag habitat. Most of the relevant ones that apply to this project have already been listed under the Coarse Woody Debris section. An additional standard and guideline required the Forest to manage for a 60% potential population capacity (PPC), which

provides an indicator of the number of cavity-nesting species likely to be present on the Forest in comparison to the Forest's total potential (USDA, Forest Service 1990).

Watershed Analysis Recommendations

Refer to the Coarse Woody Debris section for relevant watershed analysis recommendations.

Existing Conditions

Habitat for primary cavity excavators such as woodpeckers and sapsuckers consists of dead or defective trees (snags) of the proper size and in adequate numbers to support breeding birds. It was believed that these birds would survive on the Forest if at least 20 percent of the potential habitat is retained and well distributed across the Forest (USDA Umpqua NF 1990). The Oregon Department of Fish and Wildlife criterion for forest planning suggested a 60 percent level for snag habitat. More recent information suggests higher levels are needed (Mellen et al. 2005). The primary cavity excavators found in the planning area and surrounding forest are listed in Table 22 along with monitoring trends from local and regional breeding bird surveys (Sauer et al. 2006).

Table 22. Primary cavity excavators and population trend data.

Primary Cavity Excavators	PPC[5] S&G	Population Trends (1992-2006)		
		Winberry[3]	Warner Mtn[4]	Cascades
Red-breasted Sapsucker	**.27**	**Decreasing**	**Increasing[1]**	**Stable[2]**
Hairy Woodpecker	**1.15**	**Increasing**	**Decreasing**	**Stable[2]**
Northern Flicker	**.29**	**Increasing**	**Decreasing**	**Stable[2]**
Pileated Woodpecker	**.04**	**Increasing**	**Decreasing**	**Increasing[1]**

[1]Statistically significant ($p<0.05$)
[2]Stable is considered a <2% change per year
[3]This 26 mile breeding bird survey route is located about 12 miles north of the planning area.
[4]This 24 mile breeding bird survey route is located about 14 miles southeast of the planning area.
[5] The PPC column is for reference purposes, and shows the number of snags/acre required to meet Umpqua LRMP standard and guidelines.

Direct and Indirect Effects

The direct and indirect effects to primary cavity nesters were analyzed at the planning area scale. The actions that have the largest direct effect on primary excavators would be thinning and snag creation. There is no expected negative effect to potential nesting habitat from other proposed connected actions. The indirect effects are the long-term changes in future snag recruitment caused by both thinning and inoculations. These indirect effects would occur over the next 100 years as the stands develop into older forests.

Alternative One would maintain snag levels in smaller diameters and at higher densities (Figure 15). Larger diameter snags would develop more slowly, and would not reach appropriate levels for another 40 years (Figure 16). The action alternatives would cause a slight decrease (estimated one to five per acre) in small diameter snags through timber harvesting impacts. Timber harvesting and fuels treatments would also damage some

remaining trees, creating some new snags (estimated at three snags per acre). Snag models estimate that small snag levels (Figure 15) would remain above the 30% tolerance levels as recommended in DecAID. Large snags would develop more slowly than the no action alternative and would not reach levels recommended by DecAID (4.7 snags/acre, 30% tolerance level) for an additional 20 years without mitigation. Inoculation of a native heart rot fungus (Phellinus pini or Fomitopsis spp.) at rate of two trees per acre would help accelerate this process.

Inoculated trees should begin to provide cavity habitat within 30 to 40 years after inoculation. The mitigation of two inoculated trees per acre was incorporated in the action alternatives (graphed line between 30 and 40 years, Figure 16). These inoculated green trees may not be true snags (dead trees) but should provide some of the same functions as cavities and foraging habitat for many associated snag dependent species. These changes in snag levels, with mitigation, would have very little negative effects on primary cavity excavators because they maintain adequate numbers of snags in the short and long term.

There may be indirect benefits for red-breasted sapsuckers and hairy woodpeckers associated with commercial thinning. Hagar et al. (2004) recorded increases in population density of red-breasted sapsuckers and hairy woodpeckers within heavily thinned units on the Willamette National Forest. Hayes et al. (2003) noted a three-fold increase in hairy woodpeckers within five years following similar commercial thinning treatments in the Coast Range of Oregon. The reasons for these increases may be related to the attraction of these species to trees damaged during thinning (Hagar et al. 2004). Bate (1995) found both species mostly using >18” dbh hard snags, with populations declined in densely stocked conifer stands with smaller (<10” dbh) trees.

The creation of gaps would also benefit the northern flicker because this bird primarily feeds on the ground in open areas and forest edges (Elchuk and Wiebe 2003).

Pileated woodpeckers are the largest woodpecker (17 inches) in the Pacific Northwest (Sibley 2000) and prefer mature to old growth stands (>70 years) (Bull and Meslow 1977). Across their range, pileated woodpeckers use a variety of tree species for foraging and nesting. On the west side of the Cascades, they prefer large diameter (>20”) conifers. The pileated woodpecker would have an indirect beneficial effect from the thinning and tree inoculation because these actions would change the rate of large snag recruitment over time (Figure 16). The thinning prescriptions combined with tree inoculation in the action alternatives would achieve desired late-successional forest structure more quickly than the no action alternative (refer to Forest Vegetation section).

Direct Effects from Disturbance

Some proposed activities would likely occur during the breeding season for these species. Direct effects from logging activity and other connected actions on cavity nesting birds may cause some localized disruption of nesting for one or more breeding seasons. Disturbance associated with the action alternatives are expected to be short term (one or two days at a site) and localized. Disturbance would only occur if there is suitable nesting habitat (cavities) in close proximity of activities associated with action alternatives (see list of connected actions in Chapter Two). The number of individuals or species potentially affected by the proposed activities is unknown and is considered unquantifiable without reliable survey data and a known/restricted activity implementation plan. Disturbance from proposed activities related to this project are not

likely to affect this group of species such that their ability to persist in the vicinity of the project area or throughout their ranges would be compromised.

Cumulative Effects

Currently the Oregon Natural Heritage Program (ONHP), The Nature Conservancy (TNC), and the Oregon Department of Fish and Wildlife (ODFW) show the status of the pileated woodpecker to be secure, which suggests that the changing trend in timber management (that has occurred within the past decade and projected for the future) may positively influence occupancy of suitable habitat by this species as previously harvested stands redevelop, and more emphasis is placed on retention of key structural components in unharvested stands (USDA 1985, USDA 1994).

The local and regional cumulative population trend data for other primary cavity excavators do not indicate a major problem with those populations. The planning area is roughly located between the Winberry and Warner Mountain Breeding Bird Surveys (BBS) routes; decreasing trends in one area is offset by increasing trends (Sauer, et al. 2006) in the other, suggesting stable populations in this area. The only "statistically significant" documented (Sauer, et al. 2006) trends are local increases for red-breasted sapsuckers and regional increases for pileated woodpeckers (Table 24**)**.

The trend in clearcut harvesting on federal forest lands that caused the concerns for decreasing populations of primary cavity excavators has largely been halted (or at least dramatically decreased) by the NWFP. Now, about 50% of the federal forests in this area are in a reserved land allocation. The primary type of timber harvesting occurring on the Umpqua National Forest and surrounding federal lands is commercial thinning, with mitigations for snag recruitment. The action alternatives would help to offset the past effects of timber harvesting and fire exclusion in this area by accelerating forest succession. Activities proposed by this project include measures that maintain and protect habitat components important to the group of cavity excavators listed as Management Indicator Species (MIS). Implementation of project activities, when combined with future timber harvests, would result in no additional cumulative effect on these species such that their ability to persist within the project area or throughout their ranges would be compromised. Given the current standards and guidelines and management approach to timber harvesting in this area, populations of primary cavity excavators are expected to stabilize and increase in the foreseeable future.

RARE AND UNCOMMON WILDLIFE SPECIES/HABITAT

The great gray owl and red tree vole are Rare and Uncommon wildlife species whose known or suspected range includes the Cottage Grove Ranger District, according to the following documents: Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0, January 12, 2004, Survey Protocol for the Red Tree Vole v2.1, October 2002.

Relevant Standards and Guidelines

To provide habitat for viable populations of all existing native and desired non-native vertebrate wildlife species and to maintain or enhance the overall quality of wildlife habitat across the Forest.

Watershed Analysis Recommendations

There are no specific recommendations for Rare and Uncommon species. However both species are dependent on large trees and snags within patches of late-seral habitat. The recommendation from Layng Creek Watershed Analysis, under Vegetation and Wildlife Habitat, "mitigate the effects of fragmentation and loss of late-seral vegetation" (page 126) would apply to these species.

GREAT GRAY OWL

Nesting habitat for great gray owls are characterized as mature stands of timber with more than 60 percent canopy closure (Bull and Henjum 1990). Nesting suitable habitat includes large diameter nest trees, forest for roosting cover, and proximity [within 200m] to openings that could be used as foraging areas (Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0, January 12, 2004). Bull and Henjum (1990) recorded an average nest snag diameter of 31" DBH.

Initially thought (in 1993) to be restricted to elevations above 4,000 feet, they are now found in western Oregon as low as 500 feet. They prey primarily on voles and pocket gophers that inhabit meadows or other grass/forbs openings. The nearest known site is located about four miles north of the planning area near the summit of Mount June (4,600 ft. elevation).

The proposed harvest units are young plantations that are approximately 50 years old and have no remaining suitable nesting habitat structure (large trees/snags) that meets the definition of habitat nor are they in close proximity to suitable foraging habitat.

Direct and Indirect Effects

No surveys were conducted for the great gray owls for this project because proposed activities associated with the action alternatives would not have negative impact on the species' habitat, its life cycle, microclimate, or life support requirements. Because the proposed thinning project or other connected actions associated with the action alternatives would not affect large trees, snags, or mature forests that are near suitable meadow habitat, there would not be a negative effect on the owl's nesting habitat. Further, there would be no impacts to meadow habitats; therefore, there would not be negative impacts to foraging habitat.

Cumulative Effects

Because there are no direct or indirect effects, there are no cumulative effects to the great gray owl associated with the project.

RED TREE VOLE

The Oregon red tree vole is endemic to moist coniferous forests of western Oregon and extreme northwest California. Its known and suspected range extends from the Columbia River south through western Oregon and from the Siskiyou Mountains south to the Salmon and Klamath Rivers in northern California. Active nests have been found in remnant older trees in younger stands, indicating the importance of legacy structural characteristics (Biswell et al. 2002).

The proposed harvest units are previously clearcut plantations; they do not meet the definition of mature/old growth forest, nor do they contain remnant older trees.

Direct and Indirect Effects

The no action alternative would have no direct impact on the red tree vole because no trees would be cut.

The action alternatives would fall small diameter trees within these approximately 50 year-old plantations. They do not meet the definition of mature/old growth forest, nor do they contain remnant older trees that would trigger survey protocols.

Thinning plantations would provide indirect benefits to this species by accelerating the development of future habitat (as described in the forest vegetation section) and by improving crown development of leave trees within the stands.

There are no direct or indirect effects associated with connected actions because no mature/old growth or older trees are expected to be impacted.

Cumulative Effects

The cumulative impacts to red tree voles are analyzed at the Layng Creek subwatershed scale. The past clearcutting of 24,646 acres of habitat had the largest impact to this species. Based on local surveys, red tree voles occur in this and surrounding watersheds. Known populations are being protected from habitat disturbance. They have also been documented to use older clearcut plantations within the watershed.

The action alternatives would cumulatively add to the 4,765 acres of past commercial thinning within the subwatershed that have caused similar indirect impacts as described above. This and ongoing and future commercial thinning would accelerate the development of future habitat and reduce the risk of future loss of habitat to wildfire by making the stands more fire resilient. Future clearcut harvesting on private land (est. 200-600 acres per year) would not impact habitat because most of this harvest is occurring in second-growth plantations as well. There is no clearcutting of large trees expected to occur on Forest Service lands in the foreseeable future. Considering the minor indirect effects of the action alternatives, no cumulative impacts are expected to occur.

BIOLOGICAL EVALUATION OF WILDLIFE SPECIES

Regional Foresters are responsible for identifying and maintaining a list of sensitive species occurring within their Region. This list includes species for which there is a documented concern for viability in one or more administrative units within the species' historic range (FSM 2670.22, WO Amendment 2600-95-7). These species may require special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing.

The Forest Service Manual (FSM 2672.4) requires a biological evaluation to determine potential effects of proposed ground-disturbing activities on sensitive species. This evaluation analyzes the action alternatives and their associated connected actions (Chapter 2) and potential effects on species population or their habitat. It makes recommendations for removing, avoiding, or compensating for adverse effects. It must include: (1) sensitive species that may be present; (2) identification of occupied and unoccupied habitat; (3) an analysis of the effects of proposed actions on species or their habitat; (4) a discussion of cumulative effects; (5) a determination of no effect, beneficial effect, or may affect; and, (6) recommendations for avoiding or mitigating any adverse effects if needed.

A pre-field review was performed to determine which sensitive species are most likely to

be impacted by the proposed alternatives. Table 23 lists Region 6 sensitive wildlife species relevant to the Doris Planning Area, summarizes the presence or absence and potential impacts on these species or their habitat within or adjacent to the proposed actions associated with this EA.

This review is based on the latest documented survey and occurrence data, field reconnaissance, scientific literature review and GIS analysis. Impact or effect determinations are made for each species based on this review. If a substantial, measurable impact or effect is anticipated, further analysis and discussion of the direct, indirect and cumulative effects is provided in the following sections.

Table 23. Region 6 Sensitive Wildlife Species[36]

Sensitive Species	Is species or habitat in or adjacent to actions associated with action alternatives?	Is there a conflict with implementation of the project to species or habitat?	Will the project impact individual or result in loss of viablity or trend?
Northern Spotted Owl *Strix occidentalis caurina*	**Suitable nesting habitat adjacent and dispersal habitat within the project**	**Yes; see discussion.**	**Impact to individuals and habitat; NLAA[37] - Consultation with USFWS required.**
Northern Bald Eagle *Haliaeetus leucocephalus*	**No suitable habitat within or adjacent to potential actions**	**No**	**The actions would result in no effect to this species**
Harlequin Duck *Histrionicus histrionicus*	**Suitable habitat within perennial stream adjacent and within actions associated with the action alternatives**	**Presence assumed; no conflict to species or habitat with no cut protection buffers adjacent to streams and timing restriction**	**The project would result in no impact to species viablity**
Peregrine Falcon *Falcon peregrinus anatum*	**No suitable habitat within or adjacent to project**	**No**	**The project would result in no impact to species viablity**
Black Swift *Cypseloides niger*	**No suitable habitat within or adjacent to project**	**No**	**The project would result in no impact to species viablity**
Pacific Shrew *Sorex pacificus cascadensis*	**Suitable habitat adjacent to perennial stream/wet areas and within the project**	**Presence assumed; conflict to species and habitat**	**Project may result in death or injury to individuals but would not result in viabilty concerns**
Fisher *Martes pennanti*	**Suitable habitat in old growth stands adjacent to the project**	**No**	**The project would result in no impact to species viablity**
Pacific Fringe-tailed Bat *Myotis thysanodes vespertinu*	**Suitable habitat within and adjacent to project**	**Presence assumed; conflict to species and habitat**	**Project may result in death or injury to individuals but would not result in viabilty concerns**
Southern torrent salamander *Rhyacotriton variegatus*	**Suitable habitat within and adjacent to perennial stream/wet areas adjacent and within the project**	**Presence assumed; conflict to species and habitat**	**Project may result in death or injury to individuals but would not result in viabilty concerns**

36 Region 6 Sensitive Wildlife Species relevant to the Doris Planning Area; summarizes the presence or absence and potential impacts on these species and their habitat.

37 Not Likely to Adversely Affect

Foothill Yellow-legged Frog ***Rana boylii***	**No suitable habitat within or adjacent to project**	**No**	**The project would result in no impact to species viablity**
Northwestern Pond Turtle ***Clemmys marmorata marmorata***	**No suitable habitat within or adjacent to project**	**No**	**The project would result in no impact to species viablity**
Crater Lake Tightcoil ***Pristiloma arcticum crateris***	**Suitable habitat within and adjacent to project**	**Presence assumed; no conflict to species with protection buffers adjacent to perennial wet areas**	**The project would result in no impact to species viablity**

SOUTHERN TORRENT SALAMANDER

This species occurs in small, cold (usually 46º-55ºF), and clear, coniferous forest streams, springs and seeps with gravel-dominated substrates and low sedimentation (Nussbaum et al. 1983, Good and Wake 1992, Leonard et al. 1993). The upper elevation range on the Umpqua National Forest appears to be around 3,550 feet (local survey data). Usually, this salamander is not found more than a few meters away from streams (Nussbaum et al. 1983). However, observations of adults have occurred up to 165 feet from water (Good and Wake 1992, Vesely 1997). The southern torrent salamander is still present throughout its historic range, most of which has undergone large-scale road construction, timber harvesting and localized extirpations, and reductions in abundance are believed to have occurred (USDI, USFWS, Federal Register, 29 June 1995; USDI 2000).

No southern torrent salamanders were found during field reconnaissance. Other species of salamanders were found, however (e.g., Pacific giant and clouded). The nearest known torrent salamander sites are located about three miles to the southeast in the Brice Creek subwatershed and eight miles to the north in the Lookout Point Reservoir subwatershed, which is one of the northernmost watersheds in the salamander's range in the Cascades. Currently, there are no known sites within Layng Creek subwatershed, but they likely occur within it, primarily in unmanaged, late-successional forest streams.

Direct and Indirect Effects

Alternative One would have no effect on the species, as no ground disturbing activities would occur.

The direct and indirect effects are analyzed at the stand scale. Harvest operation could occur all year long, therefore injury or death may occur to torrent salamanders that are dispersing or foraging outside of the 50 foot riparian buffer during wetter months. As stated previously, this salamander is associated with the aquatic environment and is usually not found more than a few meters (approx. 10 ft.) away from streams, though adults have been observed up to 165 feet from streams. The associated stream channels provide less than ideal habitat though; because of past impacts from logging the likelihood of their presence within the adjacent harvest stands is low.

Other connected actions associated with the action alternatives that may affect this species are the replacement of eleven stream crossing culverts and the replacement of the Harvey Creek pump chance with a fish passage culvert. No torrent salamanders were observed at these crossings. However, salamanders may disperse up and down the stream channel over time and may be on site during culvert replacement; injury or death may occur at such time. The replacement of culverts would result in short term

adverse impacts to stream turbidity, but with Best Management Practices being applied (see Ch. 2) the impacts to quality of habitat are expected to be minimal and would reduce the risk of increased sediment delivery from culvert failure. Indirect beneficial effect would occur with the replacement of Harvey Creek culvert and the modification of the pump chance by providing better stream connectivity for this species. The impacts to this species are expected to be minor.

Cumulative Effects

The cumulative impacts to the southern torrent salamanders are analyzed at the Layng Creek subwatershed scale. Past harvesting of perennial stream shade occurred up until about the mid 1980's in the subwatershed (Table 6). This loss of stream shade contributed to elevated stream temperatures in the planning area until it recovered. The action alternatives would protect the effective shade along perennial streams/wet areas to avoid stream temperature increases and turbidity effects. With Best Management Practices being applied to avoid sediment delivery to stream channels this project, when combined with past, present and future projects, would not contribute to additional measurable cumulative impacts to southern torrent salamanders or their habitat.

Determination of Impact

Considering the information above concerning potential direct, indirect and cumulative impacts, it is determined that the action alternatives "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species" because of the low likelihood that this species is present in the adjacent stream channels. The no action alternative would not impact on this species.

NORTHERN SPOTTED OWL (NSO)

Nesting, roosting, and foraging habitat (NRF) for the spotted owl is strongly associated with late-successional forests containing large conifers with broken tops or cavities for nesting, multiple canopy layers for thermal regulation, protection from predation, and adequate amounts of large down wood and snags to support populations of prey (Thomas et al. 1990). For this analysis, NRF habitat is defined as mature understory reinitiation and transitional old growth forests identified using the current vegetation map.

Large contiguous blocks of NRF habitat are believed to be necessary for nesting success and survival. In the western Cascades, a 1.2-mile radius circle around an owl activity center is often used to represent the owl's home range and 40% NRF within this circle (1,182 acres) was once considered the minimum acceptable amount of habitat for long-term owl survival. There are eight historic owl activity centers within or adjacent to the planning area.

Foraging and dispersal habitats may be in younger, more open and fragmented forests than those associated with nesting and roosting (USDI, 1992a). NSO feed primarily on small mammals, especially northern flying squirrels and wood rats in southwestern Oregon (citations in Anthony et al., 2006). Dispersal habitat for spotted owls satisfies needs for foraging, roosting and protection from predators and is characterized by forests that have a minimum average tree diameter of 11 inches and greater than 40% canopy cover. Maintenance of dispersal habitat on a minimum of 50% of federal lands within a given area (e.g. quarter-township) is a conventional threshold for adequate owl dispersal conditions. The proposed harvest units are considered dispersal habitat.

Areas critical to the recovery of the spotted owl called critical habitat units (CHUs) were designated under the Endangered Species Act by the US Fish and Wildlife Service in January 15, 1992 (USDI, 1992a). There are no designated critical habitat units within the planning area.

Direct and Indirect Effects to Habitat

The direct and indirect effects are analyzed at the stand and planning area scales. Dense, closed-canopy second-growth forest without structural legacies (large trees and snags) is poor habitat for owl prey species (Carey 1995, Carey and Johnson 1995, Carey and Harrington 2001). It is also poorly suited for owl roosting, foraging, or nesting (Carey and Biswell. 1992). This period of low structural diversity can last >100 years (Carey et al. 1999, Franklin et al. 2002) and can have profound effects on the capacity of the forest to develop biodiversity in the future (Halpern et al. 1999, Carey 2003). Although there is currently no positive proof that thinning has accelerated the development of spotted owl habitat, variable-density thinning holds some promise (Carey 2003). Additionally, foraging success for spotted owls may be optimal in stands with a mix of canopy gaps and patchy ground cover (Irwin et al. 2000).

The action alternatives propose to variable-density thin 1,000 acres of homogenous, even-age stands of Douglas-fir. The proposed thinning would restore variable density in stands that are now generally homogeneous in structure and composition. Thinning and gap creation combined would accelerate the development of stand attributes that distinguish mature and late-seral vegetation by sustaining dominant tree growth. Thinning and gap creation also would invigorate the growth of the shrub layer and stimulate the growth of advanced understory trees (Tappeiner, 1997), and affect changes in species composition that would provide habitat for a variety of plant and animal species (Muir et al, 2002). The proposed silvicultural treatment is expected to accelerate the development of NRF habitat within the units within a few decades. Consequently, the action alternatives would have an indirect beneficial effect to the spotted owl and their habitat in the long-term.

The proposed thinning and fuel treatments would decrease the average canopy closure from about 65% to approximately 42 to 50% with the average stand tree diameter remaining above eleven inches dbh. The proposed thinned stands would still function as dispersal habitat after treatment.

Some minor changes in prey availability are likely because implementation of the action alternatives would disturb prey habitat and cause animals to move around in the understory. Over the long term there is not expected to be a measurable adverse effect to the spotted owl's prey base.

There will be no direct effects to NRF habitat from the proposed harvest activities or connected actions associated with the action alternatives. There is no expected impact to large mature trees or snag habitat within NRF habitat.

Direct and Indirect Effects from Disturbance

It is expected that some disturbance activities would occur during the March 1 through September 30 NSO breeding season. Activities occurring after the critical breeding period (March 1 through July 15) may disturb NSO but are not likely to disrupt NSO reproductive success. To reduce these effects, tree falling and yarding activities would be restricted to occur outside of the critical egg laying and incubation period (March 1 to

July 15) in areas within close proximity to NRF habitat that have a moderate to high potential for nesting activity. Timber harvest units (or portions of units) that are within close proximity to stands that have potential for nesting would have seasonal restrictions. Therefore, the likelihood of a disturbance resulting in any meaningful consequence to spotted owls is minimal. Units that would have a seasonal restriction from March 1 to July 15 are:

Common units for both action alternatives

- Unit 5, skyline portion west of 1746-707 and 1746-847 road
- Unit 9, skyline portion east of road 1746-707 road
- Unit 20, skyline portion east of 1746 road and north of 478 road, western tip of the unit
- Unit 21
- Unit 22, skyline portion south of 1746 road
- Unit 26, skyline portion east of 1746-760 road
- Unit 33, helicopter portion
- Unit 34, helicopter portion and the skyline and ground skid portion north of 531 and 207 road. Additionally no road construction or obliteration.
- Unit 35, Skyline and ground skid portion, south of existing temporary road. Additionally no road construction or obliteration.

Alternative 3

- Unit 32, helicopter portion
- Unit 35, helicopter portion

Prescribed fire would be used to underburn/jackpot burn about 237 acres and pile burn approximately 360 acres in the proposed project. These areas would be burned over a period of days in the Doris planning area; there are eight historic owl activity centers within or adjacent to the planning area. There is also unsurveyed suitable habitat immediately adjacent to these areas. It is not practical or desirable to place a March 1 to July 15 seasonal restriction on underburning. It is rarely dry enough to meet burn objectives in the winter (before March 1), and the risk of tree mortality and soil damage in the residual stand is high in the summer and fall (after July 15). Smoke associated with the proposed slash burning represents a potential disturbance effect to the species.

Other connected actions associated with the action alternatives are analyzed under the current “Programmatic Biological Assessment for Activities with the Potential to Disturb Northern Spotted Owls and /or Bald Eagles in the Umpqua National Forest FY 2004-2008.”

Cumulative Effects

The cumulative impacts to spotted owls are analyzed at the Layng Creek subwatershed scale. Past clearcutting of habitat (24,646 acres of Forest Service, BLM and private land) has had the largest cumulative impact to this species by removing NRF habitat. Future clearcut harvesting on private land (est. 200-600 acres per year) would not impact NRF habitat because this harvest would be occurring in second-growth plantations. Clearcutting of NRF is not expected to occur on Forest Service lands in the foreseeable future. The current trend for NRF habitat within the subwatershed is stable to increasing.

The action alternatives would add to the 4,765 acres of past commercial thinning within the subwatershed that have caused similar impacts as described above. This and future commercial thinning would accelerate the development of future habitat (a beneficial

cumulative effect) and reduce the risk of future loss of habitat to wildfire by making the stands more fire resilient.

Effects Determination

After consideration of the direct, indirect and cumulative impacts it is determined that the disturbance related activities of the action alternatives "may affect, but are not likely to adversely affect" the spotted owl, its habitat (dispersal, NRF) and associated prey species. The action alternatives would have a beneficial, indirect effect of accelerating the development of future NRF habitat and making the area more resilient to wildfire.

PACIFIC SHREW

One of the largest shrews in the area, the Pacific shrew, is found in humid forests, marshes, and thickets and though it is considered a riparian species (Gomez and Anthony 1998), it has been found as far as 70 feet away from stream banks (Anthony et al. 1987). It is more commonly found in early-successional forests than in stem-exclusion stands. The nearest documented occurrence of this species is approximately three miles to the north of the planning area. This species is believed to be well-distributed throughout the Forest. Because surveys result in a high rate of mortality to this species, no surveys were conducted. It is assumed that this species occurs within the planning area.

Direct and Indirect Effects

The action alternatives would not thin within 50–60 feet of the perennial stream banks. The outer 10-20 feet of the 70-foot range of the shrew would be thinned. Minimal direct impacts may occur to some individuals from logging and fuels reduction treatments (such as burning). Mechanical impacts from logging could also potentially impact down wood that this species uses. The mobility of this species would allow it to move to other areas with dead wood in the riparian corridors. Thinning would result in an increase in understory vegetation, followed by an increase in insects associated with this vegetation (Muir et al. 2002). This would improve the prey base for this species. Other connected actions associated with the action alternatives would have no measurable direct or indirect effects to this species. The no action alternative would have no direct impacts, as no ground disturbing activity would occur.

Cumulative Effects

This species seems to be adapted to stand disturbance because it is found more often in early-successional riparian forests than in older forests. The action alternatives would not have a major impact on this species or its habitat because of riparian buffers. The action alternatives would add to the 4,765 acres of past commercial thinning within the subwatershed. However, because of the shrew's mobility and the application of no harvest buffers along suitable streams habitat, no measurable cumulative impacts are expected to occur.

Impacts Determination

In considering the direct, indirect and cumulative impacts it is determined that the action alternatives "may impact individuals or habitat but are not likely to contribute to a trend toward federal listing or loss of viability of the species" because of the minor potential of disturbing this species during project activities. The no action alternative would not result in any impact to this species.

PACIFIC FRINGED MYOTIS

This bat is usually described as cave-dwelling (Verts and Carraway 1998, Cristy and West 1993). However, fringed myotis are known to roost in rock crevices, bridges, buildings, large trees and snags (Cross et al. 1996, Weller and Zabel 2001).

Weller and Zabel (2001) documented that habitat use by this species is influenced by the availability of large (>12 inch dbh), tall snags for roosting. Preliminary data from a recent study in the central western Oregon Cascades (Arnett and Hayes 2002) suggests a similar response by *Myotis* spp. and also a numerical response related to snag and roost tree availability. There are documented occurrences of Pacific fringed myotis within the Layng Creek subwatershed.

Direct and Indirect Effects

Harvest activities and other associated connected actions (refer to Chapter Two, Connected and Similar Actions) in the action alternatives would cause disturbance to bats if they were roosting in or adjacent to the stands. Felling of trees or snags during logging, road construction and burning operations may cause injury or death to roosting bats. However, the trees/snags proposed to be felled generally do not meet the description of typical roost trees. Most roost sites are described as large snags or trees with thick or loose bark or that provide cavities and have good solar exposure. The proposed thinning of plantations lack large snags and trees; there have been none identified as hazards, or to be used as guyline trees. The expected impact to bats should not be substantial. Although smaller snags would afford protection during harvest activities, road construction and during burning operations, it is likely that some may have to be felled for safety reasons, or may fall accidentally from logging activities. The no action alternative would have no direct impacts.

Although thinning young-growth stands has been shown to not change moth (a forage species) abundance substantially (Muir et al. 2002), hardwood shrub densities were higher in thinned than in unthinned young-growth stands, and these hardwoods (e.g., chinquapin and oceanspray) are important food sources for moths. Muir et al. (2002) recommend maintaining a variety of stand types and densities across the landscape to promote a diversity of plant species and associated fauna. All action alternatives meet this recommendation. Based on the available data, the action alternatives and associated connected actions would not have a major negative effect on the bat or its prey species.

Cumulative Effects

Cumulative effects are similar to those discussed in the coarse woody debris discussion. The scale of analysis is the Layng Creek subwatershed. The thinning (action) alternatives would accelerate development of large trees and future snags. Snag densities are expected to increase given current management on public forests. Levels of roosting habitat would remain limited on industrial forestlands. No action would prolong the time it takes to develop large trees and the closed canopies, which may limit bat utilization of habitat. Because there are no direct or indirect effects, there are no cumulative effects to the Pacific Fringes Myotis associated with the project.

Impacts Determination
In considering the direct, indirect and cumulative impacts of the proposed action, it is determined that the action alternatives "may impact individuals or habitat but is not likely to contribute to a trend toward federal listing or loss of viability of the species" because of the low likelihood that this species is present within the stand being proposed for thinning and that no large trees or snags are being proposed to be felled.

BOTANY

UNIQUE HABITATS

Unique habitats, also referred to as "special habitats", are small, highly localized plant communities that make up less than five percent of the Layng Creek Subwatershed (Layng Creek WA, 1995), and that are distinctive from surrounding coniferous forest. Examples include hardwood inclusions, forested wetlands associated with springs and seeps, dry to wet meadows, rocky balds, cliffs and rock outcrops. These sites are occupied by a wide variety of vascular plants, mosses, and lichens, and provide habitat for a range of wildlife species. Approximately 85% of the plant species diversity of the Western Cascades is found in these habitats (Hickman 1976), which make up approximately six percent of the Cottage Grove Ranger District land area. Management activities in unique habitats are guided by the Umpqua National Forest Plan as amended by the Northwest Forest Plan, and by policy and direction found in Forest Service Regulations.

Existing and Desired Conditions

There are approximately 66.3 acres of unique habitats mapped immediately adjacent to, or within the project units (Table 24). These areas range from 0.3 to 11.5 acres in size. Although some habitats are less than one acre in size, these areas are unique for this sale area and were mapped to protect the associated botany and wildlife resources. These areas were surveyed for rare species and noxious weeds during the spring and summer of 2007.

Mesic or moist meadows are generally herbaceous meadows of mixes of forbs, grasses, and sedges; however, these meadows may be dominated by shrubs as well. The soil is generally saturated or moist throughout most of the year. These meadows are often part of a larger landscape of meadow/conifer mosaic.

The desired condition is to keep the number and amount of unique habitats at their current levels or on an increasing trend for the future, and to keep unique habitats free of new invasive species as a means to maintaining their biodiversity. The specific desired condition for the wetlands and wet meadows is the maintenance of water tables so that the areas continue to function, in keeping with Objective #7 of the Aquatic Conservation Strategy.

Table 24. Unique Habitat Types and Estimated Acres

Unique Habitat	Unit Location	Acres
Hardwood Inclusions	4,12,14,19,20,25,35	20.6
Mesic to Moist Meadows-Forbs and Shrubs	1,4,5,15,17,18,20,22,25,28,30,32,34	20.5
Rocky Land, Outcrops, and Cliffs	1,3,6,19,26,30,33,34	14.0
Moist and Wet Forblands	1,34	4.4
Moist and Wet Shrublands	1,19,25,28	6.4
Wetlands	6	0.4
	Total	66.3

Direct and Indirect Effects

Direct effects in the context of Unique Habitats are those that would occur within the habitats or their immediate surroundings during and shortly following implementation. Indirect effects are those that could occur later in time or beyond the immediate area of today's existing unique habitats.

Alternative One would result in no short-term direct effects to unique habitats because no activities would occur in or near them. Without fire or other disturbance, natural succession in mesic openings (meadows and wetlands) is toward forest establishment and eventual canopy closure. Depending on many variables, a wildfire could improve or adversely affect meadow vegetation. Tree encroachment into existing meadows, given the proper microclimatic conditions, could be slowed or halted by a wildfire.

In contrast, wildfire would create vast areas of suitable habitat for invasive non-native plants. Presently, invasive non-native plants (including noxious weeds) are found along the roadsides throughout the planning area, and risk of spread to burned areas is high due to the seed dispersal capabilities of the weeds. These non-natives often out-compete and replace native plants, resulting in declines of wildlife habitat and reduction of biodiversity. Wildfires also consume the fragile cryptogrammic crust that inhabits the soil surface and rock faces of many of these meadows. The cryptogrammic crust community is important for nutrient cycling, nitrogen fixation, moisture retention, and vascular plant establishment. Recovery of an intact crust after disturbance may take a long time (> 50 years) due to the slow growth of the cryptogam layer (Belknap, et al. 2001).

Potential impacts to unique habitats were carefully evaluated during the planning of the project, and design measures were developed to protect unique habitats from direct impacts in Alternatives Two and Three. Habitats would be buffered from physical disturbance in these alternatives (refer to Mitigation Measures in Chapter Two). The buffers are sufficient to protect the microclimate around the edges of the openings, minimize weed invasion, and minimize the risk of impacts from prescribed fire. Under a scenario of escaped prescribed fire in Units 1, 2, and 25, there is risk of direct impact to unique habitats if the fire is not contained within the prescribed burn areas.

Alternatives Two and Three would have a direct effect on the meadow unique habitats if a planned prescribed burn were to escape control. As mentioned above, depending on timing and intensity, a fire in these meadows could also benefit the systems by removing built-up thatch, destroying invasive plants and their seeds, and retard tree encroachment. Possible adverse effects associated with fire, from burning too intensely and/or at the wrong time, could result in an increase in invasive plants and a decrease in overall biodiversity (Harrod and Reichard 2001). Creating stands that are more resilient

to fire is likely to benefit some unique habitats, but may not hinder tree encroachment in meadows.

The existing water table levels in the wetlands would not be affected by the thinning since the wetlands would be buffered, and the partial harvest of trees is not expected to change ground water levels to any measurable degree. Therefore, the action alternatives would be consistent with objective #7 of the Aquatic Conservation Strategy, which calls for the maintenance of water table elevation in meadows and wetlands.

Cumulative Effects

The scope of analysis for cumulative effects to unique habitats are for the units listed in Table 24 because these are the only locations where the effects of the action alternatives could possibly overlap with and add to past effects (Table 6), potentially resulting in cumulative effects. There are no other on-going or planned future ground disturbing activities within the next five to ten years in these units (Tables 7 and 8).

Past logging (Table 6) through and adjacent to unique habitats likely prevented or reduced the encroachment of trees into meadows by removing all the trees in the stand, helping meadows retain their size. Damage associated with past logging and road building activities may have occurred to vegetation, wildlife habitat, and soils in some or all of the unique habitats in these drainages.

Past logging of potential encroachment trees has been countered by decades of fire suppression, which has in turn lead to gradual succession of meadow area to forest. Past management activities have also been a major factor in the introduction and spread of invasive plants into unique habitats.

With the implementation of mitigation measures and connected actions, the cumulative effects of the action alternatives are projected to be beneficial. This overall beneficial effect is associated with prevention of future spread of high priority noxious weeds into unique habitats.

Aquatic Conservation Strategy

As disclosed in this section, no impacts to the wetlands or wet meadows are expected from any of the proposed activities in the action alternatives including road work, thinning, burning, and yarding activities. As such, the water tables associated with project's wet areas would not be affected so wet areas would remain wet, consistent with ACS objective #7.

INVASIVE PLANTS/NOXIOUS WEEDS

Invasive plant species are alien plants whose introduction may or is likely to cause economic or environmental harm, or harm to human health (USDA, Forest Service 2005). Noxious weeds (Table 25) are plant species designated as such by the Secretary of Agriculture or by the responsible State official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, or being new or not common to the United States or parts thereof.

Weeds are introduced by a variety of agents, most notably highway and off-road vehicles, construction equipment, and wind. They can also be moved by water, animals, and humans. Most weeds take advantage of disturbed areas such as roadsides, trails,

logged units, burns, rock quarries, mined sites and areas around human structures. Established populations serve as seed sources for further dispersal, especially along roads, power lines, and trail corridors. Roads are considered the first point of entry for exotic species into a landscape, and serve as corridors along which plants move farther into the landscape.

The health of native plant communities throughout the Pacific Northwest is at risk by noxious weeds and other invasive plants. Once established, introduced plant species thrive in new ecosystems for various reasons including a lack of predators, adaptations for growing in diverse habitats, and allelopathic properties. As a result, weeds are capable of out-competing native plants, ultimately altering the structure and lowering the diversity of native plant communities. The frequency of fire can also be altered in ways that are detrimental to natural ecosystems (Harrod and Reichard 2001). Further, different soil organisms predominate under different kinds of vegetation. Replacement of native plant communities with weed species can alter the soil microbial populations and nutrient cycling processes.

Relevant Standards and Guidelines

National policy states that preventing the introduction and establishment of noxious weed infestations is a high priority for the agency. The USDA National Strategy for Invasive Species Management (USDA, Forest Service 2001) is predicated on prevention, early detection, rapid response, control and management, rehabilitation, and restoration.

Forest Service Region 6 issued a Record of Decision (ROD) in October 2005, for the Pacific Northwest Region Invasive Plant Program Final Environmental Impact Statement. The 2005 ROD added a set of standards to Forest Plans (USDA, Forest Service 2005). Several of the standards that are pertinent to this project are incorporated into the Botany Mitigation Measures in Chapter Two.

The Umpqua National Forest LRMP was amended in 2003 (USDA, Umpqua NF 2003) with the following relevant Standards and Guidelines:

- Integrated weed management prevention and treatment strategies would be used to treat noxious weeds within the constraints of laws, policies and regulations and to meet Forest Management objectives. Methods may include manual (mowing, clipping, grubbing), biological, heated steam, competitive seeding, competitive planting, solarization, prescribed fire, grazing, chemical, or other applicable methods designed to control and/or eradicate the noxious weed. Biological controls tested and sanctioned by the US Department of Agriculture would be allowed to occur. Manual control methods within disturbed sites, such as along roads, trailheads, landings and within administrative sites would be allowed at any time.
- Require all ground disturbing machinery to be washed prior to entering and leaving the Forest, using the appropriate timber sale contract provisions and construction contract requirements.
- Require the use of certified-weed-free seed for all revegetation projects.
- Revegetate disturbed sites as soon as practical using native species unless there is no immediate resource concern and the site is anticipated to revegetate naturally to native species at desired cover standards. Otherwise, non-invasive, non-native seed would be used.

Existing and Desired Conditions

The increase of noxious weed introductions on the Umpqua National Forest is directly related to expanding weed populations on nearby federal, state, and private lands. Populations of extremely aggressive species such as yellow star-thistle, rush skeleton weed, false brome, and spotted knapweed, have become roadside weeds on heavily traveled highways of the State of Oregon and along arterial roads in the Umpqua and Willamette National Forests. The greatest risk of human-caused noxious weed introduction into the project units is from seed-contaminated vehicles and equipment traveling through the planning area.

Surveys for invasive plants were conducted in all proposed thinning units concurrently with the sensitive species surveys. In addition, roadside weed infestations within the planning area were inventoried and mapped by district botanical staff in the summer of 2007.

The most serious weed infestations in the Doris planning area are diffuse knapweed (*Centaurea diffusa*), meadow knapweed (*Centaurea pratensis*), Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), and evergreen blackberry (*Rubus laciniatus*).

Diffuse knapweed is established along the side of road 1746 (northern boundary of Unit 9). This is a new invader to the District, although it occurs elsewhere on the Umpqua National Forest and on adjacent Bureau of Land Management (BLM) managed lands. Diffuse knapweed reproduces through prolific seed production. A single plant can produce up to 18,000 seeds. Seeds mature by mid- to late August. Seeds germinate in both early spring (primarily) and fall. In the fall, diffuse knapweed breaks off at ground level and disperses widely as tumbleweeds.

There is one small populations of meadow knapweed found along the 1746 road within the planning area. Meadow knapweed generally invades roadsides and other open disturbed sites. It is spread by vehicles and windblown seeds. Like diffuse knapweed, meadow knapweed prefers open areas and rapidly invades following disturbance.

Scotch broom is an established vigorous weedy shrub that is found along roadsides, landings, and in very young plantations. It is generally shaded out by a closed canopy. This weed is found in small populations scattered along main roads and at spur road junctions within the planning area. Seeds of Scotch broom can persist in the soil for many decades and would germinate if the soil is disturbed.

Himalayan and evergreen blackberries thrive in open areas and along roadsides. They can persist along the edges of a closed coniferous canopy, and readily invade riparian areas beneath a hardwood canopy. Both species are spread by birds and other animals that eat the berries, and both species spread by root tipping. Himalayan and evergreen blackberries are located along roadsides and riparian areas throughout the planning area.

The desired condition is prevention of new invader establishments and containment of weed spread with a subsequent reduction in established weed presence. Management of disturbed areas would restore the area to a more natural condition and help retain sensitive species habitat and other special native habitats, while preventing the invasion of noxious weeds. Implementation of this project would help achieve these conditions by using best management practices, minimizing disturbance where possible, and executing mitigation measures such as invasive weed removal and native species re-

vegetation.

Prevention means limiting, managing, or sometimes eliminating activities on National Forests so that invasive plants do not become established within uninfested areas, and so the potential for reproduction and spread of existing invasive plants is reduced. The primary goal of prevention is to keep uninfested land from becoming infested.

Weed Categories
The Umpqua National Forest has classified its noxious weeds into the following four categories. These classifications vary across the districts depending on distribution. Species that pertain to the Cottage Grove Ranger District are listed in Table 25.

A Species with limited abundance such that eradication or containment is feasible.
B Species locally abundant in places but still actively spreading on the Forest; the objective is to contain the infestations to within the core areas. Satellite infestations would be intensively managed. Biological controls and competitive planting would be used to maintain or reduce the size and extent of major populations.
C Species are nearly ubiquitous on the Forest. Biological controls and competitive planting would be used to maintain infestations as much as is feasible. Intensive treatments would only occur in conjunction with habitat restoration projects.
D Detection species; in the vicinity of, but not yet on, the Forest or have occurred in the past but currently appear to be eradicated. Any sites discovered would be subject to immediate eradication as feasible.
O Weeds classified as “Other” are inventoried and mapped as appropriate in conjunction with ongoing noxious weed inventory (this list is by no means a complete list of non-native species on and around the Forest). New invaders and infestations that are isolated and not yet well established are subject to intensive site management actions. Other infestations would only be managed in conjunction with habitat restoration projects.

Table 25. Cottage Grove Ranger District Noxious Weed List.

Common Name	Scientific Name	Cottage Grove
High-Priority Species		
False brome	*Brachypodium sylvaticum*	A
Diffuse knapweed	*Centaurea diffusa*	A
Meadow knapweed	*Centaurea x pratensis*	A
Scotch broom	*Cystisus scoparius*	A
Yellow toadflax	*Linaria vulgaris*	A
Japanese knotweed	*Polygonum cuspidatum*	A
Himalayan Blackberry	*Rubus armeniacus*	A
Lower Priority Species		
Canada thistle	*Cirsium arvense*	B
Ubiquitous Species on the Forest		
Bull thistle	*Cirsium vulgare*	C
St. Johnswort	*Hypericum perforatum*	C
Tansy ragwort	*Senecio jacobaea*	C
Medusahead rye	*Taeniatherum caput-medusae*	C
Detection Species		
English ivy	*Hedera helix*	D
Other Weeds of Interest		
Common burdock	*Arctium minus*	O
Poison hemlock	*Conium maculatum*	O
Oxeye daisy	*Chrysanthemum leucanthemum*	O
Chicory	*Cichorium intybus*	O
Wild carrot	*Daucus carrota*	O
Foxglove	*Digitalis purpurea*	O
Common teasel	*Dipsacus fullonum*	O
Sweetpea	*Lathyrus latifolius*	O
Reed canarygrass	*Phalaris arundinacea*	O

Direct, Indirect, and Cumulative Effects

Alternative One would not result in any direct or indirect effects because ground disturbing activities with the potential to encourage new noxious weed invasions would not occur. Maintaining the closed canopy would decrease the risk that weeds would spread into the closed canopy stands due to light limitations. There would also be no equipment moving into stands that would potentially move seed from roadsides into the stand.

However, since Alternative One would result in more long-term risk of stand replacement wildfire, it could contribute to the proliferation of new and existing noxious weeds if a wildfire were to burn through the watershed and planning area. The loss of duff and

canopy cover, combined with an increase in nutrients associated with the ash, create soil disturbance conditions where noxious weeds could thrive. Over the long-term, the action alternatives would result in stands that have an increased resiliency to stand-replacing fires by reducing fire behavior (by lowering fire intensity and severity – see fuels section).

Alternatives Two and Three

Alternatives Two and Three may contribute to the introduction or proliferation of noxious weeds in the watershed. It is a combination of soil disturbance and transport of seed that constitutes the direct effects of timber harvest on weed introduction and spread. Thinned stands, roads, landings, helicopter landing sites, and gaps within the thinning units are all suitable habitat for weeds. The risk is reduced where disturbed areas (such as temporary roads and landings) are treated to eliminate existing weeds and planted with native species (such as blue wild rye).

Although care would be taken to treat existing weeds prior to project related activities, the weed seed bank in the soils around pre-existing weed sites would remain in the area. In these alternatives, District botany staff would flag and map a 30-foot no-entry buffer around selected meadow knapweed sites to prevent spread of seed.

Ground-based heavy equipment used in project operations can spread weed seeds from infested areas (such as roadsides) to uninfested areas within the thinning units. Logs skidded through existing weeds can catch seeds in the bark and assist in the dissemination along roadsides and in the accompanying slash. Landings can be a collection center for logs and slash where material embedded with invasive plant seeds get sorted for delivery. Debris from trucks, slash bark pieces and mud can spread seeds along roads, where they can establish new populations.

Treating fuels by burning is proposed for all the action alternatives. Underburning would occur on 237 acres for both action alternatives. Keeley *et al.* (2004) found that prescribed fire can reduce the occurrence of invasive weeds the first year following a burn. This reduction of invasive weeds is expected to occur over some of the acreage prescribed for underburning by the following growing season. However, invasive and noxious weeds could eventually come back in places with low competition and high canopy closure of native vegetation. To prevent the possible reinvasion of weeds, these areas would be monitored and managed closely for noxious weeds as part of the mitigation measures.

Mitigation includes post-sale and follow-up treatments on approximately 100 acres. On-going forest-wide noxious weed surveys would continue to document new infestations of noxious weeds within Layng Creek and other watersheds on the forest. Both action alternatives would also include treating, before harvest activities begin, Scotch broom, diffuse knapweed, meadow knapweed, selected occurrences of Himalayan blackberry, and any high-priority noxious weeds discovered growing in the planning area along roadways, in quarries, and at pullouts and landings, to help attain the desired condition. The action alternatives would also implement competitive planting where the noxious weed treatments create bare ground and disturbed soils.

New roads create prime invasive weed habitat. Alternative Two would result in 2.2 miles of new temporary road while Alternative Three would result in 0.2 miles. Alternative Two creates more risk for the introduction of noxious or other invasive weeds into areas where road activities occur. Because of the increased risk associated with road activities, it will be especially important for new and closed roads to be revegetated

where appropriate, mulched and monitored. Noxious weed treatments would be implemented as necessary. In other words, the connected actions and mitigation measures related to revegetation, erosion control, and noxious weed monitoring/eradication are crucial in preventing adverse weedy conditions on and adjacent to roads for all action alternatives.

The spread of invasive weeds would be minimized in both action alternatives through preventative measures taken prior to, during, and after thinning operations. Project design includes buffers around known weed sites, logging equipment washing, post-treatment survey and weed treatment, and pretreatment of existing weed sites. The canopy in the treated stands is expected to close in 10 to 20 years, and this would further reduce habitat for some weed species. These measures cannot be regarded as absolutely effective. Even the best prevention efforts cannot stop weed spread. Many weed species have wind and/or animal dispersed seed that may escape equipment cleaning (or other measures).

Cumulative Effects

With the implementation of successful connected actions, mitigation measures, and monitoring to deal with noxious weeds, there would be no direct or indirect effects anticipated from the action alternatives. In addition, because there are no direct or indirect effects, there are no cumulative effects from the action alternatives or their connected actions.

Future road maintenance, continued timber harvest on adjacent private lands, vehicular traffic, recreation-related activities, and movement of wildlife would continue in the foreseeable future and are all actions that are likely to spread or introduce weed seed and lead to new infestations.

Mitigation measures would help minimize these effects but some activities such as recreation traffic and movement of wildlife are not so easily mitigated, so it is likely that invasive species would continue to threaten native plant communities and habitat quality within the planning area. Future weed treatment and prevention measures would help to contain spread and the use of early detection and response methods is anticipated to prevent establishment of new invaders**.**

SENSITIVE, RARE AND UNCOMMON BOTANY SPECIES

Biological Evaluation

As required to complete a botanical biological evaluation (BE), botany surveys were conducted to evaluate the impact of the proposed management actions on vascular plants, lichens, fungi, and bryophyte species listed or proposed to be listed as Threatened or Endangered by the U.S. Fish and Wildlife Service, or classified as Sensitive by the USDA Forest Service (Forest Service Manual 2672.4 & U.S. Code of Federal Regulations 50 CFR 402.12-13). It is USDA Forest Service policy to “ensure that Forest Service actions do not contribute to loss of viability of any native or desired plant or contribute to a trend towards Federal listing of any species” (Forest Service Manual 2672.41).

There are currently 39 vascular plant species, 20 fungi, 12 lichens, and 24 bryophytes listed as Sensitive on the Umpqua National Forest (Table 26). There are two species known or suspected to occur on the Forest that are listed under the Endangered Species Act. *Lupinus sulphureus* ssp. *kincaidii* is listed as threatened and has been documented

on the Tiller Ranger District located on the Umpqua National Forest. Although there are isolated occurrences documented throughout the Umpqua basin, this species occurs in low elevation upland prairies and is primarily known from the Willamette Valley grasslands. *Plagiobothryshirtus* is listed as endangered and is confined to low-elevation wetlands in the vicinity of Sutherlin in northern Douglas County. It has not been documented on the Forest to date.

Pre-field Review

The sensitive fungi, lichens, and bryophytes with potential habitat in the planning area (Table 26) would most likely be found in the gentle valley bottom and gentle mountain slopes landscape areas. Dry conditions generally associated with Steep Terrain are normally not conducive to sensitive non-vascular plants (an exception is *Encalypta brevipes* which has a preference for rock outcrops) and fungi. The sensitive vascular plants with potential habitat in the area (Table 26) are generally associated with meadows, streams, or rock outcrops in any of the three landscape areas. The closed-canopy plantations proposed for commercial thinning under each of the action alternatives are generally not suitable habitat for species found on the sensitive species list; however, the scattered natural openings, riparian zones, and plantation boundaries adjacent to mature forest are potential habitat for a number of sensitive species. Consequently, habitat becomes a major focus for survey efforts[38].

Pre-field review indicated potential habitat for a number of TES species[39] and Rare or Uncommon species within the project area. This review consisted of consultation and analysis of Umpqua National Forest database records, aerial photographs, survey protocols[40] for lichens, bryophytes, and vascular species, previous botanical survey records, USGS topographical maps, and working knowledge of the area. Species on the Umpqua National Forest Sensitive Species list and Rare or Uncommon Species list with habitat in the Doris planning area are considered; species with no habitat present would not be discussed further.

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[39] A list of species found on other Ranger Districts but do not have suitable habitat within the Doris Timber Sale area are:
Bryophytes: *BARBILOPHOZIA LYCOPODIOIDES, BRYUM CALOBRYOIDES, CALYPOGEIA SPHAGNICOLA, CHILOSCYPHUS GEMMIPARUS, ENTOSTHODON FASCICULARIS, HELODIUM BLANDOWII, JAMESONIELLA AUTUMNALIS VAR. HETEROSTIPA, MARSUPELLA EMARGINATA VAR. AQUATICA, MEESIA ULIGINOSA, POLYTRICHUM SPHAEROTHECIUM, PSEUDOLESKEELLA SERPENTINENSIS, CODRIOPHORUS DEPRESSUM, SPLACHNUM AMPULLACEUM, TOMENTYPNUM NITENS, TREMATODON BOASII.* **Lichens**: *CHAENOTHECA SUBROSCIDA, DERMATOCARPON MEIOPHYLLIZUM, LOBARIA LINITA.* **Fungi**: *CHROOGOMPHUS LOCULATUS, CUDONIA MONTICOLA, DERMOCYBE HUMBOLDTENSIS, GASTROBOLETUS IMBELLUS, GASTROBOLETUS VIVIDUS, GOMPHUS BONARII, PSEUDORHIZINA CALIFORNICA, MARTELLIA FRAGRANS, RAMARIA AMYLOIDEA, RAMARIA AURANTIISICCESCENS, RAMARIA LARGENTII, STAGNICOLA PERPLEXA.* **Vascular Plants**: *ARABIS SUFFRUTESCENS VAR. HORIZONTALIS, ARNICA VISCOSA, ASPLENIUM SEPTENTRIONALE, BOTRYCHIUM PUMICOLA, CALAMAGROSTIS BREWERI, CALOCHORTUS UMPQUAENSIS, CAREX ABRUPTA, CAREX CRAWFORDII, CAREX DIANDRA, CAREX LASIOCARPA VAR. AMERICANA, CAREX NARDINA, CAREX SERRATODENS, CAREX VERNACULA, CIMICIFUGA ELATA, COLLOMIA MAZAMA, ELATINE BRACHYSPERMA, EUCEPHALUS VIALIS, LEWISIA LEANA, PERIDERIDIA ERYTHRORHIZA, ROTALA RAMOSIOR, SCHEUCHZERIA PALUSTRIS VAR. AMERICANA, SCIRPUS SUBTERMINALIS, UTRICULARIA MINOR, UTRICULARIA OCHROLEUCA, VIOLA PRIMULIFOLIA SSP. OCCIDENTALIS, WOLFFIA BOREALIS, WOLFFIA COLUMBIANA.*

[40] Plant taxonomy is consistent with Abrams 1960, Arora 1986, Derr et al. 2003, Hickman 1993, Hitchcock and Cronquist 1973, Hitchcock et al. 1969, Lawton 1971, Lesher et al. 2003, McCune and Geiser 1997, Schofield 1992, USDA/USDI 1999, and Wagner and Christy 1996.

Table 26. Documented or Suspected Sensitive Plants & Fungi (includes lichens)[41]

Scientific Name	Sensitive List	Pre-field Review	Field Survey	Risk Assessment		
		(Habitat Present?)	(Species Located?)	Alt. 1	Alt. 2	Alt.3
Threatened or Endangered Species						
LUPINUS SULPHUREUS SSP. KINCAIDII	D	N	N	NE	NE	NE
PLAGIOBOTRYS HIRTUS	S	N	N	NE	NE	NE
Bryophytes						
ENCALYPTA BREVICOLLA VAR. CRUMIANA	S	Y	N	NI	NI	NI
ENCALYPTA BREVIPES	S	Y	N	NI	NI	NI
PORELLA BOLANDERI	S	Y	N	NI	NI	NI
RHIZOMNIUM NUDUM	D	Y	N	NI	NI	NI
SCHISTOSTEGA PENNATA	D	Y	N	NI	NI	NI
TAYLORIA SERRATA	S	Y	N	NI	NI	NI
TETRAPHIS GENICULATA	S	Y	N	NI	NI	NI
TETRAPLODON MNIOIDES	D	Y	Y	NI	MIIH	MIIH
TRITOMARIA EXSECTIFORMIS	D	Y	N	NI	NI	NI
Lichens						
LEPTOGIUM CYANESCENS	D	Y	N	NI	NI	NI
LEPTOGIUM BURNETIAE	S	Y	N	NI	NI	NI
NEPHROMA OCCULTUM	D	Y	N	NI	NI	NI
PANNARIA RUBIGINOSA	S	Y	N	NI	NI	NI
PELTIGERA PACIFICA	D	Y	Y	NI	MIIH	MIIH
PSEUDOCYPHELLARIA MALLOTA	D	Y	N	NI	NI	NI
PSEUDOCYPHELLARIA RAINIERENSIS	D	Y	Y	NI	MIIH	MIIH
RAMALINA POLLINARIA	S	Y	N	NI	NI	NI
USNEA LONGISSIMA	D	Y	N	NI	NI	NI
Fungi						
BOLETUS PULCHERRIMUS	D	Y	Unknown (Unk)	NI	MIIH	MIIH
CORTINARIUS BARLOWENSIS	D	Y	Unk	NI	MIIH	MIIH
DESTUNTZIA RUBRA	S	Y	Unk	NI	MIIH	MIIH
GOMPHUS KAUFFMANII	D	Y	Unk	NI	MIIH	MIIH
LEUCOGASTER CITRINUS	D	Y	Unk	NI	MIIH	MIIH
RAMARIA SPINULOSA VAR. DIMINUTIVA	S	Y	Unk	NI	MIIH	MIIH
RHIZOPOGON EXIGUUS	S	Y	Unk	NI	MIIH	MIIH
RHIZOPOGON INQUINATUS	S	Y	Unk	NI	MIIH	MIIH
Vascular Plants						
ADIANTUM JORDANII	S	Y	N	NI	NI	NI
BOTRYCHIUM MINGANENSE	S	Y	N	NI	NI	NI
CYPRIPEDIUM FASCICULATUM	D	Y	N	NI	NI	NI

41 Documented or Suspected Sensitive Plants & Fungi (includes lichens)41 with Potential Habitat in Doris Planning Area. A Project Effects Assessment is also presented. Notes are given for clarification, where needed.

GENTIANA NEWBERRYI	S	Y	N	NI	NI	NI
ILIAMNA LATIBRACTEATA	D	Y	N	NI	NI	NI
KALMIOPSIS FRAGRANS	D	Y	N	NI	NI	NI
LEWISIA COLUMBIANA VAR. COLUMBIANA	D	Y	N	NI	NI	NI
OPHIOGLOSSUM PUSILLUM	D	Y	N	NI	NI	NI
PELLAEA ANDROMEDIFOLIA	S	Y	N	NI	NI	NI
POA RHIZOMATA	S	Y	N	NI	NI	NI
POLYSTICHUM CALIFORNICUM	D	Y	N	NI	NI	NI
ROMANZOFFIA THOMPSONII	D	Y	N	NI	NI	NI

S Suspected to occur on the Umpqua National Forest
D Documented occurrence on the Umpqua National Forest (as of 2007)
NI No Impact
MIIH May impact individuals or habitat but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
WOFV Will impact individuals or habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
BI Beneficial impact.

Results of the Field Reconnaissance

Intuitive controlled and complete surveys for botany species listed in Table 26 were conducted throughout 2007 by botanical personnel. Non-suitable habitats in the units were field verified from appropriate vantage points or during travel between suitable potential habitats. The surveyors followed appropriate taxonomy and applicable protocols listed in the references section.

Conflict Determination

Lupinus sulphureus ssp. kincaidii and *Plagiobothrys hirtus* are not known on the Cottage Grove Ranger District and were not found during surveys. *Lupinus sulphureus ssp. kincaidii* is the only documented federally listed plant on the Umpqua National Forest and is considered a threatened species. It occurs on the Tiller Ranger District and adjacent lands, and in the Willamette Valley. *Plagiobothrys hirtus*, a federally listed endangered species, occurs in a few locations near the western forest boundary on Bureau of Land Management and private lands.

Direct, Indirect, and Cumulative Effects

Because there were no Rare or Uncommon Species located within the project area there are no direct, indirect or cumulative effects associated with any of the alternatives and connected actions; therefore the implementation of any of the alternatives would have "No Impact" on these listed species (Table 27).

EFFECTS TO SENSITIVE SPECIES

Peltigera pacifica

There are four sites of P. pacifica located within the proposed planning area (see Lichens in Table 26). All of the populations are located within unit boundaries. Although this species has a wide geographic range, it is rare in distribution and occurs within the Northwest Forest Plan area. In addition to these four sites, there are an additional 25 sites scattered throughout the Umpqua National Forest. P. pacifica is found on soil,

moss, rocks, logs, and trees bases in moist, low elevation forests (McCune and Geiser 1997). Buffers associated with the Riparian Reserves and possibly Late-Successional forest types in which this species is found should assist in protection of the species and its habitat (USDA Forest Service, USDI Bureau of Land Management 2004). All sites are within or adjacent to riparian reserves and would be protected by a 100 ft. radius, no-entry buffer.

Direct, Indirect, and Cumulative Effects

Alternative One would take longer to develop late-successional forest characteristics in comparison to the action alternatives. By not thinning and treating for fuels, the densely stocked units are more susceptible to stand replacement fires, which would delay the process of developing late-successional habitat for *P. pacifica*. Delaying successional development is considered an adverse trend to the survival and propagation of *P. pacifica*. The action alternatives would have no direct or indirect effects due to the implementation of 100-foot no-entry buffers around the known sites of this lichen. The action alternatives would not cause any adverse cumulative effects to Pacific felt lichen since there are no direct or indirect effects.

Pseudocyphellaria rainierensis

This is an epiphytic species with occurrences in Oregon being restricted to old-growth Douglas-fir and western hemlock habitats. Although this species appears to be restricted to old-growth forests, it has been documented on an old-growth Douglas-fir at the edge of clear-cut and on an open grown western hemlock on a talus slope (Sillett 1995). In addition to this newly discovered population (see Lichens in Table 26), there are only three other known sites on the Umpqua National Forest. There are several individuals at this site and all will be protected with a 100' radius no entry buffer.

Direct, Indirect, and Cumulative Effects

Alternative One would take longer to develop late-successional forest characteristics with which this species appears to be associated. Delaying the development of these old-growth characteristics could limit the distribution, abundance, and habitat of this species and could contribute to the isolation of existing populations. By not thinning and treating fuels, the densely stocked units are more susceptible to stand replacement fires which would delay the process of developing late-successional habitat. The action alternatives would have no direct effects or indirect effects to populations of *P. rainierensis* due to the implementation of 100' radius no-entry buffers. A lack of direct or indirect effects brought about by the action alternatives, combined with no foreseeable actions effecting the area, would not cause any adverse cumulative effects to *P. rainierensis.*

Tetraplodon mnioides

Although the distribution of this species is worldwide, the presence of this species south of the Canadian border is rare. In the Pacific Northwest, this species forms stiff, densely-packed sods on old carnivore dung, or on soil and rotten wood enriched by dung. Habitat ranges from dry to moist coniferous forests of various age classes including early seral and in peat lands. Due to the ephemeral nature of this species, all efforts made to maintain the population can be disrupted within a few years as the nutrient enrichment from the dung dissipates. This newly discovered population is located on a decaying Douglas-fir log in the middle of the 1746 Road, adjacent to unit 3 (see Bryophytes in Table 26). As evident from the number of scat piles found along the length of this log, it appears that this log is a thoroughfare of sorts used by the wildlife.

Direct, Indirect, and Cumulative Effects

Under Alternative One there would be no direct effect due to the area not being disturbed from logging activities and the road remaining closed. The no action alternative would maintain the substrate as well as providing the continuation of a pathway used by the local wildlife. However, under Alternative One, there would be indirect effects associated with the likelihood of the area being subjected to stand replacement fires and in turn, removing any suitable habitat for this species and/or substrate.

Under action Alternatives Two and Three, re-opening the 1746-440 road would have direct and indirect effects brought about by the removal of the substrate (downed log – dung located on top of log) from the middle of the road. This action would disrupt the life cycle and habitat of the dung moss and affect the ability of the site to be replenished with more nutrients (dung). Indirect effects from the action alternatives would be brought about by the removal of trees from the surrounding canopy resulting in an increase of exposure to the habitat in which this species is found. The increased exposure to light, wind, precipitation, and other abiotic variables could alter the habitat specifications required for this species.

In addition to disruption of the habitat, a mitigation measure would require the displacement of half the population into the adjoining stand with the other half of the population remaining on the log and being moved to the edge of the road. The portion of the population moved into the adjacent stand would be subjected to changes in light and moisture. These changes could affect dispersal of this species by influencing the amount of substrate being deposited in the area. The other half of the population would remain on the log and be moved to the edge of the road to make room for logging activities. This half of the population would be subjected to disturbances brought about by vehicular traffic such as accumulating dust and chemicals used in dust abatement, disruption of animal thoroughfares, and the potential for damage to the substrate from vehicular collisions.

Cumulative effects

Due to the displacement of the population brought about by logging activities, the action alternatives may affect individuals. The project, however, is not likely to result in a trend toward Federal listing or loss of viability for populations or species.

FUNGI

There are three sensitive fungi species found in the Layng Creek Watershed; *Cudonia monticola, Leucoglaster citrinus,* and *Cortinarius barlowensis*. Although there are occurrences of two sensitive fungi species within the same watershed, there are no known sites of any sensitive fungi in the Doris Planning Area. The proposed timber harvest targets second-growth stands that appear to represent poor habitat for most sensitive species of fungi, which are generally thought to favor older stands. However, there appears to be suitable habitat present within the proposed project area. Although data published on the habitat requirements for rare fungi is only broadly described (Auorora 1986, Castellano et al. 1999, Castellano et al. 2003, Exeter et al. 2006), modeling performed by York and Heliwell (2007) indicates that there is suitable habitat for *Ramaria amyloidea, R. aurantiisiccescens, R. largentii,* and *Turbinellus kauffmanii*.

The locations of *Pseudorhizina californica* (*Gyromitra c.*) on the Forest occur along wetland and riparian ecotones so its habitat should already be managed within the riparian reserve buffers.

Boletus pulcherrimus could possibly occur within the planning area. There is a single known site on the Forest of *B. pulcherrimus* along the North Umpqua Trail, one site of *C. barlowensis* on the Cottage grove Ranger District, and a site of *L. citrinus* south of Cavitt Falls on Roseburg BLM. Although these species are thought to be associated with old-growth stands, the described habitat for each of these species is rather general but is consistent with stands within the planning area.

Among other sensitive species suspected to occur on the Umpqua National Forest, *Chroogomphous loculatus* is known from only a single site in the Northwest Forest Plan area. The site is located on the Willamette National Forest in a stand of mountain hemlock. *Dermocybe humboldtensis* is known from a couple of sites on Roseburg BLM in the Myrtle Creek and Riddle area but is otherwise known only from the Northern California coast. *Gastroboletus vividus* is only known from above 5,400 ft. while *Martellia fragrans* is only known from above 4,900 ft. in elevation. *Gastroboletus imbellus* is likewise reported from high-elevation mountain hemlock and Pacific silver fir forests.

The only site known in Oregon for *Ramaria spinulosa* var. *diminutive* is on Roseburg BLM land in the Myrtle Creek area within a Douglas-fir stand at 1470 ft. in elevation. *Rhizopogon exiguous* and *R. inquinatus* are false truffles and are known from only a handful of sites in low to moderate elevations in Douglas-fir and western hemlock forest types. *Destuntzia rubra* is another false truffle reported from Douglas-fir forest types. There is no useful habitat information for *Stagnicola perplexa*; it is known from the Rogue River National Forest in the vicinity of Crater Lake National Park. Of these species, there is a reasonable chance that *Ramaria amyloidea, R. aurantiisiccescens, R. largentii, Turbinellus kauffmanii, Rhizopogon* spp., and *D. rubra* could occur within the planning area.

Direct, Indirect, and Cumulative Effects to Fungi

Alternative One would not result in any direct impacts to sensitive fungi and their mycelial networks due to the absence of ground disturbing activities. Under Alternative Two and Alternative Three, there is the potential for direct adverse impacts to the aforementioned species, if present in the proposed units. Activities associated with removal of host trees would disrupt the networks of fungal mycelia within the top few inches of the soil (Kranabetter and Wylie, 1998; Amaranthus and Perry, 1994). However, all the prescriptions retain between 40 and 90 trees per acre (tpa). Retention of these trees would leave a refugia which could contribute, if needed, to re-colonization (Luoma et al. 2006). As these thinned stands develop late successional characteristic species within the refugias are expected to re-colonize the thinned stands. There is also the potential for indirect impacts to sensitive fungi due to the alteration of habitat quality from the opening of the canopy, soil disturbance, and short-term disruption of down wood recruitment. Based on the preceding discussion, both action alternatives may impact individuals or habitat but will not likely contribute to a trend towards federal listing or cause a loss of viability to the populations or species.

STRATEGIC SPECIES

The strategic species (Table 25), which are not considered “sensitive” species under Forest Service Manual (FSM 2670), were reviewed for potential habitat within the project area. Although the distribution, habitat, and threats for known strategic species are limited, pre-field review noted potential habitat for a number of these species (Table 25).

Management requirements for this group of species is to record the survey and location in the agency's corporate database. In addition to the Strategic Species there are currently two other species which have been documented on the Umpqua National Forest, but not on the Cottage Grove Ranger District, which are rare or uncommon in their distribution.

Intuitive controlled and complete surveys for botany species listed in Table 25 were conducted throughout 2007 by botanical personnel. Non-suitable habitats in the units were field verified from appropriate vantage points or during travel between suitable potential habitats. The surveyors followed appropriate taxonomy and applicable protocols listed in the references section.

Table 27. Strategic Species and other Rare or Uncommon Species

Scientific Name	Known Umpqua Occurrence	Potential Habitat	Results of Survey
Bryophytes			
ANASTROPHYLLUM MINUTUM	S	Y	N
ANOMOBRYUM JULACEUM	S	N	N
BUXBAUMIA APHYLLA	D	Y	N
CEPHALOZIELLA SPINIGERA	S	N	N
CODRIOPHORUS RYSZARDII	S	Y	N
GRIMMIA ANOMALA	S	N	N
HARPANTHUS FLOTOVIANUS	S	N	N
POHLIA SPHAGNICOLA	S	N	N
POHLIA TUNDRAE	S	N	N
POLYTRICHUM SEXANGULARE	S	N	N
POLYTRICHUM STRICTUM	S	N	N
SCAPANIA OBSCURA	S	N	N
SCHOFIELDIA MONTICOLA	S	N	N
SCOULERIA MARGINATA	D	Y	N
THAMNOBRYUM NECKEROIDES	D	Y	N
Lichens			
LECANORA PRINGLEI	S	N	N
LECIDEA DOLODES	S	N	N
LEPTOGIUM TERETIUSCULUM	S	N	N
USNEA SPHACELATA	S	N	N
VEZDAEA STIPITATA	S	N	N
Fungi			
ARCANGELIELLA CRASSA	S	Y	Unknown (Unk)
BALSAMIA ALBA	S	Y	Unk
CAZIA FLEXIASCUS	S	Y	Unk
CHOIROMYCES ALVEOLATUS	D	Y	Unk
CHRYSOMPHALINA GROSSULA	S	Y	Unk
CLAVARIADELPHUS SUBFASTIGIATUS	D	Y	Unk
DESTUNTZIA FUSCA	S	Y	Unk
LEUCOGASTER ODORATUS	S	Y	Unk
MYCENA QUINAULTENSIS	S	Y	Unk
MYCENA TENAX	S	Y	Unk
OCTAVIANIA CYANESCENS	S	Y	Unk
PLECTANIA MILLERI	D	Y	Unk
PODOSTROMA ALUTACEUM	S	Y	Unk
RAMARIA ABIETINA	S	Y	Unk
RAMARIA BOTRYIS VAR. AURANTIIRAMOSA	D	Y	Unk
RAMARIA CONJUNCTIPES VAR. SPARSIRAMOSA	S	Y	Unk
RAMARIA MACULATIPES	S	Y	Unk
RAMARIA RUBRIBRUNNESCENS	D	Y	Unk
RAMARIA SUECICA	S	Y	Unk
RAMARIA THIERSII	S	Y	Unk

RHIZOPOGON ABIETIS	S	Y	Unk
RHIZOPOGON BRUNNEINIGER	D	Y	Unk
RHIZOPOGON FLAVOFIBRILLOSUS	S	Y	Unk
TRICHOLOMOPSIS FULVESCENS	S	Y	Unk
Vascular Plants			
FRASERA UMPQUAENSIS	D	N	N
MONARDELLA PURPUREA	S	N	N

Effects to other Rare or Uncommon Species				
Scientific Name	**Known Umpqua Occurrence**	**Potential Habitat**	**Results of Survey**	**Risk Assessment**
PLATISMATIA LACUNOSA	D	N	N	NI
CYPRIPEDIUM MONTATUM	D	Y	N	NI
S Suspected to occur on the Umpqua National Forest				
D Documented occurrence on the Umpqua National Forest (as of 2007)				
NI No Impact				
MIIH May impact individuals or habitat but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.				
WOFV Will impact individuals or habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.				
BI Beneficial impact.				

Aquatic Environment

The condition of the aquatic environment and its relationship to the proposed project was assessed during the scoping process. Concerns associated with the condition of the aquatic environment centered on water quality in the Layng Creek Municipal Watershed and physical aquatic habitats. Neither water quality nor aquatic habitat was determined to be a significant issue. This is due to the extensive application of no-cut buffers along streams, the low impact associated with second-growth thinning, and the site-specific best management practices developed to minimize impacts to the aquatic environment. This section of the Environmental Assessment is included for disclosure purposes.

This aquatic analysis focuses on how the Doris alternatives affect riparian and aquatic physical and biological processes at various scales. This includes site-specific disclosure at the scale of individual streams or thinning units and at various larger scales including the Row River Watershed[42] (Figure 18).

42 A "watershed" is a subdivision of land that is based on hydrologic drainage and defined by a national hierarchical system, which delineates hydrologic drainage in nested multi-level subdivisions. The watershed level subdivides the "sub-basin" level (4th level). The 5th level watershed in this situation is Row River which is subdivided by five smaller subwatersheds (6th level). The subwatersheds are subdivided by drainages (7th level), which is the smallest hydrologic subdivision.

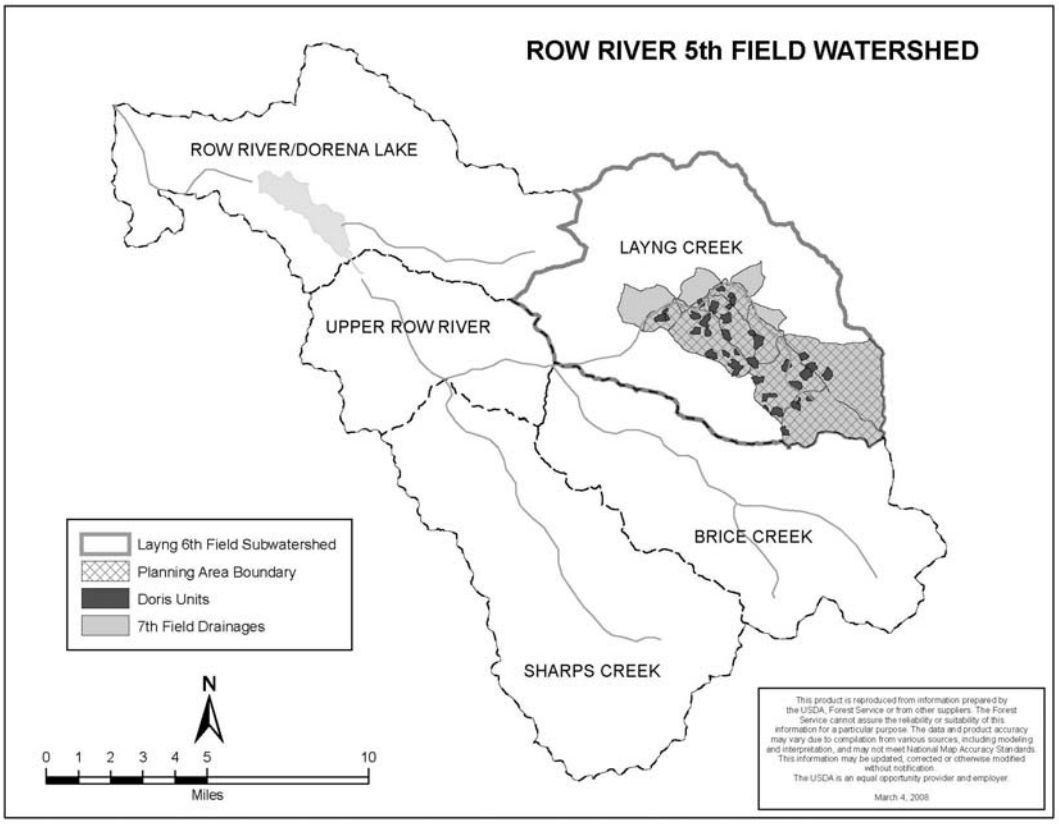

Figure 18. The five subwatersheds of the Row River Watershed

The compatibility with the objectives of the Aquatic Conservation Strategy is discussed under the headings of Forest Vegetation and Unique Habitats in the Terrestrial Environment section of this Chapter. The results of watershed analysis are presented, a description of the existing condition of the important physical and biological components of the ACS are discussed, and conclusions are offered regarding how the alternatives move conditions toward desired conditions in terms of all nine ACS objectives which include:

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

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

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

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains hebiological, physical, and chemical integrity of the system and benefits survival,

growth, reproduction, and migration of individuals composing aquatic and riparian communities.

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

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

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

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

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

The Doris planning area is within the Layng Creek Subwatershed (42,195 acres). It consists of eight 7th field drainages which encompass Doris, Harvey, East Fork Layng, and parts of Layng Creek (Table 28). The eight drainages that are associated with the Doris planning area total 13,487 acres, of which 11,316 acres (84%) are in the planning area. The Layng Creek Subwatershed flows into the Row River Watershed which is approximately 178,774 acres.

Table 28. Summary of 7th Level Drainages

Drainage Name (7th level)	Area (acres)	% of Drainage in Planning Area	Stream Density (mi/sq mi)	Resident Fish Bearing (miles)
Doris	926	100%	2.85	0.4
East Fork Layng	2,986	100%	4.17	2.4
Harvey	1,657	100%	4.74	1.5
Layng Canyon Lower*	981	73%	3.47	1.5
Layng Canyon Upper	1,870	100%	4.06	0.4
Mid Layng East*	1,589	39%	4.89	3.6
Mid Layng West*	1,378	32%	6.06	1.6
Upper Layng	2,101	100%	4.07	0
Total	**13,487**	**84%**	**4.40**	**11.36**

*Partially within the planning area boundary.

Approximately 14 miles downstream of the planning area, Dorena Dam (built in 1949) blocks all anadromous fish passage in the Upper Row River, including the Layng Creek Subwatershed. Resident cutthroat trout are found throughout the subwatershed and are

managed by Oregon Department of Fish and Wildlife as a naturally producing wild population (Connolly, 1992).

There is no federally designated Essential Fish Habitat, federally listed endangered or threatened aquatic species, or State sensitive fish species within the planning area. Refer to the Wildlife section of this chapter for an analysis of non-fish aquatic State sensitive species.

BENEFICIAL USES OF WATER

To meet the Clean Water Act and standards and guidelines in the Umpqua National Forest Plan (watershed standard and guideline #1), the beneficial uses of water must be identified, and management activities planned, so they would not interfere with or be injurious to the beneficial uses of adjacent and downstream waters. The relevant beneficial uses of the Willamette River and its tributaries, including the Row River as determined by Oregon Department of Environmental Quality, are: 1) public and private domestic water supply; 2) industrial water supply; 3) irrigation; 4) livestock watering; 5) resident fish and aquatic life; 6) wildlife and hunting; 7) fishing; 8) water contact recreation; and, 9) aesthetic quality (ODEQ, 2003).

WATER QUALITY

Relevant Standards and Guidelines

The relevant standard and guidelines from the Umpqua Land Resource Management Plan (LRMP) related to water quality include:

Water quality/riparian area standard and guideline #1: All effective shading vegetation would be maintained on perennial streams unless a site-specific assessment shows that shade removal would not result in water temperature increase or degrade aquatic habitat.

Water quality/riparian area standard and guideline #5: Streams would be designated for protection on timber sale maps.

Water quality/riparian area standard and guideline #12: The application of best management practices (BMPs) for the protection of water quality and beneficial uses (e.g.; fish habitat or potable water) would be monitored where ground disturbing activities occur.

Watershed cumulative effects and water quality standard and guideline #1: The beneficial uses of water must be identified and management activities planned so they would not interfere with or be injurious to the beneficial uses of adjacent and downstream waters.

Watershed cumulative effects and water quality standard and guideline #2: Beneficial uses of water and aquatic habitats would not be degraded by turbidity, sediment, or scoured stream channels caused by timber harvest, road construction, and related activities.

Watershed Analysis (WA) Recommendations

The 1995 Layng Creek WA and the Layng Creek WA Iteration 1.1 (USDA Umpqua NF, 2005) recommended restorative thinning in riparian reserves. The 2005 WA provided specific treatment and buffer recommendations based on the Northwest Forest Plan Temperature (TMDL) Implementation Strategies (USDA/USDI, 2005) which balances thinning and retention of primary shade so as to not affect stream temperature. The Riparian Reserve section of this Chapter lists these specific WA recommendations.

Existing Conditions

The Oregon Department of Environmental Quality (DEQ) has identified water quality limited streams throughout the Sate of Oregon, including the Row River Watershed (Table 29). Layng Creek is currently listed on DEQs 303(d) List for exceeding the stream temperature criteria (ODEQ, 2007). The temperature exceedance relevant to this project occurs during the summer months when salmonid fish are rearing. The temperature listing includes both Layng Creek (mouth to 14.4 miles upstream) and the Row River (at the confluence of Layng and Brice creeks downstream to Dorena Lake). The supporting data for the Layng Creek listing originated from Umpqua National Forest monitoring at a site above Prather Creek, which is downstream of the planning area. At this site, the seven day average of daily maximum temperatures exceeded the temperature standard of 64.4°F during several summers from 1991-1994. The Cottage Grove Ranger District continues to collect stream temperature data at this site and other locations in the Layng Creek Subwatershed. Recent temperature data continues to exceed the State temperature criterion.

In the 1970's, turbidity in the Layng Creek Subwatershed was recognized as a concern. The finer textured soil found in the Layng Creek earth flow terrain contributed to stream turbidity from both natural and anthropogenic disturbances. At that time, the City of Cottage Grove used a simple infiltration and chlorination system to treat Layng Creek water for domestic water use that did not meet state drinking water standards for turbidity (USDA Umpqua NF 1995). In response, the Forest Service initiated a turbidity monitoring program (annual turbidity-flow index) in 1976 and reduced annual timber harvest.

Since the 1970’s, many chronic turbidity sources have been identified and mitigation measures taken with improving results. The turbidity monitoring results have shown a 75% decrease for typical winter flows without flooding conditions over the first eight years (1976-1984). Since then, the annual turbidity-flow index has shown little change since 1985, stabilizing with at least half of the turbidity levels observed in the 1970’s. These results are discussed in the watershed analysis (USDA Umpqua NF 1995) and the annual forest monitoring reports (USDA Umpqua NF 2006a). Turbidity remains a key parameter of concern as identified in the Layng Creek Watershed Analysis, which recognized the City of Cottage Grove domestic water intake about one mile downstream of the planning area.

The only additional water quality parameter that is included in DEQs 303(d) List and downstream (14 stream miles) of the planning area is mercury in Dorena Lake. A mercury study of Dorena Lake (Hygelund, 2001) found that the mercury contamination is from the Bohemia Mining District in the headwaters of Brice Creek. According to this study, mercury was historically used in the processing of gold and silver ore. This type of ore processing did not occur in the Layng Creek Subwatershed, so this water quality listing is not linked to Layng Creek Subwatershed and was not evaluated.

Table 29. Water Quality Listings in the Row River Watershed.

Waterbody Name	River Mile	Parameter	Season	List Date
Row River	0 to 7.4	Temperature	Summer	1998/2004
Dorena Lake	7.4 to 11.3*	Mercury	Year Around	1998/2004
Row River	11.3 to 20.8*	Temperature	Summer	2002/2004
Sharps Creek	0 to 15.2	Temperature	Summer	1998/2004
Martin Creek	0 to 3.4	Temperature	Summer	1998
Brice Creek	0 to 15.5	Temperature	Summer	1998/2004
Layng Creek	0 to 14.4*	Temperature	Summer	1998/2004

* Sections of water bodies downstream of the planning area.

The desired condition is the maintenance of water quality in keeping with ACS objective #4, while moving stem exclusion forest stands toward the desired range of natural variability.

Direct and Indirect Effects

Direct effects in the context of water quality are those that would occur in planning area streams. Direct effects are triggered immediately as a result of the Doris alternatives. Indirect effects are those that could occur later in time or downstream of the action at the drainage or larger scale.

Alternative One would result in no direct or indirect effects to water temperature or turbidity. Since no riparian trees would be cut along any perennial streams that could affect stream temperature and no ground disturbing activities would occur that would cause sediment delivery and elevate stream turbidity, direct or indirect effects would not be expected.

Alternatives Two and Three would not have a direct or indirect effect on stream temperatures. The action alternatives would thin within riparian reserves, but effective shade along perennial streams would be retained. Water quality standard and guideline #1 and recommendations in the watershed analyses would be met. Streams within and adjacent to thinning units would be identified with applicable protection meeting water quality standard and guideline #5.

The Layng Creek Municipal Watershed Plan (LRMP Appendix G-6) includes a guideline to limit the amount of newly disturbed acres to 350 acres per year. This guideline was developed to protect water quality and avoid turbidity increases especially at the municipal water intake. Disturbed area levels include, in part, clearcut acres or thinned acres with overstory canopies of 50% or less. Under both action alternatives, the 602 acres of heavier thinning would bring the canopy closure below 50% (ranging from 40-47%, with an average of 44%), while the 398 acres of moderate thinning would maintain canopy closures closer above 50% (ranging from 50-54%, with an average of 50%). The proposed project-level Forest Plan amendment included in Chapter One more than doubles the disturbed area level based on the fact that the majority of the acres of the proposed thinning would bring the canopy closure just below 50%, and that all such acres would be associated with second-growth thinning instead of old-growth even-aged

harvest. In addition, with an expected canopy growth rate of 2% per year (Chan, et al. 2006), most stands would be at or above 50% within four years.

Under this disturbed area guideline, the Municipal Watershed Plan estimated an average removal of 55,000 board feet of timber per acre. The heaviest thinning prescriptions in the Doris units would remove about 20,000 board feet per acre under partial harvest conditions, which is less than half of what was assumed in the Plan. The level of disturbance based on timber volume would be less than half of what was originally identified in this guideline. Therefore, the risk to water quality from harvest would be within the original guidelines allowed.

Under Alternatives Two and Three, both the temporary road construction and road reconstruction and the connected actions related to roads would potentially cause direct and indirect turbidity effects. The connected actions would include a fish passage culvert/pump chance upgrade (1746-707 road at Harvey Creek), 20 culvert removals on the roads proposed for inactivation, and 5 additional culvert upgrades. The direct effects would be site-specific and occur at the time of disturbance. The indirect effects would be short-term (up to one season for erosion control measures to become effective) both at the disturbance site and downstream within the drainage. The spatial extent of the indirect effects would be within the immediate drainage and not be detectable downstream of the planning area in Layng Creek.

Through project design features that include timing of disturbance and location, best management practices (discussed in Chapter Two), and thinning second-growth size trees, the potential of the ground disturbance to influence sediment delivery and elevate stream turbidity would be mitigated, lessening the magnitude of effects on the beneficial uses. Therefore, Alternatives Two and Three would not be directly injurious to the beneficial uses at the site scale or indirectly downstream.

Six fire sumps would be maintained as part of the connected actions of this project. Four of the sumps are within the planning area boundary, of which two are within fish bearing streams (Layng and Harvey Creeks). The two sumps outside of the planning area boundary are both located within Dinner Creek, one within a fish bearing reach, the other above fish use. Maintenance to these sumps would result in temporary direct turbidity effects during the in-stream excavation of filled-in gravels. The direct turbidity effects would dissipate quickly when the action stops and are not expected to extend more than tens of feet beyond the sump. Therefore, no indirect turbidity effect is expected. The sediments removed from the stream would either be end hauled or placed in a stable area. This would prevent heavy rains from eroding the sediment pile back into the stream channel.

A best management practices (BMPs) checklist applicable to the disturbances and for the protection of water quality and beneficial uses would be used. The purpose of the checklist is to identify roles and responsibilities for tracking BMPs through time to insure that these measures would be included in the various contracts and implemented on the ground. The development and subsequent use of the BMP checklist meets water quality standard and guideline #12.

The fuels treatments for Alternatives Two and Three that would have the most potential to affect water quality are underburning and machine pile burning. The burning of concentrated fuels tends to disturb the soil's duff layer, exposing soil to erosion. The mitigation measure of underburning during moist conditions to retain effective ground cover reduces the risk of killing overstory trees or impacting water quality.

Cumulative Effects

Past harvesting of perennial stream shade occurred throughout the Layng Creek Subwatershed up until about the mid 1980's. This loss of stream shade contributed to elevated stream temperatures in planning area streams. However, areas harvested prior to the mid 1980's are now providing stream shade (Holaday, 1992).

Alternative One would result in no direct or indirect effects to water temperature or turbidity that would incrementally add to possible downstream heating or stream turbidity due to past, present or reasonable foreseeable future disturbance. Therefore, Alternative One would not have a cumulative temperature or turbidity effect.

Alternatives Two and Three would protect the effective shade along perennial streams to avoid stream temperature increases. Both actions alternatives would cause direct or indirect turbidity effects. However, the spatial and temporal extent and magnitude of these effects would not incrementally add to past, present, or reasonably foreseeable effects. Beneficial uses of water and aquatic habitats would not be degraded by turbidity, sediment, or scoured stream channels caused by timber harvest, road construction, and related activities. Watershed cumulative effects and water quality standard and guideline # 2 would be met. Therefore, no cumulative temperature or turbidity effect would result from these action alternatives.

Aquatic Conservation Strategy

As disclosed above in this water quality section, no prolonged or adverse impacts to water quality or the associated beneficial uses of water are expected from any of the proposed activities in any of the action alternatives including those actions occurring in the riparian reserve land allocation. As such, the long-term trend of improving water quality in the watershed would not be set back; water quality in Layng Creek and planning area streams would continue to support healthy riparian, aquatic and wetland ecosystems consistent with ACS objective #4. Since the action alternatives apply all relevant standards and guidelines, and since they were developed to restore riparian ecosystem health at the stream reach and landscape scale, they are also in keeping with the overarching intent of the Aquatic Conservation Strategy (USDA/USDI, 1994).

STREAM FLOWS

Relevant Standards and Guidelines

The relevant standard and guidelines from the Umpqua Land and Resource Management Plan (LRMP) related to streamflow include:

Watershed cumulative effects and water quality, standard and guideline #2: Beneficial uses of water and aquatic habitats would not be degraded by turbidity, sediment, or scoured stream channels caused by timber harvest, road construction, and related activities.

Watershed cumulative effects and water quality, standard and guideline #4: Beneficial uses of water and aquatic habitat (water quality) would not be degraded by increased peak flows caused by canopy removal from timber harvest, road construction, and related activities.

Existing Conditions

The streamflow regime of the Doris Planning Area is influenced by Western Cascades geology. The Western Cascades streamflow regime responds rapidly during winter runoff events. This regime has large annual flow fluctuations with large differences between summer low flow and winter high flow. In general, the streamflow record from the gauging station on the Row River downstream of the planning area (about ten stream miles) reveals that winter flow for the upper area of the Row River Watershed responds quickly to storm precipitation with rapid runoff, in sharp contrast to summer flows that are very low.

Ninety percent of the planning area is within the transient snow zone (2,000 to 5,000 feet in elevation) where winter peak flows are an important fluvial process. In this zone, warm rain can follow a colder snow storm causing rapid snowmelt. In the Upper Willamette sub-basin, 88 percent of floods with a return period of greater than six years were associated with rain-on-snow events (Harr 1979, Christner 1981). Sizeable canopy openings can result in greater snow accumulation and more rapid snowmelt compared to locations lacking large canopy openings.

The forest canopy has a major influence on snow accumulation, distribution, and melting rates. The Umpqua Forest Plan requires an analysis of forest canopy conditions (standard and guideline #4, listed above). The hydrologic recovery percentage (HRP) was used to estimate the hydrologic recovery of the forest canopy at the drainage, subwatershed, and watershed scales. An area is considered fully recovered when the canopy closure is 70% and the average tree diameter is eight inches (USDA, Umpqua NF, 1990b). The hydrologic recovery level represents an area compilation of forest canopy re-development following disturbance. It also represents the potential influence on the streamflow and stream channel effects from floods. A hydrologic recovery of 75% or greater would maintain current peak flows and avoid an adverse change to physical channel condition and associated factors such as water quality and fish habitat. Statistically discernible increases in peak flows have occurred when greater than 25% of smaller drainages have been harvested (loss of canopy) and included roads; that is, the hydrologic recovery was less than 75% (Jones and Grant, 1996; Thomas and Megahan, 1998). Conditions below the 75% hydrologic recovery value (i.e.; lower levels of hydrologic recovery) need further evaluation for potential peak flow cumulative effects from rapid snowmelt during rain-on-snow storms (following standard and guideline #4).

The eight drainages associated with the Doris Thin Timber Sale are all considered hydrologically recovered (Table 30).

Table 30. Change in Hydrologic recovery percentage by drainage.

7th Field Drainages	Existing Condition and Alternative 1	Alternative 2 and 3
Upper Layng	88.1%	86.0%
East Fork Layng	90.1%	87.0%
Layng Canyon Upper	88.2%	78.3%
Harvey	91.6%	82.0%
Doris	98.3%	84.6%
Layng Canyon Lower	89.2%	82.8%
Mid Layng East	95.0%	90.9%
Mid Layng West	99.9%	97.7%

Indirect Effects and Cumulative Effects

Peak flows represent an indirect effect rather than a direct small-scale effect. The Forest Plan (USDA, Umpqua NF, 1990a) identified an analysis area of 1,000 acres or more to evaluate potential peak flow response. As such, only downstream indirect effects and cumulative effects are discussed for the peak flow analysis.

Alternative One would not reduce canopy cover; therefore, no change in hydrologic recovery would occur that would potentially increase peak flow.

The overall hydrologic recovery analysis of snow accumulation and melt utilized recent research that was done on the Umpqua and Gifford Pinchot National Forests. This research indicated that a shelterwood canopy can allow about 60% greater snowpack runoff than mature forest (Storck et al. 1999) at the site scale. Therefore, the analysis for the action alternatives assumed a combined average of 44% recovery for proposed 40-60 tpa thinning units, 50% recovery for proposed 70-90 tpa and no recovery for canopy gaps. These conservative assumptions allowed for a margin of safety in the analysis that addresses scale and treatment differences between the original study and this project.

Under Alternatives Two and Three, the proposed silvicultural treatments would maintain the HRP above the level of concern (Table 30). In addition, the remaining leave trees in the thinned areas would break up the flow of warm wind across the snow pack and substantially mitigate the rapid melt process of rain-on-snow events.

Alternatives Two and Three would not reduce canopy closure to a level that would cause an indirect peak flow response at the drainage scale or that would be detectable at the subwatershed or watershed scales. No cumulative peak flow effect is expected under the action alternatives because no indirect peak flow effect would occur that could be incrementally added to past, present, or reasonably foreseeable future activities to cause a cumulative peak flow increase.

Aquatic Conservation Strategy

As disclosed above in this stream flow section, no impacts to flow regimes or the associated beneficial uses of water are expected from any of the proposed activities in any of the action alternatives including those actions occurring in riparian reserves land such as restorative thinning, underburning, and planting. As such, the timing, magnitude, and duration of peak, high, and low flows are protected under all action alternatives, consistent with ACS objective #6. Since the action alternatives apply all relevant standards and guidelines, and since they were developed to restore riparian ecosystem health at the stream reach and landscape scale, they are also in keeping with the overarching intent of the Aquatic Conservation Strategy (USDA/USDI, 1994).

RIPARIAN RESERVES

The riparian reserve land allocation was established in the Northwest Forest Plan as part of the Aquatic Conservation Strategy (USDA/USDI, 1994). This riparian reserve analysis is based on the guidance in the Northwest Forest Plan which, in general, is defined for this analysis as one site potential tree height on non-fish bearing streams (either perennial or intermittent) and two site potential tree heights on fish bearing streams. No changes to these guidelines were made with either the 1995 Layng Creek Watershed Analysis or its 2005 iteration. A site potential tree height is the average

maximum height of the tallest dominant trees, at 200 years or older, for a given area. The height of site potential trees in Layng Creek as described in the 1995 WA is 200 feet.

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems. This strategy is based, in part, on natural disturbance processes. Proposed riparian actions are assessed in relation to the watershed's existing condition and any short or long-term effects to such conditions.

Relevant Standards and Guidelines

The standards and guidelines for riparian reserves specifically related to the Doris alternatives include:

TM-1 (c). Prohibit timber harvest except where silvicultural practices are applied to control stocking and to acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

FM-1. Design fuel treatment to meet Aquatic Conservation Strategy objectives and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression could be damaging to long-term ecosystem function.

FM-4. Design prescribed burning and prescriptions to contribute to attainment of Aquatic Conservation Strategy objectives.

1995 Layng Creek Watershed Analysis Recommendations

To meet Aquatic Conservation Strategy (ACS) objectives, riparian silviculture techniques such as thinning and release can be used to accelerate development of old growth characteristics in conifer and hardwood stands and within Riparian Reserves.

Manage plantations that encroach on riparian reserves for maximum conversion to late-seral, old-growth conditions (LSOG). Manage for LSOG type diversity. Leave all non-conifer species and all western redcedar.

2005 Layng Creek Watershed Analysis Iteration

Along perennial streams, apply silvicultural treatments such as thinning, activity fuel treatments, or prescribed underburns outside the primary shade zone[43] when it is determined that such activities can benefit effective shade and other riparian functions over the long term and meet Aquatic Conservation Strategy objectives. Apply no

43 The primary shade zone is an area along a perennial stream that provides shade between 10:00 AM and 2:00 PM. Though the primary shade zone can be substantially affected by stream orientation (the south bank of an east-west flowing stream is more critical than the north bank), the following table is useful in helping define the primary shade zone based solely on tree height and slope (USDI/USDA 2005):

Height Of Tree	<30% Hill Slope	30 to 60 % Hill Slope	>60% Hill Slope .
Trees < 20 feet	12' buffer	14' buffer	15' buffer
Trees 21 to 60 feet	28' buffer	33' buffer	55' buffer
Trees 61 to 100 feet	50' buffer	50' buffer	60' buffer

treatments buffers based on the 2005 Northwest Forest Plan Temperature TMDL Implementation Strategy (USDA/USDI 2005).

Along intermittent streams, apply variable-width, no treatment buffers as needed to provide slope stability and lower sediment delivery associated with certain types of yarding. The size of no-treatment buffers would be prescribed based on site-specific conditions such as soil conditions and channel incision, and in the context of the proposed silvicultural prescription and logging system. On intermittent channels lacking substantial incision or other constraining characteristics, vegetation manipulation and fuel reduction are recommended throughout riparian reserves in order to maximize restorative treatments in the riparian area.

RIPARIAN FOREST CONDITIONS

Existing and Desired Condition

In Layng Creek, about 64% of the federally managed riparian reserves have been either previously clearcut, burned in fires, or occupied by permanent roads, leaving about 36% of this land allocation in late-seral conditions (USDA, Umpqua NF, 1995). A majority of Layng Creek's riparian reserves (62%) are considered mid-successional, and are in the stem-exclusion stage of development.

Within the drainages associated with the planning area there are about 3,780 acres of riparian reserve. Of this, approximately 2,199 acres (58%) have been previously clearcut. The majority of the previously clearcut riparian reserve in the planning area are now Douglas-fir plantations in the stem exclusion stage. The stem exclusion stands in Layng Creek are very dense and lack diversity due to the selection of Douglas-fir over other species during planting and precommercial thinning. If left untreated, many stands are on a track to develop as closed, homogeneous stands that do not represent desired conditions for either the matrix or riparian reserve land allocations (USDA Umpqua NF, 2005).

Table 31 displays the percent of roads within the riparian reserves and the percent of riparian reserve trees in a mature and older condition for each drainage associated with the planning area. Note these estimates include the entire seventh-field drainages, sometimes extending beyond the planning area boundary.

Drainages are land areas that directly drain to a common stream; they are synonymous with watersheds. The drainage basin boundaries follow topographic highs; the divides separate one drainage basin from another. Doris, East Fork Layng, Harvey and Upper Layng are the drainages listed in Table 31 that meet the above definition. The other "drainages" are more like corridors along the main stem of Layng Creek and the associated smaller unnamed face tributaries that flow directly into Layng Creek. Layng Canyon Lower, Layng Canyon Upper, Mid Layng East and Mid Layng West do not meet the definition of a drainage.

Table 31. Late- Successional and Road Densities in Riparian Reserves.

7th Field Drainage	% of Roads within Riparian Reserve	% Riparian Reserve>80 years old
DORIS	0.4%	42.4%
EAST FORK LAYNG	0.7%	50.3%
HARVEY	0.6%	27%
LAYNG CANYON LOWER*	0.5%	45.1%

LAYNG CANYON UPPER	1.4%	50.6%
MID LAYNG EAST*	1.2%	31.9%
MID LAYNG WEST*	1.8%	61.4%
UPPER LAYNG	0.8%	49.7%
Average	**0.9%**	**45.2%**

*Drainages extend beyond the planning area boundary.

Roads in riparian areas have the potential to limit shade and reduce the deposition of large wood and debris to streams and riparian areas. The Doris planning area has approximately 85.9 miles of road with a road density of 4.85 miles of road per square mile. At the scale of Layng Creek, there are about 539 acres of roads in the riparian reserves, equating to 2.8% of the land allocation (USDA Umpqua NF, 1995).

There are approximately 22 miles of road within the riparian reserves within the drainages associated with the planning area. As seen in Table 31, within the planning area drainages the percent of roads within the riparian reserves range from 0.4% to 1.4%, with an average of 0.9%. When compared to the Layng Creek scale of 2.8% above, the planning area drainages have a relatively low percent of roads within riparian reserves. There are only two stream crossings over fish bearing reaches within the entire planning area. One of these crossings is the 1746 road bridge over Layng Creek and the other is the 1746-707 road crossing at Harvey Creek.

The road densities are highest in Mid Layng West and the Mid Layng East. However, since these are not in essence true drainages, the densities are difficult to compare between the accurate drainages. The high densities are primarily due to the 17 Road that parallels Layng Creek throughout Mid Layng East and West. In addition, the road densities are highest on the north side of Layng Creek outside of the planning area.

All drainages have a moderate to low percentage of trees greater than 80 years old in the riparian reserves. The Layng Creek Watershed Analysis (USDA Umpqua, 1995, page 144) recommends managing riparian reserves for late seral conditions.

The desired condition for second-growth riparian reserves is a decrease in riparian area occupied by permanent roads, increased species and structural diversity, and lower risk of stand replacement fire in keeping with ACS objectives 2, 3, 8, and 9.

Proposed Riparian Forest Treatments

The action alternatives would each thin a total of 403.6 riparian reserve acres, with only small differences between the action alternatives with respect to logging systems (Table 32).

Table 32. Summary of thinning, fuel treatment, and logging systems in riparian reserves.

Actions	Alternative One	Alternative Two	*Alternative Three*
Thinning			
Riparian reserve in harvest units	N/A	403.6 acres	403.6 acres
Commercial Thinning	0	177.3 acres	177.3 acres

Actions	Alternative One	Alternative Two	*Alternative Three*
Fuel treatments			
Jackpot Underburn (units 1, 2, 3, 4, 9, 11, 20, 21, 22, 25, 26, 27, 30 skyline and helicopter only)	0	40 acres	40 acres
Machine pile (all ground based logging acres)	0	38 acres	38 acres
Hand pile and burn 100' in from 1746, 1745-707, 1746-531 (units 8, 12, 13, 32)	0	5.2 acres	5.2 acres
Total treatment acres		83.2 acres	83.2 acres
No treatment	0	94.1 acres	94.1 acres
Logging Systems			
Skyline	0	124.5 acres	111.7 acres
Helicopter (Helicopter Landings)	0 (0)	14.8 acres (0)	27.6 acres (0)
Ground Based	*0*	38 acres	38 acres

The riparian reserve thinning prescriptions would be the same as in the adjacent matrix land, which involves low thinning (where the smaller trees are harvested) combined with gap creation as detailed in Tables 1 and 3 in Chapter Two. There is potential that some of the gaps would be created in the riparian reserve, although they would be placed no closer than 50 feet slope distance from stream channels. All perennial streams would receive at least a 50-60 foot no cut buffer, while the stable intermittent channels within proposed harvest units would be thinned up to the edge of the stream, without buffers. A little over half of the riparian reserve acreage within unit boundaries (211 acres) would function as no-cut buffers, while the other half of the riparian reserves acres would be thinned. The proposed thinning prescriptions in the matrix and riparian reserve land allocations were primarily based on landscape scale disturbance and successional development processes as described and recommended in the 2005 Layng Creek WA iteration 1.1. Other resource objectives, specifically for TES species were also considered.

No new permanent roads would be located within riparian reserves (Table 33). Approximately 1.3 miles of previously used temporary roads are located within riparian reserves. Currently, the culverts have all been removed. However, at some of these old stream crossings the channel banks were not sloped back. This has caused the stream to down cut and has resulted in an increase of bank erosion. These roads would all be inactivated following sale activities and the stream crossings would be sloped back and left in a more stable condition. The action alternatives have a small difference in regards to roads within riparian reserves. Alternative Two constructs new temporary roads for approximately 570 feet within riparian reserves. This includes one crossing of an intermittent stream in unit 28. All roads identified in the Doris Roads Analysis as potential segments for inactivation are included in both action alternatives.

Table 33. Summary of road actions within riparian reserves.

	Alternative One	Alternative Two	Alternative Three
New permanent roads (acres)	0	0 acres	0 acres
New temporary roads*	0	0.2 acres (570 feet)	0 acres
Existing temporary roads*		2 acres (1.3 miles)	2 acres (1.3 miles)
Inactivation of existing system roads	0	6 acres (3.8 miles)	6 acres (3.8 miles)
Decommission existing roads	0	0 acres	0 acres
Change from existing condition	*0*	*-6 acres of system road in riparian reserve inactivated*	*-6 acres of system road in riparian reserve inactivated*

*Temporary roads are not factored into the calculation of change from existing condition because all temporary roads would be obliterated immediately following the logging.

Direct Effects

The direct effects to riparian reserve forest conditions are defined as those occurring within the confines of the riparian reserve over the course of one to two decades following implementation.

Alternative One has no ground disturbing activities in riparian reserves. No temporary roads would be built that would adversely affect riparian site productivity or habitat quality.

Under both action alternatives, the construction of temporary roads within riparian reserves would result in short-term impacts to riparian forest conditions by disturbing soil and vegetation. This would result in losses of habitat and site productivity at the immediate vicinity of the road prisms. The duration of these impacts is expected to be less than a decade because these roads would be subsoiled following use. Erosion control measures would be implemented. The subsoiled temporary roads and the skid roads would have harvest slash or some other suitable organic material pulled back across the subsoiled surface (see Soil and Site Productivity and Revegetation Best practices and mitigation measures in Chapter Two). These mitigation measures would reduce impacts.

Compared to Alternative One, the thinning on 177.3 Riparian Reserve acres and the fuel treatments on 83.2 acres under both action alternatives would reduce the existing 77% average canopy closure to approximately 44% (for the 40-60 tpa silviculture prescription) and approximately 50% (for the 70-90 tpa silviculture prescription), allowing more light penetration and resulting in warmer and dryer riparian forest conditions. The thinning under both action alternatives would also reduce the rate of litter input to streams and the riparian forest floor, which represents important nutrient cycling and food bases of aquatic and terrestrial organisms. This effect would likely reduce local populations of dependant organisms. It is estimated that the canopy closure would increase 2% per

year (Chan et al., 2006). The canopy of residual leave trees would gradually fill in, reaching pre-existing conditions within one or two decades

The above effects from thinning and underburning would occur on a small scale in terms of the riparian reserve network that exists in the planning area drainages. Of the 3,212 acres of riparian reserve in the planning area, only 5.5% would be thinned with the action alternatives and less than 2% would be underburned. Moreover, all perennial streams and approximately 50% of the 16,795 feet of intermittent channels would have no cut buffers which would help provide a cooler, dense forest paralleling those stream channels.

The logging itself would also result in effects to riparian reserve conditions under both action alternatives. The ground based loader harvest systems would exert the most direct impact to riparian reserves due to soil disturbance compared to skyline and helicopter logging. Approximately 38 acres of riparian reserve would be ground based logged (Table 32). The actual amount of soil disturbance expected with the ground-based logging is estimated to be about 10% (3.8 acres). However, this estimate is high since no skid trails are expected to cross stream channels and roughly 75% of all skid roads would be on pre-existing skid roads in Alternative Two and 97% in Alternative Three. In addition, all skid roads would be rehabilitated after logging activities are completed.

Machine pile and handpile burning would also result in direct effects to riparian reserves in terms of site productivity and bare soil exposure. Since machine piles typically cover up to 5% of a treatment area, the 38 acres of machine piling and burning under Alternatives Two and Three could result in hot burns on an estimated two acres. Likewise, the handpile burning prescribed over 5.2 acres would result in about 3% of the burned area (approximately $1/6^{th}$ of an acre) affected by hot pile burns where site productivity would be negatively affected.

A mitigation measure incorporated into the action alternatives would require that underburning occur during moist conditions where large down wood and duff are less likely to be completely consumed. This measure is expected to lessen impacts and meet standard and guideline FM-1. Standard and guideline FM-4 would also be met with the action alternatives since prescribed burning in riparian reserves would reduce activity fuels to reasonable levels and create adequate planting sites in openings. These activities would contribute to meeting the desired riparian forest conditions of improved diversity.

Under Alternative One, no soil disturbance from logging or pile burning would occur, thus no bare soil would be exposed and no productivity losses would occur in riparian reserves.

In summary, though some direct adverse effects to riparian forest conditions would or could take place under the action alternatives, the magnitude of these effects at the site-scale and the scale of the planning area are not considered substantial, because neither the extent nor the intensity of these impacts is substantial.

Indirect Effects

The indirect effects to riparian reserve forests are defined for this analysis as those that would occur within the riparian reserves of the Doris harvest units over the long-term (greater than two decades).

None of the alternatives construct new permanent roads within riparian reserves.

Thinning under the action alternatives would reduce snag and down wood recruitment rates compared to Alternative One by removing trees that would otherwise die from suppression mortality. The loss of suppression mortality associated with the thinning in riparian reserves would affect trees ranging in size from seven inches up to trees greater than 18 inches in some riparian stands. Since suppression mortality typically kills smaller, suppressed trees rather than the larger dominate trees, the majority of the recruitment loss associated with the action alternatives would be from smaller-sized trees (Figure 15).

The large wood recruitment loss to stream channels would be mitigated by the 50-60 foot no-cut buffers since most of the wood that naturally recruits to streams comes from within the first 65 feet of the stream (Murphy and Koski, 1989; McDade et. al 1990). The effects of this snag and down wood recruitment loss include the loss of habitat for aquatic and terrestrial species that depend on these habitat structures. Though habitat quality and quantity would be diminished, the magnitude of the thinning and gap creation effects (in terms of riparian species population declines) is not expected to be great, because only 5.5% of the planning area's riparian reserves would be affected.

The action alternatives would result in long-term beneficial effects to riparian forest structure and composition; development of late-successional conditions would occur sooner than in Alternative One. As such, under the action alternatives, standard and guideline TM-1(c) would be met. The silvicultural practices applied to control stocking in the riparian reserve contribute to meeting the objectives for desired vegetation characteristics as outlined in the Aquatic Conservation Strategy.

The created canopy gaps would approximate a moderate severity fire, which was the process that historically created gaps and triggered the initiation and development of understory layers (Zenner, 2005). Establishment of shade-tolerant conifers is an essential step in development of the multilayered characteristics of old-growth (Franklin et al. 2002). The prescribed tree planting in the one acre gaps would accelerate this process (Ref. Forest Vegetation Effects). The beneficial effects would gradually improve habitat connectivity for riparian dependant species that rely on late-successional forest conditions. Again, the magnitude of the beneficial effects from the action alternatives are slight, since only 5.5% of the riparian reserve land allocation in the planning area would experience the benefits; the rate at which these effects would accrue over time is gradual.

Alternative One would not attain these conditions throughout the modeled time frame of 100 years, and would not achieve the desired conditions of increased species and structural diversity or the acceleration of late-successional stand characteristics for riparian reserves, within the next several decades. There may be an indirect effect to riparian reserves from a potential wildfire such as loss of habitat, effective ground cover and shading of streams.

At the scale of the Layng Creek riparian reserve network and the fifth level Row River watershed, all the above indirect effects of habitat changes in the riparian reserves would not be measurable. Since the indirect effects exhibit a very low magnitude at the scale of the planning area, they would be substantially diluted at these larger scales.

STREAM CHANNELS

Streams in the planning area are primarily affected by roads that cross them or that exist near them, and by the condition of the adjacent forest that provides critical large wood. Past management practices that removed large down wood from the stream channel also impacted the stream channels by reducing channel complexity and limiting aquatic

habitat.

Riparian Reserve Road Standards and Guidelines from the Northwest Forest Plan

RF-2a. For each existing or planned road, meet Aquatic Conservation Strategy (ACS) objectives by minimizing road and landing locations in riparian reserves.

RF-2e. For each existing or planned road, meet ACS objectives by minimizing disruption of natural hydrologic flow paths, including diversion of stream flow and interception of surface and subsurface flow.

RF-3. Determine the influence of each road on the ACS objectives through watershed analysis.

RF-3a. Meet ACS objectives by reconstructing roads and associated drainage features that pose a substantial risk.

RF-3c. Meet ACS objectives by closing and stabilizing, or obliterating and stabilizing, roads based on the ongoing and potential effects considering short-term and long-term transportation needs.

Instream Standards and Guidelines from the Northwest Forest Plan

RA-4. Locate water drafting sites to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows needed to maintain riparian resources, channel conditions, and fish habitat.

FW-1. Design and implement fish habitat restoration and enhancement activities in a manner that contributes to attainment of the ACS objectives.

RF-6. Provide and maintain fish passage at all road crossings of existing and potential fish-bearing steams.

Watershed Analysis Recommendations from the 1995 Layng Creek WA

Replace or modify the stream crossing and fire pump chance migration barrier in Harvey Creek at the 1746-707 road crossing.

Storm-proof roads with cross ditches and outslope roads where maintenance levels are expected to be low.

Consider decommissioning roads in areas where densities are high and roads are not necessary for management activities.

Update the Access and Travel Management (ATM) Plan to incorporate ROD and ACS objectives.

Replace culverts that would not accommodate a 100-year flood event.

Replace culverts creating migration barriers across all fish bearing streams.

Existing and Desired Conditions

Streams are common in the planning area with an average stream density of four miles per square mile. The streams in the proposed planning units tend to be first to third order high gradient channels. Riparian trees and down large woody debris tends to help

stabilize these channels. The down wood does not have to be very large to help stabilize and add structure to these smaller channels.

Some of the streams within the units flow through sensitive soils. Refer to the Erosion and Sedimentation section for more details. These areas tend to be prone to erosion.

Road densities are highest in the riparian reserves along Mid Layng West and Mid Layng East (Table 31). Runoff from roads can be a source of fine sedimentation to stream channels. This is particularly of concern for valley bottoms (like the road paralleling Layng Creek) and the mid-sloped roads that cross several stream channels.

Roads also pose risks to the aquatic ecosystem by producing sediment to streams when culvert hydraulic capacity is exceeded. Culvert failure often results in a washout of the crossing; fill is eroded or the flow diverts down the road's ditch. During the development of the Doris Roads Analysis, stream crossings were inventoried in order to prioritize high-risk sites for failure and address standard and guideline RF-2e. The Roads Analysis satisfied standard and guideline RF-3 by assessing the influence of each road on the Aquatic Conservation Strategy objectives. In addition, the Doris Roads Analysis identified several road segments for reconstruction and inactivation to help further ACS objectives and meet standard and guideline RF-3c.

Below is a description of some of the larger streams in the planning area:

Doris

No formal stream inventory has been conducted in Doris Creek. The Layng Creek Watershed Analysis (USDA Umpqua NF, 1995, page 116) displays the correlation between mature trees in the riparian and a high amount of in-stream large woody debris. The large wood adds complexity to the stream channel that results in high quality aquatic habitat. The large in-stream wood increases pool habitat, provides hiding cover, retains spawning gravels, increases shade and provides channel and bank stability. Approximately 80% of the riparian along the fish bearing portion of Doris Creek consists of large mature and old growth trees. Field review confirmed a high amount of large wood within the stream channel resulting in a properly functioning stream.

Harvey

A stream inventory was conducted in Harvey Creek (USDA Umpqua, 1994). This inventory found the lower reach riparian trees to be predominantly hardwoods with a low amount of in-stream large wood. Overall aquatic habitat was considered poor with few pools, minimal cover habitat and minimal retention of spawning gravels. The habitat improves upstream where larger conifers are growing in the riparian resulting in more in-stream large woody debris and a substantial increase of channel complexity. Cutthroat trout number also increased in this section. There is a migration barrier where the 1746-707 Road crosses Harvey Creek. Two culverts sit side by side at this crossing and a cemented fire pump chance is located just upstream of the road. Both of these structures are currently blocking resident trout from moving upstream. Resident cutthroat were observed more than a mile upstream from 1746-707 road crossing.

East Fork Layng

A stream inventory in East Fork Layng Creek (Tioga Resources Inc., 1998)

indicated a high gradient channel. Mature conifers are common along the riparian, and large down wood is also fairly common, creating complex aquatic habitat. There is a 125-foot falls within the first mile. Resident cutthroat trout continued another 1.5 miles upstream from this barrier. The Layng Creek Watershed Analysis (USDA Umpqua NF, 1995, p.21) has indicated that East Fork Layng Creek flows through a large earth flow terrain area. The stream inventory indicated many eroding stream banks due to past landslides. These are sensitive soils that are a source of fine sedimentation into the stream channels.

Layng

The most recent stream inventory of Layng Creek was conducted in 2004 (Siskiyou Research Group, 2004). Layng Creek ranges from a low gradient sinuous channel to a high gradient canyon. The upper canyon is the only reach of Layng Creek that does not have a road parallel to the stream channel. Riparian habitat tends to consist of large mature trees; however the adjacent road limits the effectiveness of the riparian habitat. The road has also increased accessibility into Layng Creek which has resulted in the past management (late 1970's through early 1980's) of removing several log jams. This past practice over-simplified the stream resulting in a not properly functioning channel and poor aquatic habitat. Habitat does improve upstream in the canyon, once the road is no longer adjacent to the channel. In-stream large wood increases along with relative abundance of fish in this upstream reach. However, overall abundance of fish was still considered low (Siskiyou Research Group, 2004).

Desired conditions for stream channels in the planning area include: 1) decreased risk of road-related stream diversion and stream crossing failure, in keeping with ACS objective #5 that addresses the sediment regime; 2) improved habitat connectivity for upstream movement of aquatic organisms in keeping with ACS objective #3 that addresses connectivity within watersheds; and 3) maintained levels of large instream wood in keeping with ACS objective #2 that addresses stream bed and bank conditions.

Roads Analysis Recommendations

A project-level roads analysis was accomplished to meet standard and guidelines RF-3a and RF-3c. The specific recommendations are in the roads analysis.

Proposed Road Treatments

The road treatments that cross streams are similar in both action alternatives. The proposed inactivation of roads would remove several stream crossings while other crossings would be upgraded (Table 34).

Table 34. Number of stream crossings upgraded or removed.

	Alternative One	Alternatives Two and Three
Number of stream crossings upgraded	0	12 crossings upgraded (11 non-fish bearing stream crossings and 1migration barrier upgrade)

	Alternative One	Alternatives Two and Three
Number of new stream crossings	0	0
Number of existing stream crossings removed through road inactivation	0	20 crossings removed
Net change from existing condition	*0*	*-20 stream crossings removed*

All the temporary roads constructed to gain access for logging would be obliterated following use. The stream crossings removed are on roads proposed for inactivation. Inactivation includes the removal of culverts and the blocking of the road entry points to eliminate the possibility of unauthorized use.

The high priority stream crossings recommended in the Doris Roads Analysis for reconstruction or replacement are included in both action alternatives. Eleven sites that were identified in the roads analysis are proposed for treatment under the action alternatives (Table 35). These upgrades meet standard and guideline RF-3a.

Table 35. High priority stream crossings identified during roads analysis to be upgraded.

Road Number	Mile Post	Proposed Modification (cmp=corrugated metal pipe)	Diversion Potential	Avg. fill cover	Estimated sediment delivery (cubic yards)	Reconstructed through the Timber Sale Contract
1746-763	0.36	15" stream/spring cmp, replace w/24" cmp	No	5'	35	No
1746-763	0.8	30" stream cmp, replace w/48" cmp	No	inlet=12', outlet=20'	285	No
1746-763	2.02	36" stream cmp, replace w/48" cmp	No	inlet=12', outlet=18'	250	No
1746-707	0.75	24" stream cmp, replace w/36"cmp (DH#68-Dinner EA)	Yes	8'	130	No
1746-707	1.09	replace w/48" cmp with flared inlet (DH#70-Dinner EA)	No	27'	350	No
1746-529	0.5	30" stream cmp, replace w/48" cmp	Yes	13’	175	Yes
1746-529	0.72	24" stream cmp, replace w/36" cmp	No	5'	35	Yes
1746-529	1.32	24" stream cmp (rusted), replace w/24” cmp	No	6'	45	Yes

1746	8.51	24" stream cmp, replace w/48" cmp	No	6'	45	Yes
1746-707	1.76	24" stream cmp, replace w/36" cmp	Yes	21’	350	Yes
1746-707	1.95	18"stream cmp, replace w/30" cmp	Yes	7'	55	Yes

Proposed Stream Treatments

The 1746-707 road crossing and fire pump chance in Harvey Creek will be modified to allow for fish passage. Both action alternatives propose to replace the side by side culverts at this crossing with a squashed pipe designed for fish passage. The fire pump chance located immediately upstream of the road crossing would be modified by breaching the cement structure to channel width. Boulder stair step structures would be installed between the culvert inlet and the fire pump chance to help facilitate resident fish upstream passage. This fish passage project (Figure 6) would implement WA recommendations listed above and would meet standard and guideline FW-1. Most of the work to replace the culvert would occur within the confines of the existing road prism; however some equipment access into the stream would be necessary for the pump chance modification and in-stream boulder placement.

Direct Effects

The direct effects to stream channels are defined as short-term effects at the immediate location of instream project areas over a period of up to five years. This is based on observations of the recovery time for in-channel and bank disturbances associated with road reconstruction, inactivation and various stream restoration projects.

Both old and new temporary road(s) would cross small perennial and intermittent streams (refer to Proposed Riparian Forest Treatments). Construction would occur during low flow conditions when several of the streams are dry. These crossings would be used for one operating season and would be removed prior to the winter rains. This mitigation measure would help minimize erosion and sedimentation risks.

The direct effects to stream channels from road reconstruction would be increased sediment input caused by exposure of soil throughout the area where upgrading and removal of stream crossings is done. Channel banks and beds would also be highly modified during these activities by the equipment working on banks and within channels that would excavate native materials and backfill around upgraded culverts. The extent of stream channel adversely affected would average about 45 feet for each stream crossing. Both action alternatives have similar effects (Table 36).

Table 36. Stream channel disturbance by alternative.

	Alternative One	Alternatives Two and Three
Stream crossing removal with road inactivation	0	20 removals 900 lineal feet 200 cubic yards (CY) sediment
Stream crossings replacement	0	12 replacements 540 lineal feet 120 CY sediment
Totals	0	32 sites 1,440 lineal feet 320 CY sediment

The instream changes in these areas are likely to impact resident aquatic organisms, potentially killing or harming aquatic life. There is a potential to harm fish with the work at the Harvey Creek fish passage upgrade. No other culverts are located directly in fish bearing reaches. These adverse biological effects would last the several days to weeks when the machinery is operating in the channel.

Erosion and sedimentation is expected to occur while all culverts are removed and/or replaced. Vegetation, which would help stabilize the banks, is expected to establish within two years of construction. The amount of sedimentation potentially delivered with each instream construction site is estimated to be about ten cubic yards over a two-year period. This level of sedimentation from 32 dispersed instream construction sites (Table 36) associated with both action alternatives is minimal with respect to the overall sediment regime of the planning area. Moreover, the erosion control measures and best management practices listed in the roads section of Chapter Two would effectively reduce both the extent and duration of the work-site sedimentation.

Under Alternative One, no direct effects to stream channels or aquatic organisms would occur since no new roads would be built across streams and no existing stream crossings would be decommissioned.

Indirect Effects

The indirect effects to stream channels are defined as the long-term effects of the instream work that would last longer than five years, plus any downstream effects occurring in Layng Creek.

Overall, the action alternatives would both result in long-term beneficial effects to stream channel connectivity as a result of the road inactivation, culvert/fire sump upgrades and the road reconstruction compared to Alternative One, where no such work would occur. In total, both action alternatives would result in a net decrease of 20 stream crossings in vicinity streams (Table 36), which would reduce the long-term risk of stream crossing failure at eleven of the stream crossings identified in Table 34.

The 20 stream crossings removed under the action alternatives are associated with roads that would be inactivated until future needs (10-15 years). Removal of these culverts would eliminate the potential for culvert failure and associated sedimentation that may occur during the time these roads are not needed. These 20 stream crossing removals would result in overall improved aquatic connectivity to non-fish species that inhabit these smaller tributary streams. Improved connectivity equates to unabated movement of organisms up and downstream, and the free flow of water, sediment, and wood downstream, in a natural condition, compared to these same sites under Alternative One.

Under the action alternatives, the reduced risk of culvert failure at the eleven high priority stream crossings would also substantially reduce the long-term potential for sediment delivery to streams. In contrast, Alternative One would perpetuate the long-term risk of sedimentation associated with these eleven sites, which is estimated to potentially produce an estimate of 1,755 cubic yards (Table 35) if they failed during a winter storm event.

The fish passage work in Harvey Creeks proposed under both action alternatives would allow the free upstream movement of resident cutthroat trout for a total of one mile. The long-term beneficial effects to aquatic organisms associated with improved connectivity would provide the potential for isolated upstream subpopulations to re-connect with

downstream subpopulations over time. With a lack of action under Alternative One, upstream fish passage in these streams would continue to be blocked and the desired condition of improved habitat connectivity for upstream movement of aquatic organisms would not be attained.

Riparian and Stream Channel Cumulative Effects

The potential for the Doris action alternatives to result in either adverse or beneficial cumulative effects to riparian forest and riparian stream conditions is addressed at the scale of the planning area drainages. Since the direct and indirect effects to riparian forests and stream channels are of low magnitude, it is reasonable to assume that these effects would only overlap with the effects of other past, present, and foreseeable future activities at the planning area scale.

Impacts to streams and riparian forests have resulted from past road building and timber harvest in this planning area's drainages. Approximately 2,071 acres (55%) of riparian reserve acres have been harvested within the drainages associated with the planning area. Most of these stands are currently in a stem exclusion stage, outside the range of natural variability. This has resulted in an altered riparian condition and processes. The existing 19.6 miles of road in the riparian reserves within the planning area drainages continues to profoundly affect local streams at stream crossings, and to more broadly affect the overall stream system's connectivity, given the hundreds of stream crossings that exist.

Timber sales analyzed under the Dinner EA includes units within Harvey, Mid Layng East and Mid Layng West drainages. The effects to riparian and stream channels are similar to those discussed above for the Doris units. There are approximately 78 acres of riparian reserves associated with the Dinner units within these overlapping drainages. Other activities that would overlap with this project include routine road maintenance, noxious weed control, and public and administrative road use. (Tables 6 and 7). There and no other reasonably foreseeable activities would overlap with this project that would impact riparian conditions (Table 8).

Past clearcuts on federally administered lands occurred at least one to two decades ago; adverse impacts to riparian micro-climates have recovered. There is a temporal and spatial overlap with some of the Dinner EA units. However, the effects are minimal and are not expected to contribute to cumulative impacts.

The adverse direct effects of the road actions to stream conditions such as sediment delivery and direct channel habitat impacts from culvert upgrade and removal would temporally overlap with the impacts of the existing road network in planning area streams. However, the longer-term beneficial effects of the action alternatives on stream channels, including the stream crossing upgrades, removals and fish passage work, would help off-set the cumulative effects of the action alternatives.

Taken in total (Table 37), the adverse cumulative effects associated with the action alternatives are outweighed by the longer-term beneficial effects. Thus, the accelerated attainment of desired riparian forest conditions and the removal of stream connectivity barriers outweigh the short term adverse effects because the longer-term beneficial effects result in greater net benefits.

Table 37. Summary of riparian reserve actions and effects.

Riparian Actions	Riparian Change	Primary Effect (Beneficial and/or Adverse)	Duration	Amounts by Alternative	
				1	2 & 3
Thinning with canopy gaps	Lower tree density & less crown closure	Beneficial--improved species and structural diversity/late-successional characteristics	30+ years	0 ac	177 ac
		Adverse--dryer microclimate, less litter to streams/forest floor	10-20 years		
	Change in snag and down wood recruitment process	Adverse--loss of suppression mortality in smaller-sized trees	30 years		
		Beneficial--accelerated growth of larger leave trees	up to 60 years		
Road actions	Stream crossings removed with road inactivation	Adverse--increased sediment delivery at the site, & immediately downstream	2 to 3 years	0	20 sites, 200 CY sediment
	Stream crossing upgrades	Beneficial—lower risk of stream diversion and/or washout	25 years	0 sites, Higher risk	12 sites, Lower risk
Instream Restor-ation	Fish passage instream modifications	Beneficial--upstream access	25 years	0	1 mile
		Adverse--harm to organisms from equipment	1 week to 1 month	0	1 sites
Creation and treatment of activity fuel	Activity fuel created, not treated	Adverse--increased fire risk	20 years	0	73.3 ac
	Underburning	Beneficial--reintroduction of excluded process	20 years	0	40 ac
	Machine Pile	Adverse--soil disturbance, loss of site productivity, risk of weed infestations	0-20 years	0	38.4 ac

Aquatic Conservation Strategy

The riparian reserves included in this project have regenerated under dense conditions that do not reflect the historic disturbance regime. The proposed thinning and fuels treatments in the reserves under the action alternatives would implement Watershed Analysis recommendations (USDA, Umpqua NF, 2005) to use thinning and prescribed fire to manage plantation tree densities in both matrix and riparian reserve land allocations. The actions within riparian reserves under Alternatives Two and Three are in compliance with Northwest Forest Plan Riparian Reserve standard and guideline TM-1c which calls for the application of silvicultural practices that meet desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

As disclosed above under the Riparian Reserve discussion, the action alternatives would restore species composition and structural diversity of plant communities, and would also supply sufficient coarse woody debris in riparian areas. As such they are consistent with ACS objective #8. The restorative riparian thinning would also be consistent with ACS objective #9, because the thinning would provide long-term habitat for riparian dependant species of plants and animals. By restoring more open stands like those that historically developed following disturbance, the stem exclusion stands would be less prone to stand-replacement fire and more likely to develop habitat characteristics needed by riparian dependant species. Finally, at the broader scale, the riparian forest restoration under the action alternatives advances the role of riparian reserves in providing connectivity within and between watersheds, consistent with ACS objective #2. By maximizing the amount of riparian treatment in unnaturally dense stands, the stands would advance more rapidly to maturity, and would move the riparian network toward the natural range of variability of more late-successional habitat.

The instream restorative work, stream crossing upgrades and the migration barrier modification, is consistent with ACS objective #3 of restoring the physical integrity of stream shorelines, banks and bottom configurations, and ACS objective #2 of restoring unobstructed routes for aquatic species movement. The non-restorative instream road work (re-use of existing stream crossings and reconstruction of abandoned stream crossings under both action alternatives, along with one new temporary road crossing in Alternative Two) follows riparian reserve standards and guidelines for roads. Though small scale adverse effects are expected under the action alternatives, the broader long-term objective of moving riparian and upland stands toward the natural range of variability addresses the overarching intent of the Aquatic Conservation Strategy.

Alternative One would not pro-actively implement any of the objectives of the Aquatic Conservation Strategy.

Erosion and Sedimentation

Erosion and sedimentation are geomorphic processes that shape the physical appearance of the landscape and strongly influence aquatic ecosystems. The range of natural variability for sediment delivery to streams and wetlands within the planning area is considered to be very large because erosion processes are influenced by infrequent natural disturbance events such as floods and wildfire. Sedimentation[44] rates to streams are typically inconsequential on a year to year basis but can spike several orders of magnitude during large storm events. Land management has the potential to accelerate erosion rates and the volume of sediment entering streams and wetlands.

44 Sedimentation pertains to the deposition or settling of rock and soil materials in an aquatic environment.

Field verification of the proposed thinning units led to a project-level Forest Plan amendment in Chapter One. Amendment #1 reclassifies portions of unsuitable soils to suitable. These areas were determined to be stable.

Within the planning area sediment enters the aquatic environment through mass wasting, surface erosion and fluvial erosion.

MASS WASTING

Mass wasting is the dominant mechanism of sediment production within temperate rain forests of the Pacific Northwest (Naimen, et al., 1990), which includes the Layng Creek watershed. The potential mass wasting processes within the planning area include rapid-shallow landslides such as debris avalanches and in-channel debris flows, and slow-moving deeper-seated forms of mass-movement that include rotational slumps, earth flows, and soil creep. Topography has a strong influence on the form of a landslide.

Relevant Standards and Guidelines

LRMP soil standard and guideline 5 (IV-68). Prepare a risk and hazard analysis when the potential exists for triggering slope mass-movements as a result of proposed land management activities.

Alternative prescriptions or mitigation measures are required when management activities might substantially increase the potential risk or hazard of accelerating landslide activity and when that landslide activity may result in damage to aquatic resources. Units were visited by a soil scientist and evaluated for mass movement potential. A summary of findings is discussed in the effects analysis.

RF-2e. For each existing or planned road, meet Aquatic Conservation Strategy (ACS) objectives by minimizing disruption of natural hydrologic flow paths, including diversion of stream flow and interception of surface and subsurface flow (USDA/USDI, 1994).

RF-3a. Meet ACS objectives by reconstructing roads and associated drainage features that pose a substantial risk (USDA/USDI, 1994).

RF-4, Existing stream crossings determined to pose a substantial risk to riparian conditions would be improved to accommodate at least a 100-year flood. Crossings would be maintained to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure (USDA/USDI, 1994).

Existing and Desired Conditions

Slope and soil stability was field verified for the Doris units. A total of 93 acres were delineated as unstable areas prone to landslide and slope failures. These areas are considered unsuitable for timber production and therefore excluded from timber harvest. As seen in Figure 19 the unstable areas are located in units 1, 3, 8, 9, 12, 14, 16, 18, 19, 20, 22, 32 and 33.

Earth flow terrain is gently-sloping and weakly-dissected terrain where soils are finely textured, fairly deep, and poorly drained (Swanson and Swanson, 1976). The Doris planning area has both active and dormant earth flow terrain. The active earth flow was delineated out as some of the unstable areas mentioned above. The dormant earthflow is included in the 82 acres that has been identified as conditionally unsuitable, sensitive to soil disturbance. These are areas with seasonally saturated soils, ponded water, or

where shallow piping occurs. Past clearcutting has not activated movement of the dormant earth flow features in the planning area, but the network of old skid roads tended to redirect runoff, which has caused some development of localized gullies and landslides. Figure 19 displays these conditionally unsuitable areas in Units 3, 9, 16, 17, 19, 28, 29, 32 and 33. Thinning would occur, however, protection measures such as no ground based logging would apply. In addition, in order to maintain and increase root stability no gaps would be created in these areas.

Stream crossings represent potentially critical sites for mass wasting when culverts are undersized to pass large flows or become plugged by some combination of sediment and wood debris. Under these circumstances, water can divert down the road where it might exit the road in a steep area causing a rapid-shallow landslide. A total of 170 stream crossings were inventoried to assess the potential risk for sediment delivery to streams should a site failure occur by overtopping (washout) or diversion. Eleven existing steam crossings were identified within the planning area as high risk for sediment delivery. Table 35 discusses the proposed modification for these culverts. Reconstruction of these sites would reduce the risk of stream sedimentation at unstable sites to help further ACS objectives and meet S&G RF-3c.

Improperly functioning (plugged) cross drains or an insufficient number of cross drains are a chief cause of road fill failures (USDA, Forest Service, 1999). When road fills become saturated and fail, rapid-shallow landslides can occur. Existing road failures are located on roads 1746-707, 1746-763 and 1746-824. These road fill failures triggered rapid-shallow landslides into tributaries of Harvey and Layng Creeks. Road reconstruction and maintenance would improve drainage on all roads that were identified in the Doris Roads Analysis.

The desired condition is improved road drainage and stream crossings with less risk of mass wasting triggered by roads, and is intended to meet ACS objectives through improved road drainage and stream crossings that in turn results in less risk of mass wasting, and is in keeping with ACS objective #5 of restoring the sediment regime.

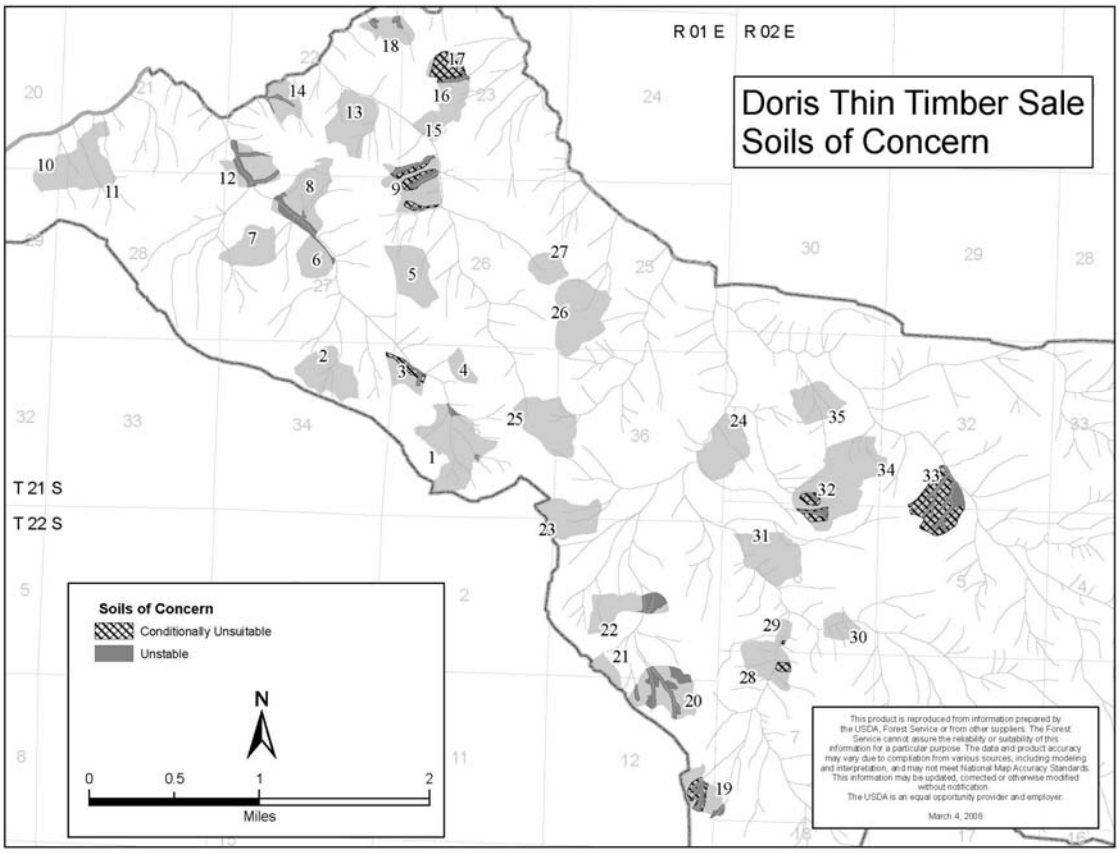

Figure 19 . Soils of Concern in the Doris planning area.

Direct and Indirect Effects

Direct effects would occur as an immediate result of the proposed road work; such work can result in immediate changes to slope stability due to changes in water routing. Indirect effects are defined as those that occur over a longer time period as a result of longer-term changes to slope stability caused by chronic road problems, thinning, and potential future fires.

The action alternatives are not expected to result in any adverse short-term direct effects or longer-term indirect effects to the aquatic environment as a result of mass wasting. The unstable soils were removed from the timber harvest base. Restrictions within Conditionally Unsuitable areas, such as no ground-based logging or created gaps, would maintain slope stability. The risk of activating any new mass movement in the earth flow terrain as a result of the thinning and logging under the action alternatives have been diminished. Moreover, since all the units now proposed for thinning have been previously clearcut and broadcast burned, and since these past intensive treatments did not activate the dormant earth flow features, it is very unlikely that the less-intensive thinning would either. For these reasons, the thinning in earth flow terrain under the action alternatives is not expected to trigger any new mass movement within the units or in downslope locations.

Under the action alternatives, an increased risk of partial stand-replacement fire would last for at least 20 years due to areas of untreated activity fuel. The planning area is not at high risk for lightning caused fires, nor is it in a high recreation use area. However,

should a fire occur within areas of untreated fuel, the probability of a full stand replacement fire is high. Therefore, the level of tree root mortality (and loss of slope stability) due to wildfire is considered inconsequential. The likelihood of additional mass wasting taking place in the planning area as a result of some future severe wildfire event is considered negligible. Alternative One would not increase the short-term fire hazard because no new fuel would be created.

The modification of the eleven high priority stream crossings (Table 35) along with road reconstruction would result in beneficial effects to the aquatic environment. Such modifications to the existing road network would decrease the risk of mass wasting and would meet the desired condition of less road-related mass wasting. The duration of these beneficial effects are expected to last for up to 20 years assuming some level of road maintenance would occur. Though the extent of these beneficial effects is limited due to the small amount of road actually treated, the magnitude of the beneficial effects is actually considered substantial. This is because the eleven culverts to be upgraded have a high chance of failure with substantial sediment delivery potential to planning area streams.

Alternative One would not result in any beneficial effects of reducing the existing mass wasting potential of high priority stream crossings.

Cumulative effects

Since there are no adverse direct or indirect effects of increased mass wasting under the action alternatives, there would be no chance of these alternatives resulting in any adverse cumulative effects to the aquatic environment.

SURFACE EROSION

Surface erosion occurs when mineral soil is exposed to the erosive forces of water, wind and gravity. This occurs in forest environments when the protective surface layer of duff and other materials such as wood and rock is removed or displaced and exposes mineral soil to erosive forces. Activities such as dragging trees across the ground during yarding, burning activity-created fuels, road building, reconstruction, or decommissioning, and timber haul on existing dirt or gravel roads, can all result in sedimentation of the aquatic environment.

Relevant Standards and Guidelines

Soil standard and guidelines #2 and #3 (USDA, Umpqua NF, 1990a) requires a minimum amount of effective ground cover (EGC) in order to meet acceptable levels of surface soil loss resulting from gravity, water, or wind action and to maintain soil productivity. Acceptable levels of ground cover must exist within the first year following the end of a ground disturbing activity. The action alternatives would maintain 85% effective ground cover in riparian reserves, along drainage ways, in areas mapped as conditionally unsuitable, and on steep slopes greater than 65%. In all other disturbance areas a minimum of 65% effective ground cover would be maintained. This minimum effective ground cover requirement is included as a mitigation measure for the action alternatives as listed in Chapter Two. If adequate ground cover is not present, certified weed free mulch or hydro-mulch would be applied as needed.

Soil standard and guideline #11 (USDA, Umpqua NF, 1990a) requires monitoring during and immediately following the implementation of prescribed burning to assess the adequacy of EGC during underburning with adjustments as needed to meet the requirements.

Soil standard and guideline #13 (USDA, Umpqua NF, 1990a) requires all areas of soil disturbance to have erosion control measures (effective ground cover and erosion control structures) in place by the beginning of the rainy season. During the rainy season (November 1 - April 30), no more than ½ acre of exposed soil (S&G#13, LRMP pp. IV-71), including landings, skid trails, and temporary roads would exist at any time without erosion control that is effective in preventing sediment from reaching streams or any concentrated surface flow in excess of one cubic foot per second (cfs).

Soils standard and guideline #16 (USDA, Umpqua NF, 1990a) requires the identification of erosion control in existing developed areas where pre-existing surface erosion is on-going.

Existing and Desired Conditions

The proposed thinning units that are located on slopes less than 55% were originally clearcut using large dozers that displaced, compacted, and exposed the soil. Tractor yarding that occurred on slopes of 35 to 55% required cutting skid trails and roads into the slope. When swales were crossed with tractors, subsurface flow was often intercepted and brought to the surface. New surface flow can result in the extension of new stream channels and the production of large quantities of surface erosion that can continue until eventually stabilized. In units 16, 21, 26, 34 and 35, skid trails and smaller haul roads were placed across swales that contained buried streams where subsurface flow runs through natural piping in the soil. This caused the pipes to collapse, and brought the flow above ground, creating new surface flow, stream extension, and more surface erosion. For the most part, slopes and streams affected by these skid trails have had time to adjust and have stabilized. An exception is the old abandoned road network in the upper portion of unit 33 where there is an active road cut slope failure.

The units located on steeper terrain were originally clearcut using a highlead[45] logging system where entire log lengths were dragged either down or uphill without any part of the log suspended off the ground. Highlead yarding often displaced large amounts of soil that ended up at the bottom of slopes and in streams, along with large amounts of large woody debris. This occurred in units 9, 18, 28 and 33, where the material later washed out in debris flows that plugged culverts and created roads failures. Most of the old surface erosion from the historic highlead logging has subsided with the recovery of ground cover and stream flow; thus restoring site productivity.

Existing roads are another source of surface erosion that leads to sedimentation of streams. Road inventories in the planning area revealed an overall low level of road prism erosion. When erosion is occurring it is mostly due to lack of broken down aggregate and lack of road maintenance on most roads that traverse the planning area.

Regular road maintenance is critical to keeping the levels of road-related surface erosion in check. However, road maintenance has declined sharply in the last two decades because fewer timber sales have occurred to help accomplish road maintenance and since appropriated funds to do road maintenance have also declined. Annual road maintenance is limited to main use roads, which are part of the primary road system identified in the Forest's Access and Travel Management Plan (USDA, Umpqua NF 2003).

7 Highlead logging was used up until the mid-1970s. The system lacked a tall tower and typically lacked the ability to suspend any portion of the log off the ground. It has been replaced by skyline logging which typically gets one end of the log off the ground.

The desired condition is to reduce total compaction (legacy plus predicted) to no more than 20% of an area (LRMP S&G 1, pp. IV68), and to reduce long-term chronic surface erosion associated with system roads, legacy skid trails, and future wildfire in keeping with ACS objective #5, which calls for the restoration of sediment regimes.

Direct Effects

Direct effects are defined as the short-term effects of sedimentation that might occur within planning area streams as an immediate result of the proposed road work, timber haul, logging and treatment of activity fuels with fire.

Alternative One would result in no short-term impacts to the surface erosion processes because no ground-disturbing activities would occur.

Roads are a source of surface erosion that leads to sedimentation of streams. Grading and graveling dirt roads in the action alternatives would help to decrease erosion by more effectively dispersing surface water before it becomes concentrated as runoff over road surfaces. The potential benefit from increased road maintenance in the project planning area would be similar between action alternatives, reducing the potential for sediment delivery over the next ten years from roads after the sale has closed and traffic is reduced.

Alternative Two would utilize 6.6 miles of previously used and abandoned temporary roads. An additional 2.2 miles of new temporary roads would be constructed. Alternative Three would utilize the same 6.4 miles of previously used and abandoned temporary roads. However, only 0.2 miles of new temporary road would be constructed. Alternative Two would have one more temporary stream crossing than Alternative Three. Erosion and sedimentation from temporary roads are expected to be low and a difference in effects between alternatives is not expected to be measurable.

The mitigation of subsoiling has the direct effect of reducing disturbance and restoring site productivity (Ref. Mitigation section, Soil and Site Productivity). The additional stream crossing is an intermittent stream and mitigation measures such as limiting stream crossings construction to the dry season and removed these crossings during the same operating season would help reduce sedimentation and erosion concerns. When considering winter haul as a factor, Alternative Two would have the potential risk for delivering slightly more sediment to streams than Alternative Three. However mitigation measures reduce these risks and all temporary stream crossings would be removed prior to winter haul. Implementing stream crossing improvements would have a net benefit of reducing the potential sediment delivery in all action alternatives once the original soil disturbance has been revegetated.

Indirect Effects

Indirect effects are defined as the effects of delivery of sediment from surface erosion to streams within the planning area that can continue to contribute large spikes of fine sediment for several years or longer. Indirect effects are also defined as effects that could occur downstream in Layng Creek if a substantial storm event should occur immediately following the ground disturbance.

Based on the analysis described below in the cumulative effects section it is reasonable to assume that the projected amounts of sediment associated with Alternatives Two and Three are unlikely to result in an indirect adverse turbidity spike downstream of the planning area. This is because the amount of predicted surface erosion associated with the action alternatives is not expected to exceed the capacity of the local streams to

properly store, route, and transport their burden of sediment. Based on sediment analysis and turbidity monitoring records between 1982 to the present, any spikes of sediment into the system would be expected to recover within one to two years.

Cumulative Effects

An analysis of soil erosion potential considers soil texture, slope steepness, changes in topography, precipitation, runoff potential and vegetation cover, and incorporates disturbances such as exposed, compacted, and severely burned soil. The cumulative potential for hill slope erosion and runoff from roads and harvest to deliver sediment to streams was evaluated using Disturbed WEPP (Eliot 2005), WEPP: Road (Elliot et al. 1999) and GIS modeling. Curran Junetta and Dinner (other recently analyzed timber sales in the Layng Creek Subwatershed) were run through the model. Modeled sediment delivery is presented as a relative comparison, but the models tend to over-predict, thus delivery rates represent a worse case scenario.

The Dinner Timber Sale Environmental Assessment (USDA, Umpqua NF, 2006b) discusses these results in detail; that discussion is incorporated by reference here. In summary, the results from the sediment analysis indicate that Layng Creek was in a sediment laden state from the 1950s up until 1983. Turbidity in Layng Creek was recognized as a concern in the 1970s when the drinking water going to Cottage Grove did not meet State standards. In response, the Forest Service initiated a turbidity monitoring program in 1976, reduced the annual timber harvest in the Layng Creek Watershed, and implemented restoration projects to reduce surface erosion. A large (several thousand cubic yard) failure occurred in Layng Creek in about 1976, while sediment from past harvest and road building practices was probably still moving through the system and Layng Creek was receiving heavy truck traffic. By 1982, the watershed appeared to have returned to a more resilient state; sediment delivery and increased turbidity quickly recovered. Sediment delivery potential estimated for a ten-year storm event in 1989, and a 100-year event in 1997, only resulted in minor measured turbidity spikes with recovery to pre-event levels by year two after each event.

When considering past, present, and reasonably foreseeable future activities the effect of implementing either action alternative would result in lower sediment delivery potentials than occurred in 1989. Therefore it is reasonable to assume that no adverse cumulative effects from sediment delivery would occur to water quality or fisheries as a result of implementing Alternatives Two or Three.

FLUVIAL EROSION

Fluvial erosion is the erosion of stream banks and stream beds from the forces of water. Stream channels change both spatially and temporally under the fundamental influences of climate, geology, and topography. These factors help determine the stream flow and sediment regimes, as well as riparian vegetation which provides in-stream wood. Disturbances can affect stream channel form and the equilibrium between sediment input and output.

Relevant Standards and Guidelines

The relevant standard and guidelines from the LRMP related to fluvial erosion is watershed cumulative effects and water quality standard and guideline #2: Beneficial uses of water and aquatic habitats would not be degraded by scoured stream channels

caused by timber harvest, road construction, and related activities.

Existing Condition

Vegetation along stream banks helps bind finely textured soil in place and provides physical resistance to fluvial erosion. Past logging practices within the planning area have sometimes affected stream channels. Clearcutting of riparian vegetation, especially along the near vertical banks of sensitive stream channels, have contributed to bank instability and resulted in sediment delivery. Past logging disturbances from yarding old-growth near and across sensitive channels, without suspension or mitigation measures, has also influenced potential delivery of sediment to these stream channels. The removal of large channel wood has changed channel stability and effected sediment storage, delivery, and routing.

Streams of concern are often, but not exclusively, associated with sensitive and unstable soils. These channels frequently lack the complex geology structure in the form of various size substrates (cobbles and small to large-sized boulders) and are dependent on external input, specifically large wood recruitment, for channel complexity and stability. The erosion processes associated with these channels involve a high proportion of fine sediments that have little armoring of the bed and banks (USDA, Umpqua NF, 1995). As a result they often have little resistance to down-cutting and bank erosion during winter storm flow.

Streams in areas mapped as unstable (Figure 19) tend to be more prone to erosion and bank instability. Field review indicated that streams in units 6, 8, 9, 12, 14, 19, 20, 22 and 33 are of particular concern.

Direct and Indirect Effects

Direct effects from fluvial erosion are described at the scale of stream segments within or adjacent to harvest units and that occur during the activity. Indirect effects occur after the activity at the disturbed stream segment, or downstream at the subwatershed or watershed scale, over two to three decades.

Alternative One would not change existing fluvial erosion processes that are currently occurring. Future recruitment of large instream wood that would stabilize and provide storage of channel sediment would be delayed because the overstocked riparian stand condition of dense, young trees would delay the development of large trees along channels.

Under the action alternatives, no thin buffers would help maintain bank stability. In most cases the 55’ no thin buffer along perennial streams adequately protected the streams of concern. However, where necessary, such as in units 6, 8, 12, 14 and 33, the no thin widths along perennial streams were increased and no thin buffers along intermittent streams were added. These measures help to minimize bank erosion concerns.

None of the action alternatives would increase peak flows or accelerate sedimentation that could affect fluvial erosion. The riparian reserve thinning would improve overall health and vigor of the riparian leave trees, and would improve the potential future channel recruitment of large wood while reducing the long-term risk of wildfire impacts on the riparian reserves. Therefore, no direct or indirect effects associated with fluvial erosion in planning area streams would occur.

Cumulative Effects

Alternative One would not incrementally add to past, present, or reasonably foreseeable future activities to cause a cumulative fluvial erosion effect since no action would occur.

Since Alternatives Two and Three would not cause any direct or indirect fluvial erosion (as described above), they would not have any effects that could incrementally add to past, present, or reasonably foreseeable future activities at any of the analysis scales; thus no cumulative effect would occur.

Aquatic Conservation Strategy

Large historic wildfires were the primary drivers of fluvial erosion when occasional stand replacement fires killed large areas of trees and caused peak flow increases. The advent of industrial forestry and fire suppression clear-cuts and roads are the primary drivers of peak flow increases and associated impacts that cause fluvial erosion. Since the action alternatives apply all relevant standards and guidelines, and since they were developed to contribute to restoring the fifth level watershed over the long term (USDA, Umpqua NF, 1995), they are in keeping with the intent of the Aquatic Conservation Strategy.

The historic sediment regime was one of occasional, episodic sediment delivery following large scale fires. Wildfire occurred in particular drainages, followed by years of recovery with little to no disturbance (Reeves et al, 1995). Most of the sediment delivery came from mass wasting and fluvial erosion triggered by large post-fire rain storms, rather than from surface erosion. The sediment regime is now dominated by on-going, chronic sediment delivery at lower levels, occurring most every winter, due to the road system. Fire suppression has temporarily curtailed the pre-management sediment regime of occasional, episodic sedimentation. Yet, as fire hazard builds due to the lack of natural fire and the preponderance of unnaturally dense plantations, more extreme sediment pulses are expected once wildfire escapes control efforts.

The Doris alternatives were purposefully designed to minimize the chance of large scale fire within the proposed units. This in turn helps maintain and restore the sediment regime. Moreover, the long-term benefits of the restorative road activities under the action alternatives outweigh the short-term impacts of road work needed to implement the thinning. As such, the action alternatives are consistent with ACS objective #5, which calls for the restoration of sediment regimes.

Alternative One would not proactively address the Aquatic Conservation Strategy.

Specifically Required and Other Disclosures

RECREATION

Existing and Desired Conditions

The Doris planning area is inventoried as “roaded modified” according to the Recreation Opportunity Spectrum[46] (ROS) inventory system. The area is characterized by

46 Recreation Opportunity Spectrum (ROS) definition of Roaded Modified: An area characterized by a natural environment with much evidence of the works of humans. Such evidence usually dominates the natural environment.

predominantly natural appearing environments, with evidence of the sights and sounds of people.

The Doris planning area is entirely within the Layng Creek subwatershed, which is managed as an "open" Municipal Watershed for the city of Cottage Grove. General recreation use is not encouraged above the water intake because of potential adverse effects on the quality of the water supply, and therefore there are no developed campgrounds or trails within the planning area. Day use activities such as driving, hiking, fishing, hunting, and gathering forest products are allowed; however, overnight camping and water based activities (swimming) are not permitted.

While recreation is not encouraged and certain activities are limited or prohibited by regulation in the Layng Creek subwatershed, there are a few individual dispersed camp areas within the Doris planning area. Most of these dispersed sites are typically located at the end of a spur road, or where old harvest landings have created a secluded flat area. These isolated dispersed spots are typically remote and infrequently used due to the prohibitions on overnight camping and the limitation of other developed recreation opportunities in the watershed.

Relevant Standards and Guidelines

For Layng Creek, the Forest Plan lists the following Standards and Guidelines:

1. Overnight camping, swimming, and developed recreation sites would not be allowed.
2. Dispersed day use is permitted, but increased usage shall not be encouraged.
3. Control recreational vehicle use on roads during wet periods through a travel management plan. In the interim, wet-period travel would be restricted to paved or rocked roads.
4. ROS class for the Layng Creek municipal watershed is roaded modified.
5. All standards and guidelines for this area would continue to be met with this project.

Watershed Analysis Recommendations

No recommendations relevant to recreation were made in the 2005 Layng Creek WA iteration. Actions associated with Alternatives Two and Three would continue to implement the recommendations of not encouraging general recreation.

Direct and Indirect Effects

The type of recreational opportunities that exist within the Doris planning area would remain relatively static, with a continued trend toward slight increases in the quantity of recreation use under Alternative One. The occurrence of illegal overnight camping at dispersed sites is also expected to increase due to an overall increase in the number of forest visitors seeking remoteness. Because no proposed activities would occur that would affect these illegal dispersed recreation sites, Alternative One (No Action) would not directly or indirectly have an effect on forest visitors.

Commercial thinning of approximately 1000 acres under both action alternatives may have some short-term direct effects on recreation from noise disturbance during logging.

This impact is expected to be minor and short-lived due to the limited amount of traffic and existing prohibition on camping.

Road construction activities proposed in both Alternatives Two and Three would normally have some seasonal indirect effect on recreation road use; however, the increase in road miles is short-lived since these same miles are scheduled for obliteration following proposed activities. In addition, 6.6 miles of existing road is proposed for obliteration in both action alternatives. Most of these miles of existing non-system roads have been closed to vehicular use due to maintenance standards and watershed limitations, but they continue to provide for recreational foot access. Decommissioned road miles would eliminate all vehicular traffic and would be slightly more difficult to walk on, and therefore would affect the ability of hunters to travel those short spur roads by foot. This impact is very small given the short segments that would be obliterated.

Considering the above minimal effects, the implementation of Alternatives Two or Three would have no long-term or noteworthy direct or indirect effects on the recreation resource.

Cumulative Effects

The scale at which cumulative effects are analyzed is the planning area. There are currently no new recreation projects proposed within the planning area since there would be no direct or indirect effects, no cumulative effects would occur.

VISUALS

Existing and Desired Conditions

The Visual Management System is a tool used to recognize the scenic qualities of a specific area. It establishes criteria for identification and classification of, as well as visitor's concern for, scenic quality. Each visual quality objective (VQO[47]) represents the degree of alteration from the natural appearing environment. The Umpqua LRMP applies the Visual Management System Inventory (VMSI) as a minimum standard that projects should achieve when implemented. The visual resources can also be described by the USDA's National Forest Scenery Management System (SMS) (Agriculture Handbook Number 701). The Umpqua LRMP has not been amended to officially adopt this system. However, SMS terms are described in parenthesis where applicable, in order to provide information as to how the alternatives address visual resource protection.

Management of visual resources requires proposed activities to comply with the assigned objective; these objectives include retention (high scenic integrity), partial retention (moderate scenic integrity), modification (low scenic integrity), or maximum modification (very low scenic integrity).

47 The VQO inventory is divided into three components: the distance zone, the sensitivity level (constituent information), and the variety class (scenic attractiveness). The distance zones are described as FG-foreground, MG-middleground, and BG-background. The sensitivity level (1-highest, 2-average sensitivity, and 3-lowest) rates the concern for scenic quality. The visual inventory also describes the primary and sometimes the secondary place where a specific area can be viewed. This is usually from a prominent point of view or primary use area, or a particular road. Variety class relates to how distinct or common the visual resource is.

Of the total acreage of the Doris Planning Area, less than 0.1% has the VQO of partial retention; nearly 90% is modification, and 10% is maximum modification (Table 38). Approximately 70 acres of the Harvey Timber Sale was clear-cut harvested in the mid 1980's, thereby creating several large "created openings" that encompasses less than 1% of the Doris planning area. These acres have since been replanted and for the most part are no longer considered "created openings". There are no "special features" identified in the LRMP that are located in the Doris Planning Area; therefore, there are no sensitive or substantial visual quality concerns.

Table 38. Acres of VQO and VQO Standards for Implementation.

Visual Quality Objective	Planning Area Acres	Percent of Planning Area	Distance Zone	Recommended Range of Opening Size	Recommended Maximum Percent of Created Opening at Any One Time
Partial Retention (N/A, no proposed units in PR areas)	**12**	**0.1%**	**Foreground 0-500' Foreground 500'>**	**0.5-1.5 1-8**	**10% 15%**
Modification	**10,154**	**90%**	**Middleground Background**	**Site Specific Analysis**	**25% Middleground 30% Background**
Maximum Modification	**1,169**	**10%**	**All**	**Site Specific Analysis**	**33%**
Totals	**App. 11,335**	**100%**	**N/A**	**N/A**	**N/A**

Relevant Standards and Guidelines

Visual Standards & Guidelines are listed in the Umpqua LRMP on pages IV-19 to IV-26

Specifically for this project, the Umpqua LRMP lists the following standards and guidelines:

- Management activities in partial retention areas must remain visually sub-ordinate by repeating form, line, color or texture common to the characteristic landscape. In areas with a VQO of modification, management activities may visually dominate the landscape; however, roads and visible remnants from logging such as slash and stumps, etc. should remain visually subordinate to the landscape. The maximum modification VQO allows management activities of vegetative and landform alternations to dominate the landscape.
- The maximum percentage of created openings at any one time is based on the VQO objective and distance zone, and is described in the above VQO table.
- A harvest unit is considered to be a created opening when the average stand height is less than 20 feet tall in fore and middle ground distance zones, and is less than 4.5

feet tall in background distance zones. Commercial harvest units are not considered to meet the definition of a created opening.

- Activity slash within view sheds shall be treated commensurate with the VQO.

Direct and Indirect Effects

Less than 1% of the planning area meets the Forest Plan definition of created openings. This is well below the recommended 25-33% maximum percentage of created openings within areas of modification and maximum modification VQO's. Alternative One (No Action) would have no direct, indirect, or cumulative effects to the visual quality of the area because no additional created openings would be produced.

Under Alternatives Two and Three all of the proposed harvest units (totaling approximately 1000 acres) are commercial thin units; no clear-cut harvest units are proposed. The action alternatives also propose the creation of one and ¼ acre gaps (Ref. Vegetation Section). Since these proposed gaps or created openings are one acre or less in size they meet the Visual Quality Objectives and would remain visually unnoticeable from any sensitive viewing area. The percentage of created openings would continue to be well below the recommended maximum percentages in the of modification and maximum modification VQO's allowed by the Forest Plan.

Both proposed action alternatives and the applicable prescriptions for each of the units are well below the recommended Forest Plan Visual Quality Objective Standards for implementation as described in Table 38. All of the proposed commercial thinning and road construction areas are located in VQO areas designated as either modification or maximum modification; there are no areas within partial retention acres. Therefore, harvesting and construction activities would have minimal short-term direct effects on forest visitors passing through the area.

There would be relatively no substantial change to the landscape as viewed from any sensitive viewing area; therefore, there would be no direct or indirect effects on the visual resource. All Forest Plan Standards and Guidelines would be met with all alternatives.

Cumulative Effects

The scale at which cumulative effects are analyzed is the planning area. The most recent clearcut harvest units in the Doris planning area was the Harvey Timber Sale in the mid 1980's. Most of this area has since revegetated and only a small area could still be considered a created opening. According to Forest Plan direction, neither action alternative would further create any substantially visible change to the landscape. There would be no overlap in time or space with any past or reasonably foreseeable activity resulting from the proposed commercial thinning. Because there would be no visible change or overlap, there would be no cumulative effects on the visual resource with implementation of either action alternative.

HERITAGE RESOURCES

The affected environment for heritage resources falls within the areas of proposed ground disturbing activities (timber harvest, fuels treatment, road construction, reconstruction, and decommissioning, subsoiling, landing construction, etc.).

Forest Plan goals and objectives and Cultural Resource (Heritage) Standards and Guidelines are listed in Chapter IV, pages 28-30 of the Umpqua National Forest LRMP. All applicable Standards and Guidelines have been met through the inventory and evaluation of any historic or prehistoric heritage resources.

A heritage resource inventory was conducted as part of the compliance process of section 106 of the National Historic Preservation Act of 1966. The Doris Timber Sale Project Reconnaissance Report has been completed and submitted to the State Historic Preservation Office (SHPO) as required; concurrence is expected. The Doris Timber Sale project meets the Stipulation III (B)1 Programmatic Agreement[48] (PA) for a "No Historic Properties Affected Determination."

Field surveys discovered several historic artifacts related to logging in the 1950's; these historic remains (logging cable, equipment debris) were noted and considered to be insignificant. Three prehistoric isolates were located in three different proposed units. These isolates were documented and collected and the areas within these units were identified as high probability and recommended for post-activity monitoring. The potential exists for unidentified heritage resources in the Doris project area, especially in areas where heavy shrub cover made surveying difficult. Mitigation measures described in Chapter Two would protect undiscovered heritage resources, reducing the potential for effects to these resources. Overall, proposed ground disturbing activities would have no potential to affect known heritage resources. Standard contract provisions would provide for protection of unknown heritage resources discovered during project implementation.

The Umpqua National Forest sent a cover letter with the quarterly copies of the Schedule of Proposed Action (SOPA) to each of the Tribes. Each quarter, the cover letter highlights new projects that may be of interest to the Tribes; the Doris Timber Sale was identified as a new project. The Confederated Tribes of the Grand Rhonde, Confederated Tribes of the Siletz, and the Cow Creek Band of Umpqua Tribe of Indians were contacted by Debra Barner, Heritage Program Manager for the Forest. Other contacts in the form of phone calls, letters, and opportunities to participate in public tours and meetings at Tribal offices and elsewhere were also utilized to interact with the Tribes. No interest in this project was expressed by any of the tribes.

Under the treaties with the Tribes, no trust resources or reserved treaty rights are given for the lands managed by the Umpqua National Forest. Therefore, no effects to trust resources or reserved treaty rights would occur with any of the alternatives.

Direct, Indirect, and Cumulative Effects

Based on the results of the heritage surveys, review and avoidance mitigation of known heritage resources, mitigation for undiscovered sites, and consultation with tribes, there would be no direct, indirect, and thus no cumulative effects on heritage resources as the result of implementing either of the action alternatives. There are no direct, indirect or cumulative effects as a result of no action.

AIR QUALITY

The Fire Weather Regulated Use Map for the State Forester's Smoke Management Instructions identifies the Cottage Grove Ranger District as Cascade Range Zone 617.

48 The Stipulation III (B)1 Programmatic Agreement is between the Advisory Council on Historic Preservation (ACHP), Oregon State Historic Preservation Office, and the United States Forest Service, Region 6.

Doris is 20-21 miles from the Willamette Valley designated area and is within the Oakridge Special Protection Zone. This zone requires that from November 15th through February 15th the Forest Service checks the Oregon Smoke Management Advisory for special instructions for this area. These instructions may put further restrictions on burning done on the District during this time.

The closest Class I areas are Diamond Peak and Three Sisters Wilderness areas. The closest Class II areas are the Boulder Creek and Waldo Lake Wilderness areas. Burning would not impact these areas during the July 1 to September 15 restricted period. At the time of year burning would be conducted, smoke produced would not reach these areas; sufficient heat is needed to loft smoke to the heights necessary to carry the smoke those distances. That heat would not likely be produced, as a cooler burn would be required to protect residual trees and coarse woody debris (CWD).

Oakridge is the main population center that could be affected by the smoke from these stands. Burn planning would require favorable winds that would carry smoke away from the town. Based on past experience in this area, the smoke produced would likely disperse well before reaching populated areas.

Different treatment options cause different emission effects. Hand pile burning is usually done in the late fall to early spring months; consumption occurs mostly in the flaming phase and smoldering is minimal. Jackpot and underburning consume much of the fuels in the flaming stage of combustion, and can contribute to emissions in the smoldering phase if not mopped up afterward.

Utilizing burning techniques that minimize consumption in the smoldering phase of burning can directly influence emissions production. Early season (spring, early summer) burning can lessen emissions output by reducing primarily 0-3 inch fuels and leaving the majority of the duff and litter layer and larger woody material intact; these are the fuels that tend to generate the most emissions from the smoldering phase of combustion.

Through the plans and techniques described above, the health standards established by the Environmental Protection Agency (EPA) would likely be met. Prior to any burning, data is entered into a smoke management software program that can estimate emissions given certain weather, burn prescription and site parameters. This software is part of the Oregon Smoke Management Program, and is also used to record and document burn information for the State of Oregon.

Particulate Matter

The major pollutant of concern from smoke is fine particulate matter (Sandberg et al. 2002), which can travel great distances, reduce visibility, and absorb and transmit harmful gases. EPA standards have been established for two classes of airborne particulate matter – PM 10 and PM 2.5. PM 10 is particulate matter less than 10 microns in diameter while PM 2.5 is a subset that is less than 2.5 microns in diameter. Studies indicate that 90 percent of all smoke particles emitted during burning (both prescribed and wildland fire) are PM 10; of these, the majority are PM 2.5 (Hardy et. al. 1991). PM 2.5 causes the majority of air quality impacts. Human health studies on the effects of particulate matter indicate that fine particles are largely responsible for health effects (O'Neill et al. 1997).

Direct and Indirect Effects

Particulate matter emissions were estimated for the Doris Project using the Consume 3.0 model (Ottmar, et al 2006). In Table 39, the differences between PM 2.5 emissions from fuels treatments and emissions from wildfire are compared.

In comparing the direct effects of the alternatives, Table 39 shows that the direct effect of Alternative One results in no emissions produced (because no fuel treatment would occur), as compared to 280 and 275 tons of PM 2.5 for the action alternatives. The amounts of PM 2.5 displayed include all burning that would occur. Because not all units would be burned the same day and not all piles would be burned at the same time, the amount of emissions produced is not likely to affect population centers. This is because the emissions would last only a short time (the day of the burning) and would disperse rapidly, minimizing any direct effects to humans. In addition, the burning is carried out in a way that results in rapid burns with short residence time (of flaming combustion), and the lowest amount of smoldering possible. These short duration fires create the least amount of emissions, while smoldering creates the most.

If a wildfire should occur in the future over the Doris Planning Area, the production of PM 2.5 emissions in treated stands would be less than what would be produced if no fuels treatment were to occur (Alternative One). In a severe wildfire in unharvested stands (Alternative One), emissions would be about 60 percent greater than those of thinned and activity fuels treated stands, and 54 percent greater than units only receiving thinning. This is due to the presence of more standing and surface fuels that would be available. Table 39 illustrates the beneficial effect of thinning and slash treatment over no action in terms of total PM 2.5 produced.

Table 39. Total PM 2.5 Emissions in Tons by Alternative.

Fuels Treatment	Total PM2.5 Emissions From Fuels Treatment	Total PM2.5 Emissions with Future Wildfire on acres receiving fuels treatment	Total PM2.5 Emissions with Future Wildfire on acres receiving no fuels treatment
Alternative 1	0	N/A	1174
Alternatives 2	280	457	638
Alternative 3	275	449	649

The effects of the emissions would cause temporary and short-term visibility impacts in the immediate project area during ignition and burning of activity-created fuels. The duration and extent of the effects would be affected by wind speed and direction. Weather systems can cause inversions that would affect dispersal of smoke down wind. The localized effects of burning in the project area would be short-term degradation of air quality from prescribed burning, primarily during the initial burning stage and during inversions. Smoke from prescribed burning may be visible to people driving through the area. The impacts to recreationists would likely be limited to the day of the burn, since camping is prohibited in the planning area. Burning piles in the fall would have minimal impacts to hunters or dispersed recreation users; this is due primarily to the favorable dispersal of smoke in the fall. Hunters in the area may be affected for a short period of time (the day of the burn), but would not experience adverse long-term impacts.

Very minor amounts of particulates would be generated by road work and road use during harvest activities. Dust abatement may be used on roads during dry periods to minimize this particulate source.

Cumulative Effects

The area encompassing the designated area of Cottage Grove is the scale at which cumulative effects are analyzed for air quality. There is one on-going project (Dinner) that, when combined with any of the alternatives associated the Doris project, might contribute to cumulative effects for PM 2.5 emissions. In addition there are future projects that might produce emissions that affect air quality (Table 8). The Curran/Junetta Timber Sale will treat (thin and slash treatment) an area similar in size (approximately 1200 acres) to the Doris project. In addition Holland/Moon Salt is estimated to treat an additional 1,200 acres in the same manner.

It is reasonable to expect similar particulate emissions if the prescribed fuels treatments for the Curran Junetta, Dessert and Dinner Timber Sales are similar to that proposed for this project. If fuels treatment occurs simultaneously on these three sales, there would be a potential cumulative effect of increased fine particulate matter in the Layng Creek sub-watershed. It is unlikely that these two projects, and this project, would have slash treatment occurring at the same time. Burning in all planning areas in the same burn season would be more likely to occur on successive days. In either case, there would be limits set by Oregon Smoke Management as to how much could be burned in a given time period.

Burning conducted by other user groups or the public (firewood burning for heat or slash burning on other lands) may also occur at the same time that burning for the Doris project occurs. The Forest Service is required to file a burn plan with Oregon Department of Environmental Quality (ODEQ) and would comply with the strict standards for air quality. ODEQ would not allow burning when atmospheric conditions exist that may result in an inversion and, because they regulate most burning (state, private and federal) there it is unlikely that the effects from the Doris Project would add to the effects of other burning in the area. Therefore, it is very unlikely that there would be negative cumulative effects to air quality.

Specifically Required and Other Disclosures

NATIONAL FOREST MANAGEMENT ACT DETERMINATION OF SIGNIFICANCE

In terms of the proposed Forest Plan Amendment, the responsible official would make a Determination of Significance of Change to the Forest Plan in the Decision Notice/Finding of No Significant Impact. In order to make that determination, FSH 1909.12, Section 5.32, outlines the factors to be used to determine whether a proposed change to the LRMP is significant or not significant, based on National Forest Management Act requirements. A discussion of each of these four factors follows.

1. Timing. Determine whether the change is necessary during or after the plan period. In most cases, the later the change, the less likely it is to be significant for the forest plan. The proposed amendments are necessary now in order to efficiently thin the second growth stands in the Doris Planning Area. The LRMP was written in 1990 when the assumptions were that most harvest would be done through clearcutting of old-growth; this project focuses on thinning second growth stands and many of the protection measures outlined in Appendix G are not needed. In addition, the LRMP allows for updating earth flow terrain as proposed

with the project and is considered timely now. Currently, the LRMP is 18 years old and is scheduled for revision in 2008. The plan is currently at the end of the planning cycle. Therefore, timing is not considered to be a significant factor related to the amendments.

2. Location and Size. Define the relationship of the affected area to the overall planning area. In most cases, the smaller the area affected by the change, the less likely it is to be a significant for the forest plan. The proposed amendments are specific to Layng Creek subwatershed, and apply only to a subset of the 1,000 acre treatment in the planning area. Given the acreage of the Forest (about 1,000,000 acres) the proposal affects less than one percent of the land area. Therefore, the location and size of the area involved in the proposed amendment are not considered to be significant.

3. Goals, Objectives, and Outputs. Determine whether the change would alter long-term levels of goods and services projected by the forest plan. The proposed amendments would not change existing goals or outputs as defined by the Forest Plan and would not result in changes in the level of goods and services currently being produced, which are consistent with levels projected by the LRMP. Therefore, the goals, objectives, and outputs are not considered to be a significant factor related to the proposed amendment.

4. Management Prescription. Determine whether the change in a management prescription is only for a specific situation or whether it would apply to future decisions throughout the planning area. The proposed amendments would eliminate or waive restrictions on certain yarding, road building, or logging practices within the Layng Creek municipal watershed for this project. These were the same amendments used for the Dinner and Curran Junetta. In addition, a Forest Plan amendment for the recent Curran Junetta and Crawdog EAs allow thinning up to the boundary of the hardwoods, will be used. These combined amendments will be site-specifically used for the Doris project. No permanent changes to the Standards and Guidelines or Management Prescriptions would occur. The Holland Moonsalt Timber Sale Project, planned for 2009, may also prescribe some of the same practices and require some of the same amendments. However, that project is in the very early stages of planning and it is not known whether or not some of the amendment language proposed for this project would be used. Therefore, the change in management prescription is for this specific situation and project, and is not considered to be a significant factor related to the proposed amendment.

UNIQUE HABITATS

Unique habitats are discussed in Chapter Three, under the terrestrial section. No further information will be added here.

WETLANDS AND FLOODPLAINS

Floodplains are associated with perennial streams and vary from only a few feet to much larger areas depending on the size of the stream and the topography of the streambanks and surrounding area. The action alternatives propose thinning and fuel treatments in several riparian areas. The action alternatives would also upgrade eleven culverts. The connected actions for both alternatives, which have definable floodplains, would include removal of 20 culverts through road inactivation, maintenance of six fire sumps, and replacement of a migration barrier culvert/fire sump chance located where Harvey Creek crosses the 1746-707 road. These actions would be improvements over the existing condition by reducing erosion risks. No new occupancy of project floodplains would

occur; the culvert replacements and related road work would occur within the original locations.

No effects to floodplains associated with timber harvest under any action alternative would occur since perennial streams would all receive no-cut buffers. No adverse direct, indirect, or cumulative effects to floodplains are expected to occur.

The environmental effects of road reconstruction and inactivation within the floodplain are consistent with the Standards and Guidelines for the Umpqua National Forest LRMP have been evaluated and declared in the LRMP Final EIS (USDA, Umpqua NF. 1990a). Since the activities in this project follow those Standards and Guidelines, this activity would not be declared separately for this sale.

Small wetlands are dispersed throughout the planning area and located within most of the units. The wetlands range from 0.2 to 2.2 acres with an average wetland size of about 0.9 acres. No thinning or yarding would occur in the wetlands as described in mitigation measures included in Chapter Two, and a 50 foot no-cut buffer would be site specifically applied. Underburning would not be initiated in wetlands, but would likely back into portions of some wetlands. The effects could be beneficial. This is because the species of plants found in this site are expected to thrive in the years following the underburn. Given the design features and mitigation incorporated into the action alternatives and the anticipated beneficial effects; no adverse direct, indirect, or cumulative effects to wetlands are anticipated under any of the Doris alternatives.

PRIME FARMLANDS, RANGELANDS, FORESTLANDS, AND PARKLANDS

No prime farmlands, rangelands, forestlands or parklands exist within the area; therefore; no direct, indirect or cumulative effects would occur.

POTENTIAL OR UNUSUAL EXPENDITURES OF ENERGY

The action alternatives would require expenditures of fuel for workers to access the project area, use power equipment, and to utilize the logging systems. In addition, jet fuel use for helicopter operations would also occur under Alternatives Two and Three (as was discussed in the Economic section); overall, these alternatives would not result in any unusual expenditure of fuel. The no action alternative would require no expenditure of fuel. No other direct, indirect, or cumulative effects are expected to occur with any of the alternatives.

CONFLICTS WITH PLANS, POLICIES, OR OTHER JURISDICTIONS

Implementation of any of the alternatives would not conflict with the plans or policies of other jurisdictions, including the Tribes. This project would not conflict with any other policies, regulations, or laws, including the Clean Water Act, Endangered Species Act, and the National Historic Preservation Act. Effects to air quality and compliance with the Clean Air Act are described in this chapter. No Inventoried Roadless Areas would be affected by this project.

CONSUMERS, CIVIL RIGHTS, MINORITY GROUPS, AND WOMEN

Contracting procedures would ensure that projects made available to contractors through this project would be advertised and awarded in a manner that gives proper consideration to minority and women-owned business groups. Because of this consideration, there would be no direct, indirect, or cumulative effects to consumers, civil rights, minority groups with implementation of any of the alternatives.

ENVIRONMENTAL JUSTICE

On February 11, 1994, President Clinton signed Executive Order 12898. This order directs Federal agencies to address environmental justice by identifying and disclosing the effects of the proposed activities on minority and low-income populations. The effects of the proposed alternatives on the economic conditions of the State and county are disclosed in the Economics section of this document.

According to statistical data for Lane County, 9.4% of the population is made up of minorities. Unemployment in the county is at about 6.6%, which is slightly higher than the State average of 5.6%. The Dorena and Dorena Lake areas, which lie about 12 air miles to the west/northwest, could see an increase in log truck traffic during logging operations. The city of Cottage Grove, which lies about 16 miles to the west/northwest, may also see an increase in business and an increase in traffic. However, none of these increases would be comparable to the logging seen in the area in the late 1980's. The area is not heavily used for recreation or other activities that may affect minority populations. Overall, none of the alternatives imposes any other additional hardships on minority or low-income communities; therefore, even when combined with ongoing and future timber sales (Dinner, Curran Junetta and Holland Moonsalt) there would be no direct, indirect, or cumulative effects to environmental justice with any alternative.

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CHAPTER FOUR

CONSULTATION WITH OTHERS

PUBLIC INVOLVEMENT

The Forest Service listened to all input and addressed as many concerns as possible during development of the proposed action. Formal scoping (a process used to surface issues) began after the proposed action was developed and the project was first listed in the October 2007 Umpqua National Forest Quarterly Schedule of Proposed Actions (SOPA). A scoping notice and field trip announcement was sent to the public in late October 2007 with the intent of introducing the proposed action and soliciting issues. Three members of the public attended a November 2007 field trip, which raised numerous comments and concerns. Follow-up consisted of letters, e-mails and phone conversations. The Doris Project File contains a scoping summary that details the scoping comments received for the project.

The November 15th, 2007 field review notice was sent to 65 people who might potentially be interested in the Doris project. Concerns from the public ranged from temporary roads, nutrient loss from burning, water quality, heavy thinning, and economically viable timber sales. The Forest Service listened to all input and addressed as many concerns as possible during development of the proposed action.

AGENCY CONSULTATION

The regulatory agencies (US Fish and Wildlife Service and NOAA Fisheries) charged with overseeing the Endangered Species Act, were consulted extensively throughout the planning process. Consultation with these agencies would be finalized before the Decision Notice is signed. Tribal consultation also occurred; no interest in this project was expressed by the Tribes.

INTERDISCIPLINARY TEAM

The following people are members of the Interdisciplinary Team (IDT) that participated in the preparation or review of all or part of this environmental assessment:

Laurie Bernstein	District Fisheries Biologist
Rob Cox	Wildlife Biologist
Bryan Benz	Botanist
Bev Reed	Writer/Editor
Eric Risdal	Fuels Planner
Suzanne Schindler	IDT Leader, District Silviculturist
Deb Schmidt	District Ranger
Pat Williams	Transportation and Logging Systems

In addition, the following people assisted in developing the proposal or in the editing and review of this document:

Debbie Anderson	Forest Environmental Coordinator
Debra Barner	Forest Archeologist
Ray Davis	Forest Wildlife Biologist
Richard Helliwell	Forest Botanist
Paul Higgins	Silviculture/KV
Greg Orton	Soil Scientist
Cindy Pack	Heritage Resources/Recreation and Visuals

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GLOSSARY OF TERMS

- Thinning is the harvest of a portion of the trees in a stand in order to release the remaining trees from competition to allow for improved growth and development of understory vegetation.
- Machine piling is done by a small excavator that picks up and piles slash in large piles, which are later burned during moist conditions.
- Hand pile burning is accomplished with hand crews where slash is piled in relatively small piles and burned under moist conditions.
- Lop and scatter is a fuel treatment where hand crews use chainsaws to cut and scatter activity fuel to a depth of 12 inches or less. Fuels closer to the ground wouldeither decay faster, or if burned, would produce lower flame lengths and make fires easier to control.
- Underburning is the burning of logging slash after a thinning where slash is burned in place rather than being redistributed by machines or hand crews.
- Loader logging uses one piece of equipment. A log loader works on a grid of straight skid roads to transport hand-felled trees to landings along roads within or outside of the unit. Slash is piled or hauled away and later burned.
- Cut-to-length logging uses two pieces of equipment, a processor which fells, limbs, and cuts trees into log lengths, and a forwarder to transport the logs out of the unit. Most of the work is done within the unit on the forwarding trails. Slash on the forwarding trails are crushed, and generally do not need further treatment.
- Skyline logging is generally accomplished on steeper ground where cables bring logs uphill to landings using a carriage/cable system attached to a tower to help suspend logs off the ground.
- Helicopter logging is accomplished where no immediate road access exists or where resource concerns override use of ground-based or skyline equipment. Helicopters fly logs to nearby road and landings.
- Cut-to-length/skyline swing logging is a combination of both skyline and cut-to-length logging together in one harvest unit. The logs accumulated from the cut-to-length system are piled such that they can be yarded to a landing using the skyline.
- System roads are those roads needed to provide long-term access for future stand management. Open system roads have different levels of maintenance, depending on whether they are managed for passenger vehicles or high clearance vehicles. Closed system roads (maintenance level one) are blocked with boulders, dirt berms or guard rails.
- Temporary roads are built only for a short-term use such as logging, and are not considered part of the long-term transportation system. They are obliterated following use.
- Road reconstruction activities are implemented on existing roads to reduce risk of resource damage and/or improve traffic safety. Treatments to address aquatic resources problems typically include the addition of cross drains (ditch-relief) culverts; drivable ‘rolling grades’ structures and out-sloping the road, if practical; increasing the capacity of the culvert to meet a 100-year storm event; reducing

plugging potential from excessive accumulation of sediment and woody debris (adding a side-tapered inlet or trash rack); eliminating diversion potential (constructing a 'drivable rolling grade', if road grade allows); reducing the size (height) of the fill where overtopping-type failure may occur; stabilizing or armoring fill slopes with riprap (rock blanket); dissipating stream outflow energy with riprap; dispersing water ('dewater') before reaching affected failure site (add cross drain on upgrade); and pull-back of the 'over-steepened' fill slopes.

- Temporary road obliteration is done after a newly created temporary road is used for logging purposes. The timber sale purchasers are required to obliterate the road under the timber sale contract. This involves subsoiling the road as appropriate, and pulling displaced soil and duff back over the road surface. Logging slash is also often pulled over the top of the road to provide additional ground cover and bare soil protection.
- Road inactivation includes reconstruction activities that reduce the risk of resource damage by preventing vehicle use of a road for an indefinite (temporary) period of time. An 'open road' may be closed as a result of inactivation, or a currently closed road may receive further treatment to reduce the risk of resource damage. The road remains on the Forest road system, though anticipated maintenance needs are minimal to none.
- Road decommissioning is intended to remove or substantially reduce the potential for resource damage attributed to the road, and results in the permanent closure of the road and its removal from the Forest system of maintained roads. Decommissioning implies that there is no reasonable expectation for use of the road in the foreseeable future, given presently available information and direction. Work typically includes removal of drainage structures (culverts) and reestablishing stream channel beds and banks, pullback of unstable road shoulders or landings, subsoiling the road surface, and various levels of revegetation.
- Passive road decommissioning is done to a road that presents little to no risk of resource damage that is being removed from the Forest system of maintained roads. Work typically involves minor work such as blocking or barricading the road, and in some cases constructing water bars or drain dips, and lopping and scattering woody debris onto the road surface.
- Jackpot burning is the application of prescribed fire to concentrations of fuels rather than the landscape as a whole. Typically, it is applied during the time of year when the probability of fire spread is very low and in situations where fuels reduction is not a primary objective. Jackpot burning is the method used in units where residual activity created fuels or natural fuels are discontinuous.Jackpot burning would be implemented in the late fall, winter, or spring seasons (October to March) when soils and live fuel moistures are elevated and existing shrubs are more likely maintained.
- Cryptogrammic crusts are important in the reduction of soil erosion, and facilitate vascular plant seedling establishment by improving water penetration and reducing runoff.
- Succession is the process of development of vegetation involving changes of species and communities with time (Sugden 1984).