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Quartz Integrated Project
Environmental Assessment

Umpqua National Forest
Cottage Grove Ranger District

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Quartz Integrated Project
Environmental Assessment

Lane & Douglas County, Oregon

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Abstract

This Environmental Assessment documents the alternatives considered for an integrated project within the Sharps Creek Watershed on the Cottage Grove Ranger District, Umpqua National Forest. Activities include commercial timber harvesting; fuel reduction treatments such as burning and thinning; meadow restoration and maintenance treatments such as burning and invasive weed removal; and aquatic restoration and maintenance treatments such as riparian thinning as well as road maintenance, decommissioning and inactivation.

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CHAPTER ONE

PURPOSE AND NEED FOR ACTION

INTRODUCTION

This Environmental Assessment (EA) documents the analysis of a range of alternatives for timber harvest and other proposed activities in the 42,509-acre Sharps Creek watershed of the Row River located on the Cottage Grove Ranger District, Umpqua National Forest.

Chapter One describes the project area, the purpose and need for the project and the agency's proposal for achieving that purpose and need. This chapter also outlines applicable management direction, addresses the scope of the decision, summarizes the scoping process, and lists the issues identified from the public.

PROJECT LOCATION

The 8,331-acre Quartz planning area is located about 22 miles southeast of Cottage Grove, OR primarily within the upper portion of the Sharps Creek watershed (Figure 1). Sharps Creek drains into the Row River, and then flows into Dorena Lake, above Dorena Dam. This watershed has mixed ownership: 42% Forest Service, 21% Bureau of Land Management, and 37% private land. The majority of private ownership is made up of private timber lands in the lower portion of the watershed. The Quartz planning area is located in portions of T23S, R1W, R1E, and T24S, R1W and R1E within Lane and Douglas County, OR. A portion of the planning area is administered by the Upper Willamette Resource Area, Eugene District Bureau of Land Management.

RELATIONSHIP TO OTHER PLANNING DOCUMENTS AND ANALYSES

MANAGEMENT DIRECTION

The 1990 Umpqua National Forest Land and Resource Management Plan (LRMP) and its amendments to date, including the 1994 Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (NWFP), provide broad management direction for the Quartz Integrated Project (USDA 1990; USDA/USDI 1994). The Quartz planning area includes Management Areas (MA) 10, 11 and 13 as defined by the Umpqua National Forest LRMP, as well as Matrix, Riparian Reserves, and Late-Successional Reserves (LSR) as defined by the NWFP. Proposed treatment units are located within MA 10, MA 13, Matrix, Riparian Reserves and the South Cascades LSR (Figure 2).

> MA 10 provides for production of timber on a cost-efficient sustainable basis consistent with other resource objectives.
>
> MA 13 provides additional emphasis for the orderly exploration, development, extraction, and production of mineral resources.
>
> Matrix consists of those federal lands outside the six categories of designated areas (Congressionally Reserved Areas, Late-Successional Reserves, Adaptive Management Areas, Managed Late-Successional Areas, Administratively Withdrawn Areas, and Riparian Reserves). Most timber harvest and other

silvicultural activities are to be conducted in the portion of the matrix with suitable forest lands.

Riparian Reserves provide an area along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis.

Late Successional Reserves management objectives are designed to protect and enhance habitat for late-successional and old-growth forest related species. No commercial timber harvest is proposed within the LSR's.

The Quartz planning area also contains a portion of the Fairview Inventoried Roadless Area (IRA) as identified by the Forest Service Roadless Area Conservation, Final Environmental Impact Statement (USDA, 2000). No activities are proposed within the IRA.

The 1999 Eugene District Bureau of Land Management (BLM) Record of Decision and Resource Management Plan (ROD/RMP) provides management direction for the 142 acres of the planning area within the BLM boundaries. The BLM portion of the planning area is within The South Cascades LSR-222.

This EA tiers to the Final Environmental Impact Statement (FEIS) of the 1990 Umpqua National Forest LRMP, as amended, the FEIS of the 1999 Eugene District BLM ROD/RMP, as amended, and the 2005 Final Environmental Impact Statement for the Pacific Northwest Region Invasive Plant Program.

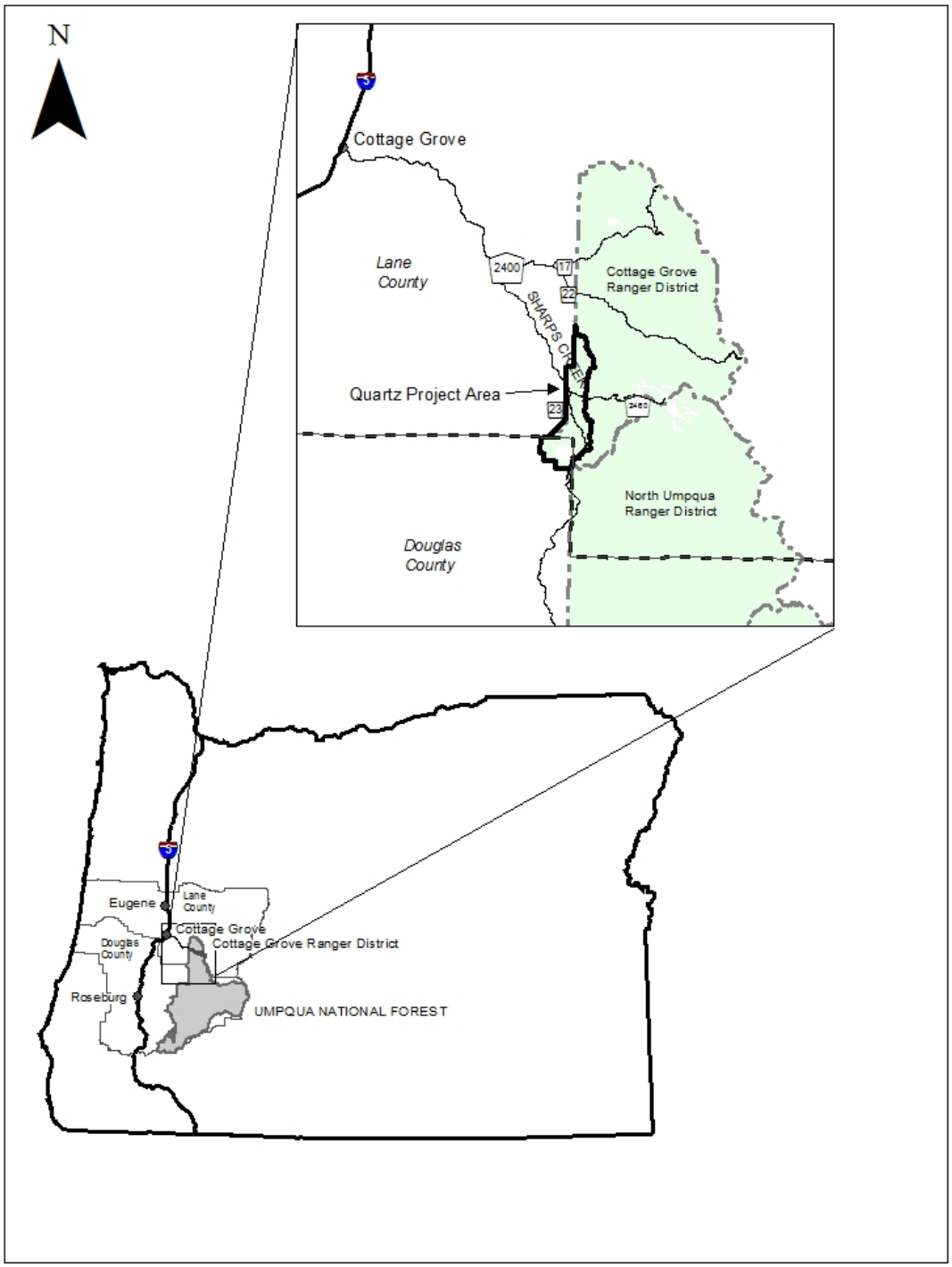

Figure 1. Quartz Vicinity Map

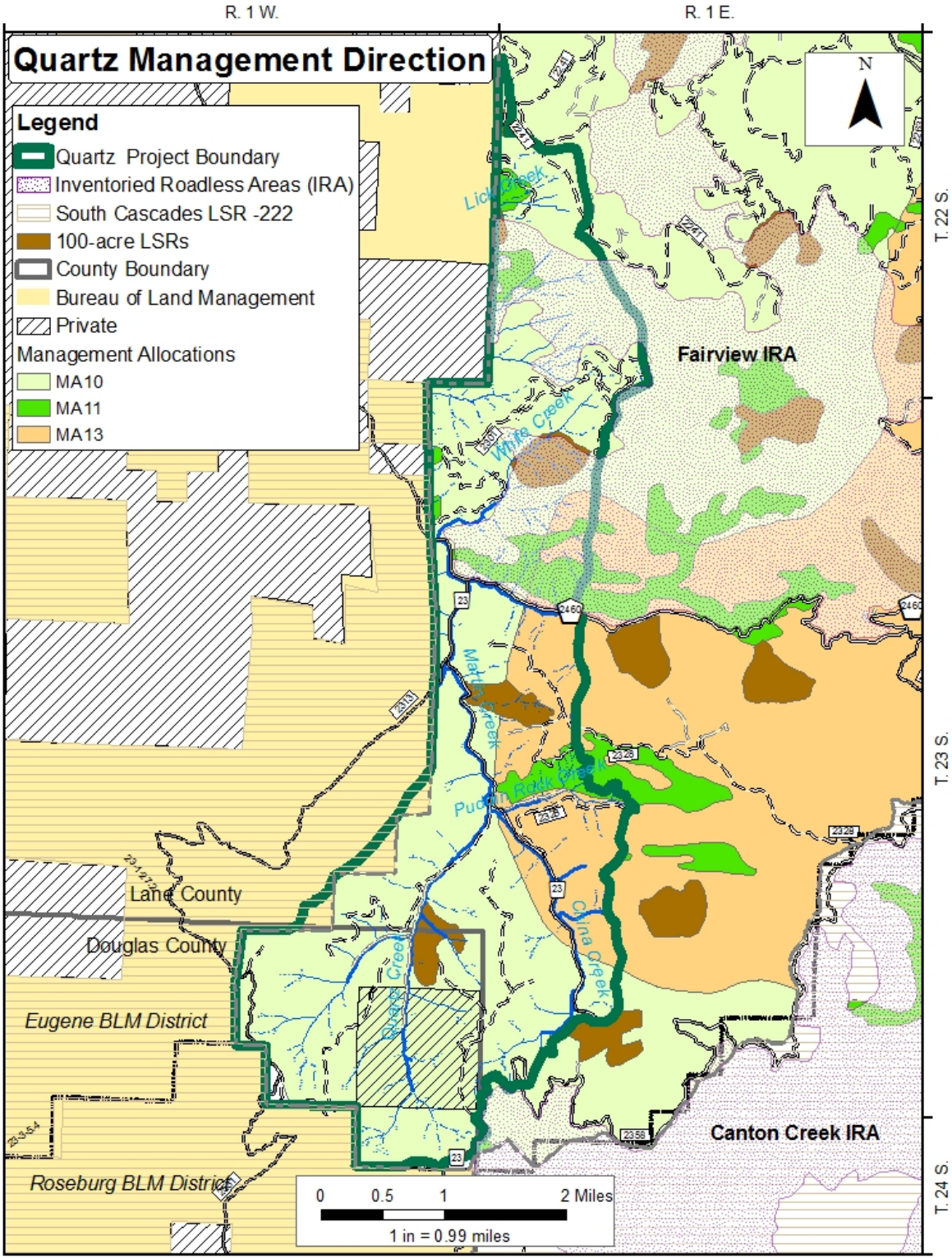

Figure 2. Management Direction for the Quartz Planning Area

PLANNING ANALYSES INCORPORATED BY REFERENCE

This EA incorporates by reference the following:

- The Quartz Project Roads Analysis Report (USDA 2014), which provides information on the current road system, describes road-related issues, assesses risks, and provides recommendations regarding the road system within the planning area.
- The recommendations and analyses in the Sharps Creek Watershed Analysis (USDA/USDI 1999), Canton Creek Watershed Analysis (USDI 1995), and the Brice Creek Watershed Analysis (USDA 1997a). These analyses provide descriptions of the historic and existing conditions of the important physical, biological, and social components of the watershed. The planning is distributed by watershed as follows: 8,285 acres within the Sharps Creek, 4 acres within Brice Creek, and 42 acres within Canton Creek.
- The South Cascades LSR Assessment (USDA/USDI 1998), which provides a landscape strategy for implementation of restoration activities by prioritizing treatment areas and listing criteria for developing appropriate treatments. Silvicultural treatments in LSRs are subject to review by the Regional Ecosystem Office.
- The Watershed Condition Classification (USDA 2011a), which is a National Forest-based evaluation of watershed conditions based on a core set of indicators. The classification is a process of describing watershed condition in terms of discrete categories or classes that reflect the level of watershed health or integrity.
- The landscape fire analysis within PNW GTR-850 “Status and Trends of Northern Spotted Owl Populations and Habitats (Davis et al 2011). Chapter 4 of this monitoring report analyzed and mapped areas within the owls’ range prone to large wildfires.
- This EA incorporates by reference the Project Record (40 CFR 1502.21). Chapter 3 provides a summary of the specialists input in adequate detail to support the rationale for the decisions and the appendices provide supporting documentation. The Project Record contains supplemental information and other technical documentation used to support the analysis and conclusions in this EA. Incorporating this information implements the CEQ Regulations provision that agencies should reduce National Environmental Policy Act (NEPA) paperwork (40 CFR 1500.4), and that environmental documents shall be “analytic rather than encyclopedic, and shall be kept concise and no longer than absolutely necessary (40 CFR 1502.2)”. The objective is to furnish adequate site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated, without repeating detailed analysis and background information available elsewhere. The Project Record is available for review at the Cottage Grove Ranger Station, 78405 Cedar Park Road Cottage Grove, Oregon 97424.

A LANDSCAPE PERSPECTIVE

The development of the Quartz Integrated Project began at the landscape level focusing on the Sharps Creek Watershed Analysis (WA), the Watershed Condition Classification (WCC), and the landscape fire analysis conducted as part of the evaluation of the status and trends of the Northern spotted owl populations and habitats (USDA 2011b).

The Sharps Creek WA stratified the watershed into landscape areas based upon drainage boundaries. The Quartz planning area falls into two of the landscape areas—the Upper Sharps and Lower Sharps East Landscape Areas (Figure 3). The WA recommended using Landscape Areas as a framework to establish a desired condition for vegetation.

Key recommendations by Landscape Areas include:

East Lower Sharps Landscape Area

- Use thinning to accelerate the development of early-seral to mid and late-seral stands.
- Use partial harvest and fuel reduction treatments to balance the distribution to mid-and late-seral stages.
- Protect unique habitats and key refuge areas.

East Upper Sharps Landscape Area

- Evaluate vegetation patterns and fire risk.
- Use vegetation treatments as necessary to maintain overall distribution of vegetation stages.
- Reintroduce fire.
- Protect unique habitats and key refuge areas.

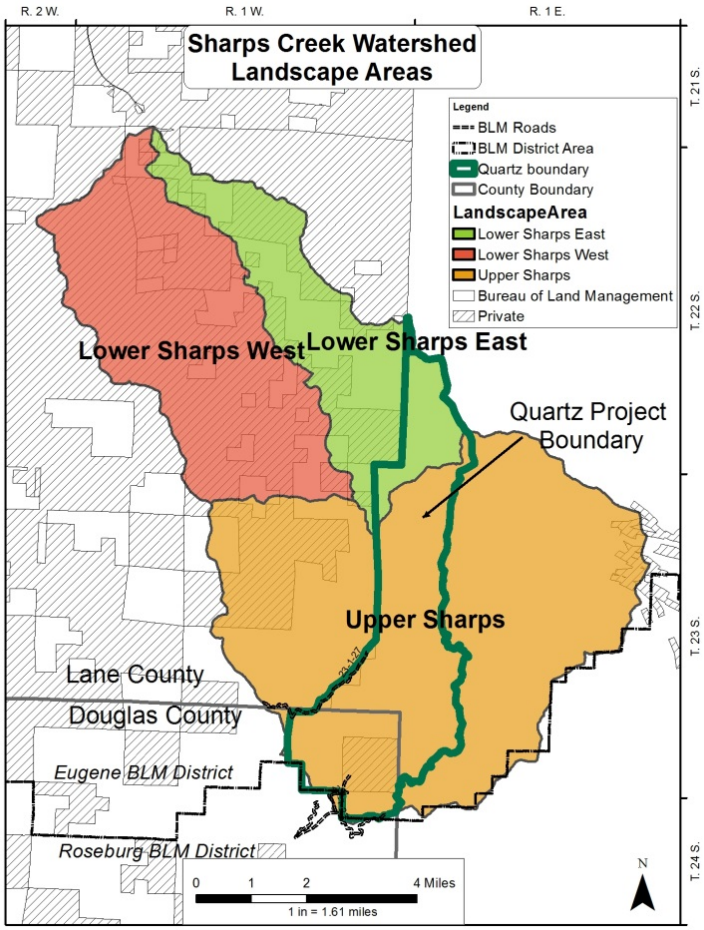

Figure 3. Sharps Creek Landunits and Landscape Areas

The 2011 WCC stratified watersheds across the nation into the following three classes related to the degree or level of watershed functionality or integrity: Class 1 (functioning properly), Class 2 (functioning at risk), and Class 3 (impaired function). The WCC system consisted of 12 indicators related to watershed processes and each 6th-field watershed was scored good, fair, or poor using those indicators. The classification showed that the Sharps Creek watershed is functioning at risk (Class 2) and ranked poor in three condition indicators: Aquatic Habitat, Roads and Trails, and Fire Condition. Table 1 provides a description of the WCC indicators that were ranked as poor in Sharps Creek.

Table 1. Watershed Condition Class Indicators

Condition Indicator	Condition Attributes	Sharps Creek Attributes
Aquatic Habitat	Habitat Fragmentation	Blocked fish passage, increased stream temperatures
	Large Woody Debris	Lack of large woody material
	Channel Shape and Function	Increased width-to-depth ratios
Roads and Trails	Open Road Density	More than 2.4 miles/square miles threshold (3.9 miles/square miles)
	Road Maintenance	Issues with keeping up with maintenance of drainage features
	Proximity to Water	Many roads within riparian areas
	Mass Wasting	Roads on lands subject to mass wasting
Fire Condition	Fire Regime Condition Class (FRCC)	Originally classified as FRCC3 (reclassified as a FRCC1 in 2012)
	Wildfire Effects	n/a

In 2011, the USDA issued a monitoring report on northern spotted owl population and habitat trends on federally administered lands since the implementation of the Northwest Forest Plan (Davis et al 2011). That report identified wildfire as the leading cause of habitat loss and a range wide "wildfire suitability" model and map was developed to highlight the portions of the owl's range where suitable nesting/roosting habitat overlaps with landscape at risk for the occurrence of large wildfires. The report summarized that most remaining nesting/roosting habitat is now contained on federal land, and its fragmented condition makes it, and the populations that rely on it, more vulnerable to future large wildfires. The fire analysis identified landscape-scale areas within the owl's range where large wildfires are more probable over time. The range-wide map of the likelihood for large wildfire occurrence identifies the Quartz planning area as fire-prone (Figure 4).

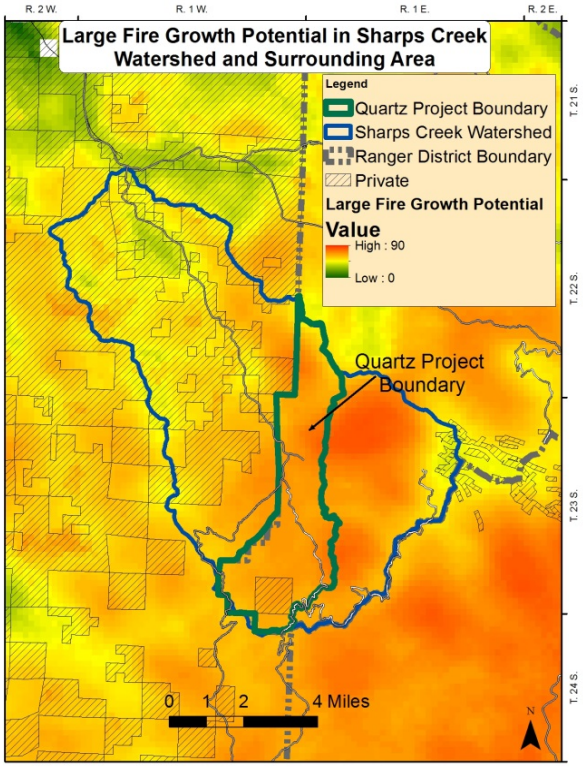

Figure 4. Large Fire Potential

PURPOSE AND NEED

The purpose of this project is to:

- **Improve stand growth, health, and diversity**
- **Improve fire resiliency and create opportunities to manage wildfires that threaten values at risk**
- **Provide forest products in an economically viable manner**
- **Maintain and restore meadow habitats**
- **Maintain and restore aquatic habitats**

Past harvest and fire suppression practices have resulted in stands across this landscape that are dense, slow growing, lack diversity, and also provide poor growing conditions for existing sugar and western white pine (species in need of restoration). Today, there is an abundance of these mid-seral closed forests in the watershed compared to historical conditions resulting in large areas of contiguous high canopy covers. Past fire suppression practices have also resulted in areas of more extensive surface and ladder fuels. The upper portion of the watershed is considered a fire-prone landscape. These fuel conditions, given the right weather patterns, could result in long fetches of running crown fires across the area affecting resources at risk that include critical habitat for the Northern spotted owl, adjacent late-successional reserve and private land, as well as recreation and mining areas.

There is a need for management within the planning area to provide multiple-use benefits which includes an expected output of timber products. The Northwest Forest plan recognizes the need to “maintain a sustainable supply of timber and other forest products that will help maintain the stability of local and regional economics on a predictable and long-term basis” (USDA/USDI 1994).

Meadows within the planning area are primarily dry meadows where long-term fire suppression has encouraged some conifer encroachment. Non-native plants and invasive weeds have also become established in some of the meadows in the area.

Past harvesting has resulted in: roads adjacent to and bisecting streams, the removal of large woody material in and near streams, and younger stands with less species and structural complexity as well as shorter trees providing less shade to streams. Current road maintenance is minimal, and as the roads and drainage structures continue to age and deteriorate, the sediment risk to streams continues to rise.

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

ELEMENT 1: STAND GROWTH, HEALTH AND DIVERSITY

The 45 to 65-year-old plantations in the planning area are concentrated in the lower slopes of the drainages. These stands were regeneration harvested, burned, planted with Douglas-fir at a close spacing and managed for uniformity in both species and structure for timber production. Today, they are densely-stocked stands dominated by a single overstory tree species with little understory diversity or natural canopy gaps. The 90 to 130-year-old fire regenerated stands in the planning area are concentrated in the mid to upper slopes near ridgelines. These are primarily even-aged stands that naturally regenerated following stand and partial stand replacement fires that dominated the watershed at the turn of the last century. Today, like the

plantations described above, they are densely-stocked stands dominated by Douglas-fir in the overstory with little understory diversity or natural canopy gaps. Many of these fire regenerated stands have scattered sugar and western white pine that is in decline due to heavy competition from other trees coupled with the occurrence of mountain pine beetle and white pine blister rust.

Both age classes of stands are classified as mid-seral closed or stem exclusion stage where there is a dense overstory that blocks out light to the forest floor and limits understory development and diversity of flora and fauna species. Trees in this stage compete for sunlight, water, and nutrients causing reduced tree growth and stand vigor. Canopy cover averages 60% or more in all of these stands.

The desired condition for both the plantations and fire regenerated stands is a healthy, more diverse condition that approximates what would typically exist in a mixed severity fire regime benefiting a wider range of flora and fauna species. Stands located in the lower slopes of drainages, which historically were areas of refuge from fire, would be on an accelerated trajectory of developing multiple canopy layers and a diversity of understory species to enhance habitat for old growth species. Stands nearer the ridgelines, which historically had more frequent fire activity, would be more open with less competition between trees, more reflective of historic conditions, and benefiting a wider range of flora and fauna species. Removing trees around the scattered sugar and western white pine in the stands would increase structural diversity and reduce the likelihood of mortality from insects and white pine blister rust. Treatments within the outer portion of the Riparian Reserves within the plantations would improve species composition and structural diversity of plant communities in keeping with the Aquatic Conservation Strategy objectives.

Element 1 is measured by:

- Acres of stands treated to improve growth, species and structural diversity.
- Acres of stands treated to promote sugar and western white pine health.
- Acres of Riparian Reserves treated to improve species composition and structural diversity of plant communities.

ELEMENT 2: FIRE RESILIENCE AND WILDFIRE SPREAD

The upper portion of the Sharps Creek watershed is considered a fire-prone landscape. In 2011 a landscape fire analysis was conducted as part of an evaluation of the status and trends of the Northern spotted owl populations and habitats (USDA, 2011b). The decision to map fire-prone areas in the owl's range stemmed from a concern that wildfire will destroy owl habitat and is a large concern for the management and conservation of the species. The analysis identified landscape-scale areas within the owl's range where large wildfires are more probable over time. The range-wide map of the likelihood for large wildfire occurrence identifies the planning area as fire-prone (Figure 4).

The natural fire disturbance patterns in this area have been altered by past fire exclusion, management practices and past harvesting. The absence of periodic low to moderate severity wildfire events that typically occur in a mixed severity fire regime have resulted in more extensive ground and ladder fuels as well as denser tree canopies. Past harvesting and the subsequent management of those areas have also contributed to areas with denser tree canopies. Today there is an abundance of mid-seral closed forest in the Sharps Creek watershed compared to historical conditions and currently the upper portion of the watershed

has large areas of contiguous high canopy covers of 60% and greater. These conditions, given the right weather patterns, could result in long fetches of running crown fires across the area affecting resources at risk that include critical habitat for the Northern spotted owl, adjacent late-successional reserve and private land, as well as recreational and mining areas.

The desired condition is to strategically provide more fire resilient stands across the watershed where a) ground and ladder fuel treatments would help reduce flame lengths and b) canopy fuel treatments would reduce the likelihood of sustaining crown fires. The treatments would result in increased barriers to wildfire spread across the landscape improving firefighter effectiveness and providing opportunities to protect resources at risk.

Element 2 is measured by:

- Acres treated to reduce ground fuels that would limit flame lengths to 8 feet or less in the event of a wildfire.
- Acres treated to increase canopy base height to achieve a Torching Index[1] (TI) of moderate or better.
- Acres treated to reduce canopy fuels resulting in stands with Crowning Index[2] (CI) of moderate or better.

ELEMENT 3: PROVIDE FOREST PRODUCTS

There is a need for management with the planning area to provide multiple-use benefits which includes an expected output of timber products. The Northwest Forest plan recognizes the need to “maintain a sustainable supply of timber and other forest products that will help maintain the stability of local and regional economics on a predictable and long-term basis” (USDA/USDI 1994). There is also a need for timber sales to be economically viable and competitive in a tightening timber market and this project to consider economic realities and be designed in a manner that provides the best opportunity for the sale to sell in an uncertain timber market.

The desired condition is to provide wood products to meet the long-term sustained yield capacity with multiple use objectives and meet environmental requirements.

Element 3 is measured by:

- Amount of forest products produced in terms of board feet of timber or tons of biomass.
- Cost-efficient timber harvest measured by predicted stumpage price[3] per thousand board-feet.

[1] The open wind speed at which some kind of crown fire is expected to initiate is the Torching Index. To initiate a crown fire, a moderate TI would need windspeeds above 25 mph to transition a ground fire into the canopy.

[2] Called the Crowning Index, it is the open wind speed above which an active crown fire is possible for the specified fire environment. For a moderate crowning index, it would require windspeeds of 25-50 miles per hour to sustain a crown fire.

[3] Stumpage is the value of the timber. 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.

ELEMENT 4: MEADOW RESTORATION

Meadows within the planning area are primarily dry meadows, often called “balds”. Vegetation in balds typically consists of bunchgrasses and forbs, with mosses and lichens dominating the space between vascular plants. There are also a few wet meadows and shrublands scattered throughout the area and are often part of a meadow/conifer mosaic at the landscape level. Long-term suppression of fire has allowed conifer encroachment into wet meadows and replacement of meadow species with forest herbs. Most balds are unable to support trees due to shallow soils and drought-like conditions in the summer and are unlikely to be as affected by conifer invasion. However, fire may have prevented encroachment into more mesic areas of balds historically, and decades of fire suppression have probably resulted in only the driest and shallow-soiled sites remaining open. Non-native and invasive weeds are also a problem in many meadows in this area.

The desired condition is the maintenance and improved quality of meadow habitats. Restoring meadows by underburning, conifer removal, and treating invasive weeds will potentially enhance recruitment and growth of meadow species.

Element 4 is measured by:

- Acres of meadow habitat underburned.
- Acres of meadow habitat treated to remove invasive weeds.
- Acres of meadow habitat treated to reduce conifer encroachment.

ELEMENT 5: AQUATIC HABITAT RESTORATION

In 2011 a nation-wide Watershed Condition Classification showed the Sharps Creek watershed as functioning at risk. The watershed ranked poor in three categories: 1) aquatic habitat, 2) roads and trails, and 3) fire condition. Past timber harvesting was focused within the lower part of drainages resulting in roads adjacent to and bisecting streams; the removal of large woody material in and near streams; and in younger stands with less species and structural complexity as well as shorter trees providing less shade to streams. Current road maintenance is minimal, and as the roads and drainage structures continue to age and deteriorate, the sediment risk to streams continues to rise.

The desired condition is a reduced risk of stream crossing sedimentation delivery by existing roads, improved passage of aquatic organisms and organic material at road-stream crossings, and improved stand growth leading to more stream shade and enhanced riparian species and structural diversity.

Element 5 is measured by:

- Miles of road decommissioning.
- Miles of road inactivation (hydrologically stabilize roads, store for future use).
- Miles of road treated for storm damage risk reduction.
- Acres of stands treated within riparian areas to increase tree growth and species and structural diversity.

PROPOSED ACTION

The proposed action (Alternative 2) is designed to meet the purpose and need to improve stand growth, health, diversity and structure in stem exclusion stands, improve stand fire resiliency and create opportunities to manage wildfires that threaten values at risk, provide forest products in an economically viable manner, maintain and restore meadow habitats and maintain and restore aquatic habitats. The Forest Service proposes the following activities (Figure 5):

- Commercial thin approximately 1,026 acres of stands 45 to 130 years old including 1/10th acre pine release gaps in Matrix and Riparian Reserves, generating about 19 million board feet of timber. No treatment (or skips) would occur on approximately 340 acres within the stands proposed for treatment.

- Harvest systems would include roughly 56% skyline logging, 40% helicopter logging, and 4% ground based logging. Up to nine landings for helicopter logging would be used with each opening up to 1 acre in size.

- No harvesting of the Riparian Reserves within the 90 to 130-year-old fire regenerated stands is proposed. Within the 45 to 65-year old plantations, harvesting is proposed in the outer portions of the Reserves with a 60-foot no harvest buffer on perennial streams and a 30-foot no harvest buffer on intermittent streams.

- Treat activity-generated fuels on approximately 522 acres within the commercial thinning areas using a combination of underburning, machine piling, and hand piling and burning.

- Outside of the commercial thin areas, treat surface and ladder fuels on 374 acres within 200 feet of strategic ridgeline roads. Understory fuel treatments would include thinning trees (<10” dbh) and shrubs, pruning, piling and burning, or chipping. Biomass utilization and opportunities for public firewood would be considered.

- Meadow maintenance and restoration on 18 acres within dry meadows and the 30 acres of transitional zone surrounding the meadows. Activities would include meadow burning, cutting encroaching conifers, pulling non-native and invasive weeds, and underburning the area surrounding the meadows.

- No new permanent (system) roads would be constructed. Approximately 0.7 miles of existing temporary roads would be used and another 1.0 miles of temporary roads would be created. All temporary roads would be obliterated after use.

- Road reconstruction and maintenance work on approximately 54 miles of existing roads including approximately 9 miles on BLM roads needed for project access.

- Expansion of the existing Shane Saddle rock pit on the North Umpqua Ranger District as one of the rock sources for the road work. The expansion would include about 100 horizontal feet into the previously undisturbed rock outcrop area above the current top of the pit.

- Road decommissioning on approximately 1.5 miles on the 2300-106 and 2300-808 roads near Quartz Creek. Activities include removing culverts and a failing wooden

bridge, restoring stream channels at stream crossings, ripping and out sloping road surfaces, stabilizing fill slopes, and blocking entrances.

- Road inactivation on approximately 1.6 miles on the 2241-841 road. Activities include removing culverts, installing water bars and blocking entrances.

- Implementing a number of similar and connected actions such as coarse woody habitat creation, invasive weed management and big game forage seeding.

- Timber sales and other activities resulting from this proposal would be expected to begin in two to three years.

DECISION TO BE MADE

Based on the analysis documented in this Environmental Assessment, the Cottage Grove District Ranger would 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, which monitoring requirements, water quality best management practices, project design features and similar or connected actions are necessary to achieve the resource goals and objectives of the project.
- Whether there is a significant effect on the human environment that would require preparation of an Environmental Impact Statement.

The BLM Upper Willamette Resource Area Manager would decide on any actions involving activities on the BLM portion of the planning area. See Chapter 2 for details on activities proposed on BLM which includes 49 acres of roadside understory fuel treatment, reconstruction of 0.2 miles of temporary spur road and use of an existing landing for helicopter landing.

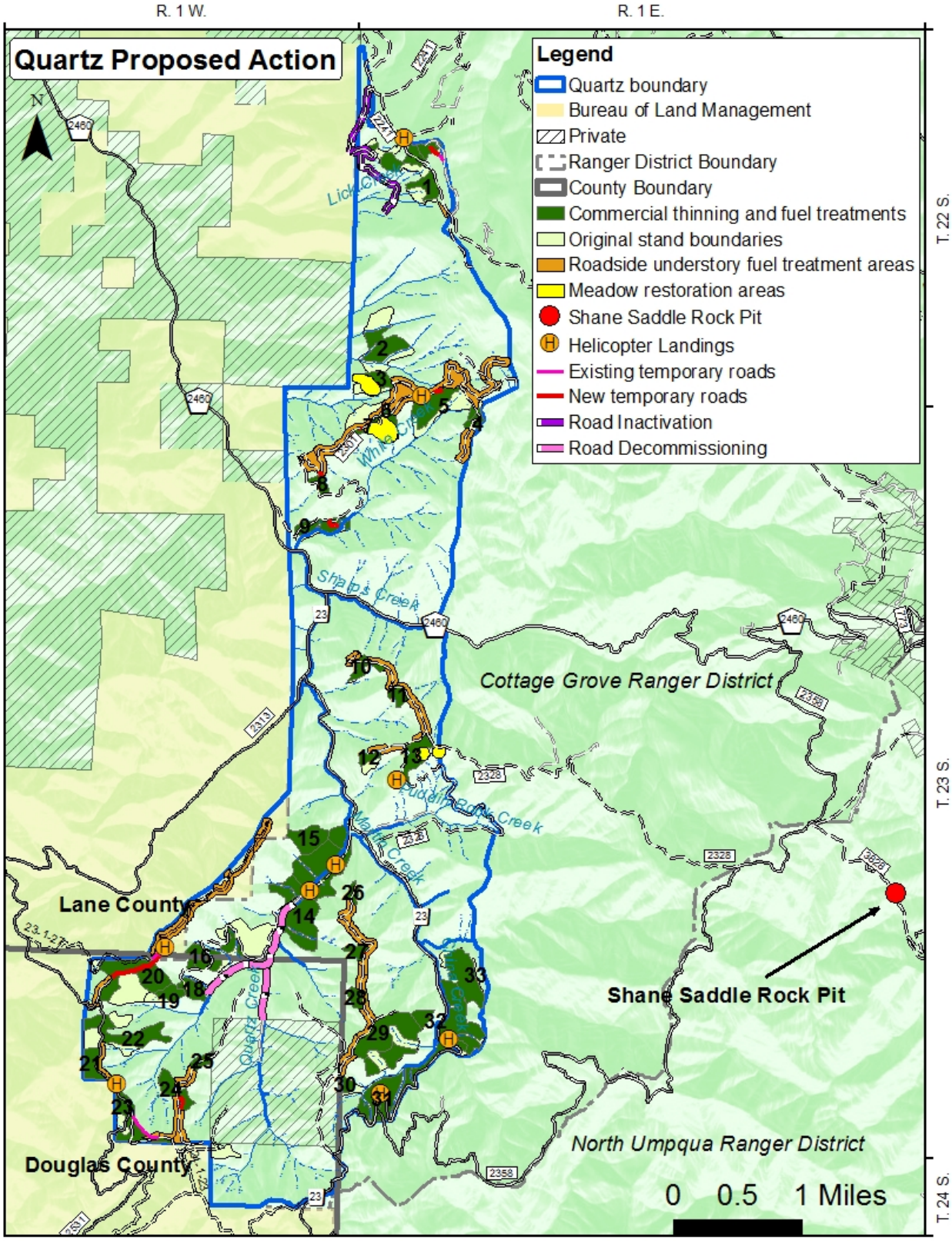

Figure 5. Quartz Proposed Action

PUBLIC INVOLVEMENT

The Forest Service considered all input and addressed as many concerns as possible during development of the proposed action. Pre-scoping began prior to development of the proposed action. A preliminary field trip occurred in July 2013 to present initial ideas and to discuss the project area with the public. In attendance were 10 people from the interested public, 1 person from the Eugene District BLM and 8 people from the Umpqua National Forest. The meeting was designed to show likely treatment areas and discuss project goals.

Formal scoping (a process used to allow issues to surface) began after the project was first listed in the November 2013 Umpqua National Forest Quarterly Schedule of Proposed Actions (SOPA). After development of the proposed action, a scoping notice was sent out and an open house was held at the Cottage Grove District office in December 2013. Comments and concerns were raised from both the pre-scoping and formal scoping sessions. Two written comments were received during the open house and four letters were received. A second field trip occurred in June 2014 to further discuss the project. In attendance were 8 people from the interested public and 5 from the Umpqua National Forest. The Quartz Project File contains a scoping summary that details the scoping comments received for the project.

ISSUES

Issues associated with a proposed action are unresolved conflicts expressed in terms of cause and effect relationships. In an Environmental Assessment, issues can help drive alternative development, be resolved through the addition of mitigation measures or project design features, or are carried forward into analysis to better inform the responsible official. Scoping identified a number of key and non-key issues related to the proposed actions in the planning area.

KEY ISSUES

The following issues were used to help drive the development of an alternative to the proposed action:

Key Issue: Economic Viability

During scoping concerns were raised about the ability to economically harvest the timber in the proposed action, particularly given the amount of helicopter logging and the vicinity of the helicopter landings.

Response: Alternative 3 addresses the issue of economic viability. This alternative reduces the amount of helicopter logging and proposes heavier thins and small gaps in the managed stands. This issue is tracked through the acres of helicopter logging and benefit/cost ratio.

Key Issue: Older Forest Management

During scoping comments were received concerning the age of some of the stands proposed for commercial thinning. Comments included recommending dropping stands 80 years and older to allow natural processes to lead to desired outcomes, discouraging fuel treatments in older stands because they tend to be naturally fire resistant/resilient, and concern that logging in mature forests leads to a variety of adverse effects that cumulatively outweigh any benefits.

Response: This issue is addressed through Alternative 3 and a disclosure in Chapter 2 under "Alternatives Considered but Eliminated from Further Study." Alternative 3 reduces the amount of fire-regenerated stands 90-130 years old from timber harvest. This issue is tracked through acres of fire regenerated stands thinned.

NON-KEY ISSUES

Several other issues were resolved by clarifying or modifying the proposed action, mitigation measures, project design features or by carrying forward into analyses. These issues did not require the development of an alternative to the proposed action. These are discussed below by category in Table 2, and are also available in the Quartz Project File.

Table 2. Non-Key Issues

Non-Key Issue	How Addressed
Commercial thinning increases fire risk	Scientific literature suggests that there are competing variables, both increasing and decreasing fire behavior metrics, which are impacted by thinning a forest stand. This issue is addressed in the fuels analysis within Chapter 3.
Roads 760 and 805 should be included for fuel treatments	The roads, which wind in and out of the private section within the planning area were initially considered for fuel treatments but subsequently dropped based on the poor condition of the road and the associated costs of improving the road. In conversations with the Douglas Forest Protective Association, it was decided to include these in proposed action and work with the Association and the landowner about improving the road to conduct the fuel treatments.
Focus riparian thinning in younger stands	All action alternatives implement commercial thinning in the outer portion of the Riparian Reserves in the 45 to 65 year old stands only.
Winter haul is needed to improve economic viability; winter haul has negative impacts on riparian areas	A careful evaluation of which areas are available for winter haul was conducted and some winter haul is proposed. Chapter 2 defines design elements regarding winter haul to minimize impacts and Chapter 3 analyzes potential effects on riparian areas.
Avoid road construction	One of the purposes of the project is to provide forest products in an economically viable manner and road construction was considered during harvest system design to achieve this purpose. No new permanent roads are proposed. Some existing temporary roads would be used (~0.7 miles) and ~1.0 miles of temporary roads would be created.
Don't decommission roads 808 & 106	Douglas Forest Protective Association raised concerns that the proposed decommissioning would limit the lower firefighting access to section 36, a privately owned section within the planning area. Project design features of the proposed decommissioning were modified to ensure foot traffic will still be available.
Use bigger gaps for five-needle pine release	The proposed pine release gaps are approximately 1/10th acre in size which equates to a radius of 37 feet from the tree. This prescription is based on the similar projects in the area and the latest results from the Wolfpine Thinning Study

Non-Key Issue	How Addressed
	(USDA 2010). No literature is currently available that advocates the need for larger gaps.
Avoid logging in unroaded areas >1000 acres	No harvest is proposed in Inventoried Roadless Areas and a full analysis of potential wilderness areas is disclosed in Chapter 3.
Maintain 60%+ canopy cover in thinning the older fire regenerated stands for Northern spotted owl habitat	The proposed thinning in the fire regenerated stands is designed to improve stand growth and health, and reduce crown fire potential. Efforts were made to avoid thinning in high quality Northern spotted owl foraging, nesting and roosting habitat. The effects of thinning on canopy cover are fully analyzed and disclosed in the Wildlife section of Chapter 3.
Develop an alternative that reduces negative carbon and climate change impacts	See Chapter “Alternatives Considered but Eliminated From Further Study”.
Create early seral habitat	See Chapter “Alternatives Considered but Eliminated From Further Study”.

PROJECT IMPLEMENTATION

Should one of the action alternatives be selected, the Forest Service would implement the timber harvest, road construction and reconstruction through timber sale contracts. Either action alternative would likely result in two 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 effects 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 (Forest Service Handbook 1909.15 sec. 18) would be followed.

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 and approved by the District Ranger. Alternative 3 was developed in response to key issues identified during scoping. Other alternatives were considered, but eliminated from detailed study.

ALTERNATIVES CONSIDERED, BUT ELIMINATED FROM DETAILED STUDY

Based on scoping comments received, three alternatives were considered, but eliminated from detailed study for the reasons described below.

DROP STANDS 80 YEARS AND OLDER

An alternative was considered that only commercially thinned in the 45 to 65-year old managed stands. This alternative thins 397 acres and generates about 6 MMBF of volume. About 47% of the acres would be helicopter logged due to lack of road access. A preliminary economic analysis was done and, given the lower average harvest volumes/acre and the high amount of helicopter logging, it is unlikely this alternative could provide timber products in an economically viable manner.

The 90 to 130-year-old stands selected for the proposed action are concentrated in the mid to upper slopes near ridgelines. Stands nearer the ridgelines, historically had more frequent fire activity than the 45 to 65-year old managed stands concentrated in the lower slopes of drainages. A desired condition for this project area is to strategically provide more fire resilient stands across the watershed. By focusing on reducing canopy fuels in stands only down in the lower part of the drainages, which were historically fire refuge areas, it is unlikely this alternative would result in increased barriers to wildfire spread.

Because this alternative would not meet the purpose and need of providing timber products in an economically viable manner nor strategically reduce canopy fuels in stands nearer ridgelines, it is not considered in detail.

DEVELOP AN ALTERNATIVE THAT REDUCES NEGATIVE CARBON AND CLIMATE CHANGE IMPACTS

The Intergovernmental Panel on Climate Change (IPCC) has summarized the contributions to climate change of global human activity sectors in its Fourth Assessment Report (IPCC 2007). The top three human-caused contributors to greenhouse gas emissions (from 1970-2004) are: fossil fuel combustion (56.6% of global total), deforestation (17.3%), and agriculture/waste/energy (14.3%). IPCC subdivides the deforestation category into land use

conversions, and large scale deforestation. Deforestation is defined as the removal of all trees, most notably the conversion of forest and grassland into agricultural land or developed landscapes (IPCC 2000). The Quartz project does not fall within any of these main contributors of greenhouse gas emissions. Forest land would not be converted into a developed or agricultural condition. Forest stands are being retained and thinned to maintain a vigorous forested condition that can continue to support trees and sequester carbon long-term.

Timber management projects can influence carbon dioxide sequestration in three main ways: 1) by increasing new forests (afforestation), 2) by avoiding their damage or destructions (avoiding deforestation), or by manipulating existing forest cover (managing forests). Land-use changes, specifically deforestation and regrowth, are the biggest factors on a global scale in forests' role as sources or sinks of carbon dioxide (IPCC 2000). Projects that improve forest conditions and capacity to grow trees are positive factors in carbon sequestration. The proposed action falls into this category however it would have a minimal effect on carbon and climate change (see Chapter 3 Climate Change effects).

During scoping, it was specifically requested the Forest Service develop an alternative that reduces negative carbon and climate change impacts by a) deferring harvest of older forests to store carbon and provide biodiversity and connectivity and (b) thin younger stands to increase forest resilience and diversity and connectivity. As identified above, designing an alternative that only thins younger stands does not meet purpose and need. Designing an alternative to reduce negative carbon impacts by reducing the amount of harvesting would not result in meaningful differences to the effects on climate. Elimination of timber harvest would not meet the purpose and need of the project nor would it improve and maintain vigorous forest conditions which are positive factors in carbon sequestration. Therefore, because this alternative would not meet the purpose and need, it is not considered in further detail.

CREATE EARLY SERAL HABITAT

Creation of early seral habitat was not identified as a purpose and need as part of this project. However, all 90 to 130-year old stands proposed for commercial thinning have reached or surpassed 95% of culmination of mean annual increment and therefore could be considered for regeneration harvest under our Umpqua Forest Plan. The decision to propose thinning instead of regeneration was based on 1) the current and historic vegetation conditions and 2) the desired future condition.

The 1999 Sharps Creek Watershed Analysis showed that 29% of the landscape was in an early seral stage whereas historically it was around 18%. The vegetation classification used in the 2005 Fire Regime Condition Class (Barrett et al 2010) showed a similar trend for the major biophysical setting in the area (current landscape had 10% in early seral whereas reference conditions were 5%). Both of these analyses indicate that at the time of the analysis, there was more early seral in the area than historically. Given that 37% of the watershed is in private ownership where regeneration harvesting continues, it is expected that this general trend continues today.

The desired future conditions for all stands is a healthy, more diverse condition that approximates what would typically exist in a mixed severity fire regime. Stands located in the lower slopes of drainages, which historically were areas of refuge from fire, would be on an accelerated trajectory of developing multiple canopy layers and a diversity of understory species. Stands nearer the ridgelines, which historically had more frequent fire activity, would be more open with less competition between trees and more reflective of historic conditions. Commercial thinning provides a viable tool to accomplish this desired future condition.

Alternative 3 does propose small gaps in the younger stands located in the lower slopes of drainages to promote species and structural complexity. These ¼-acre gaps can also provide some temporary early seral habitat.

Because the creation of early seral habitat was not identified in the purpose and need, a comparison of current and historic landscape conditions do not indicate a need for more early seral habitat, commercial thinning is a viable tool to accomplish the desired future condition and small gaps are proposed in Alternative 3, this alternative is not considered in further detail.

ALTERNATIVE 1 – NO ACTION

In Alternative 1, none of the proposed projects would occur. The project objectives to improve stand growth, species and structural diversity would be addressed passively rather than through active management. Dense overstory canopy covers would remain for a longer period of time. No proactive efforts would be made to strategically provide more fire resilient stands and increase barriers to wildfire spread across the landscape. Fire suppression efforts would continue as they have in the past. Meadow habitats would continue to be at risk of conifer encroachment and invasive weeds. The existing road network would remain unchanged with no decommissioning, inactivation or reconstruction occurring. Road maintenance would continue to occur at minimal levels. Finally the objectives of providing forest products would be met with other areas on the Forest.

ALTERNATIVE 2 – PROPOSED ACTION

This alternative is the proposed action used in the scoping process and was designed to meet purpose and need. Figure 5 in Chapter 1 displays the proposed action.

Alternative 2 includes the following:

- Commercial thin approximately 1,026 acres of stands 45 to 130 years old, including 1/10th acre pine release gaps in Matrix and Riparian Reserves, generating about 19 million board feet of timber. No treatment (or skips) would occur on approximately 340 acres within the stands proposed for treatment. See Table 3.

- Harvest systems for this project would include roughly 56% skyline logging, 40% helicopter logging, and 4% ground based logging. Up to nine landings for helicopter logging would be used, with each opening up to 1 acre in size. See Figure 6.

- No harvesting of the Riparian Reserves within the 90 to 130-year-old fire regenerated stands is proposed. Within the 45 to 65-year-old plantations, harvesting is proposed in the outer portions of the Reserves with a 60-foot no harvest buffer on perennial streams and a 30-foot no harvest buffer on intermittent streams.

- Treat activity-generated fuels on approximately 522 acres within the commercial thinning areas using a combination of underburning, machine piling, and hand piling and burning.

- Outside of the commercial thin areas, treat surface and ladder fuels over 374 acres within 200 feet of strategic ridgeline roads. Understory fuel treatments would include thinning trees (<10” dbh) and shrubs, pruning, piling and burning, or chipping. Biomass utilization and opportunities for public firewood would be considered.

- Meadow maintenance and restoration on 18 acres within dry meadows and the 30 acres of transitional zone surrounding the meadows. Activities would include meadow burning, cutting encroaching conifers, pulling non-native and invasive weeds, and underburning the area surrounding the meadows.

- No new permanent (system) roads would be constructed. Approximately 0.7 miles of existing temporary roads would be used and another 1.0 miles of temporary roads would be created. All temporary roads would be obliterated after use.

- Road reconstruction and maintenance work on approximately 54 miles of existing roads including approximately 9 miles on BLM roads needed for project access.

- Expansion of the existing Shane Saddle rock pit on the North Umpqua Ranger District as one of the rock sources for the road work. The expansion would include about 100 horizontal feet into the previously undisturbed rock outcrop area above the current top of the pit.

- Road decommissioning on approximately 1.5 miles on the 2300-106 and 2300-808 roads near Quartz Creek. Activities include removing culverts and a failing wooden bridge, restoring stream channels at stream crossings, ripping and out sloping road surfaces, stabilizing fill slopes, and blocking entrances.

- Road inactivation on approximately 1.6 miles on the 2241-841 road. Activities include removing culverts, installing water bars and blocking entrances.

- Implementing a number of similar and connected actions such as coarse woody habitat creation, invasive weed management and big game forage seeding (See Figure 6).

VEGETATION AND FUELS

Commercial thinning is proposed in 1,026 acres. Stands would be thinned from below to 60 to 80 trees per acre to an average residual canopy cover of 51%. Pine release gaps 1/10th acre in size are proposed in the 90 to 130-year-old stands to reduce competition and stress on the sugar and western white pines scattered throughout the stands. Variable density thinning is promoted through the retention of legacy trees (32-inch plus diameter trees), hardwoods, and minor conifer species; no harvesting areas within stands on about 25 to 28% of the original stand boundaries; and creation of small gaps around pines. Table 3 provides a unit summary. One of the helicopter landings would be located off the 2301 road on BLM land in an existing landing.

Fuel treatments in the commercial thin areas on 522 acres include underburning, machine piling and hand pilling and burning. Table 3 provides a unit summary. Fuel treatments outside of the commercial thin areas for roadside surface and ladder fuels include 374 acres within 200 feet of strategic ridgelines roads. These understory treatments would include, where needed, thinning understory trees <10” in diameter and shrubs, pruning, as well as pile and burning or chipping created slash. Biomass utilization and opportunities for public firewood would be considered in these areas. A portion of the roadside fuel treatments occur on BLM land on the 2301 road (49 acres). Figure 5 in Chapter 1 shows the roadside understory fuel treatment areas.

Four dry meadows have been identified for restoration as part of Alternative 2 and 3. These are within or near Units 3, 6, 7, and 13 (Figure 5). Prescribed burns would be initiated within the meadow habitat and allowed to burn into the forested buffer areas. This action would have the

effect of killing encroaching seedling and sapling conifers and also creating snags from some of the larger diameter trees. Other activities would include cutting encroaching conifers, pulling non-native and invasive weeds.

Table 3. Alternative 2 Unit Summary

Unit	Stand Acres	Stand Age	Harvest Acres	Harvest Rx (trees per acre left)	Gaps[4]	Total MBF volume	Logging Systems	Fuels Prescription
1	76	130	55	60-80	1/10-ac. pine release	1430	ground, skyline, helicopter	Underburn
2	73	62	35	60-80		609	helicopter	No Treatment
3	26	123	11	60-80	1/10-ac. pine release	213	skyline	Underburn
4	5	105	12	60-80		248	ground, skyline	Underburn
5	69	105	37	60-80		925	ground, skyline	Underburn
6	13	107	7	60-80		138	skyline	Underburn
7	5	113	2	60-80		38	skyline	Underburn
8	9	106	9	60-80	1/10-ac. pine release	203	skyline	Underburn
9	32	59	23	60-80		324	ground, skyline	Hand Pile
10	15	117	14	60-80	1/10-ac. pine release	294	skyline	Underburn
11	12	117	12	60-80		258	skyline	Underburn

[4]Sugar or western white was identified in these stands. Due to the pines' rarity across the landscape it is assumed that the other stands may also have the sugar or white pine present. If so, they would also have pine release gaps.

Unit	Stand Acres	Stand Age	Harvest Acres	Harvest Rx (trees per acre left)	Gaps[4]	Total MBF volume	Logging Systems	Fuels Prescription
12	14	99	8	60-80	1/10-ac. pine release	172	skyline	Underburn
13	30	111	23	60-80	1/10-ac. pine release	621	helicopter	Underburn
14	179	63	159	60-80		2465	ground, skyline, helicopter	Hand Pile
15	30	91	30	60-80	1/10-ac. pine release	630	helicopter	No Treatment
16	92	49	36	60-80		468	skyline, helicopter	Hand Pile
17	4	126	4	60-80	1/10-ac. pine release	88	helicopter	Hand Pile
18	20	49	17	60-80		187	skyline	No Treatment
19	18	130	12	60-80	1/10-ac. pine release	342	helicopter	Underburn
20	100	125	63	60-80	1/10-ac. pine release	1103	skyline	Underburn
21	40	108	27	60-80	1/10-ac. pine release	432	skyline, helicopter	Underburn
22	55	125	38	60-80	1/10-ac. pine release	684	helicopter	Hand Pile
23	41	100	38	60-80		456	ground, skyline	Underburn

Unit	Stand Acres	Stand Age	Harvest Acres	Harvest Rx (trees per acre left)	Gaps[4]	Total MBF volume	Logging Systems	Fuels Prescription
24	23	115	23	60-80	1/10-ac. pine release	414	skyline	Hand Pile
25	9	115	9	60-80		162	skyline	Hand Pile
26	7	98	7	60-80		117	skyline	Hand Pile
27	10	108	10	60-80		250	skyline	Hand Pile
28	11	98	11	60-80		184	skyline	Hand Pile
29	116	106	95	60-80	1/10-ac. pine release	2280	skyline, helicopter	Hand Pile
30	12	107	9	60-80	1/10-ac. pine release	162	skyline	Hand Pile
31	84	53	75	60-80		1305	ground, skyline	Hand Pile
32	83	53	67	60-80		998	skyline, helicopter	Hand Pile
33	53	112	48	60-80		1008	helicopter	No Treatment
Total	1,366		1,026			19,208	Ground based – 42 ac.; Skyline – 578 ac.; Helicopter – 406 ac.	522 ac. fuel treatment, 504 ac. no treatment

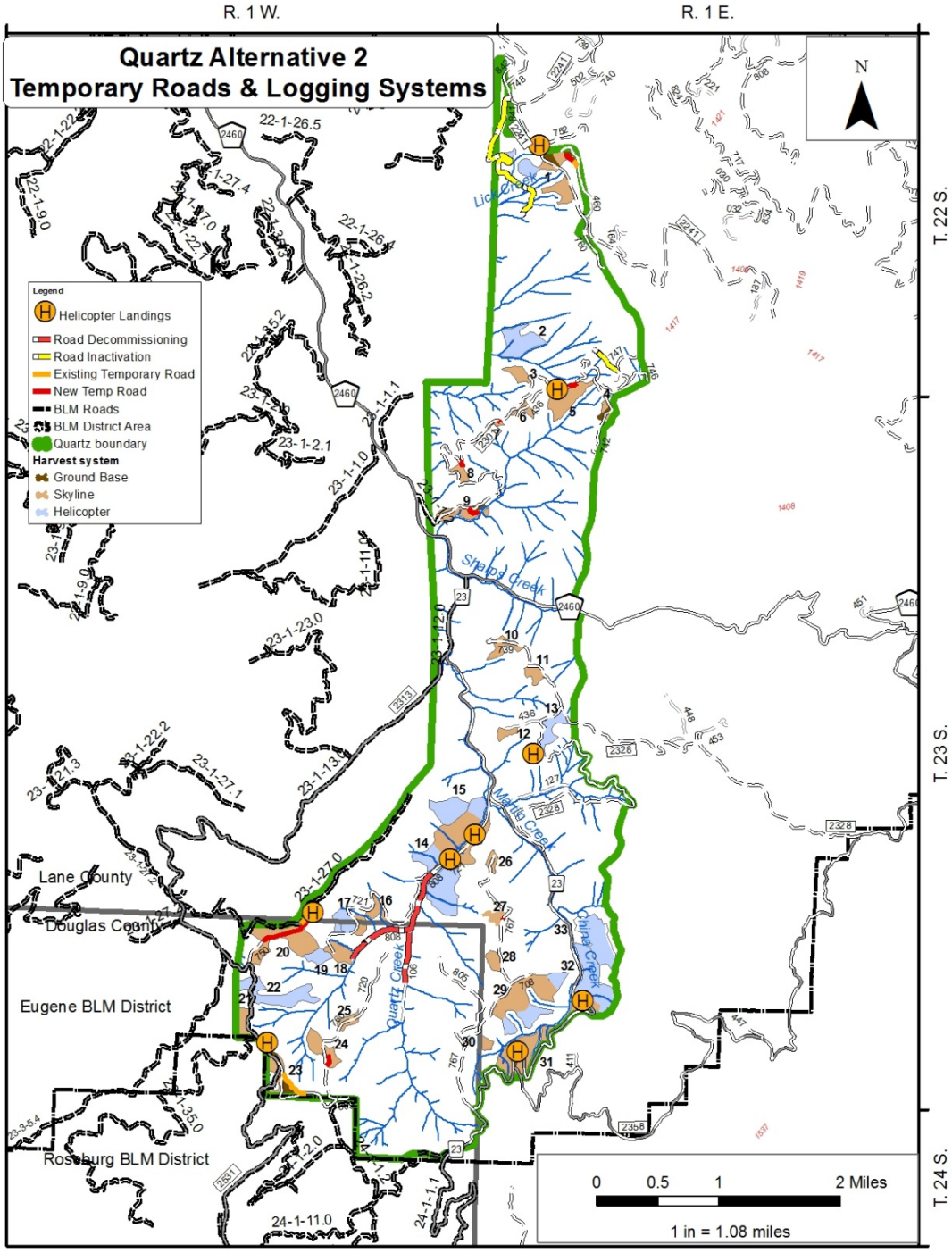

Figure 6. Alternative 2 Temporary Roads and Logging Systems

ROADS

In Alternatives 2 and 3 no new system roads would be constructed. Approximately 1 mile of new temporary spur road would be constructed to gain access into thinning units, and none would be located within no harvest buffers (Figure 6). Approximately 0.7 miles of temporary spur roads would be reconstructed to gain access into thinning units and would be located on the existing footprint of skid roads, fire lines, and abandoned or unclassified road that were built to access the original harvest units. In addition, approximately 300 feet of a mining access spur in Unit 32 will be temporarily used for thinning access. Approximately 90 feet of the reconstructed roads would be located within Riparian Reserve areas and provides the opportunity to obliterate and hydrologically restore these roads. After use, the temporary roads would be obliterated which involves subsoiling as needed and pulling displaced soil and duff back over the road. A native forage seed mix is applied to minimize erosion and invasive weed establishment. The mining access spur in Unit 32 would not be obliterated as it is needed to access the mining claim. Approximately 0.2 of 0.7 miles of reconstructed temporary spur roads are located on BLM land. Table 4 provides a summary of temporary road construction and reconstruction.

Table 4. Temporary Road Construction and Reconstruction for Alternatives 2 and 3

Unit No.	New Temporary. Road Construction (miles)	Existing Temporary. Roads Reused (miles)
1	0.09	0.07
5	0.10	
7	0.01	
8	0.04	
9	0.11	
20	0.43	0.22
23		0.36
24	0.11	
27	0.01	
31	0.07	
32		0.05
TOTAL	**0.97**	**0.70**

Alternative 2 and 3 propose the reconstruction and maintenance on approximately 54 miles of road. Road reconstruction activities are implemented on existing roads to reduce risk of resource damage and/or improve traffic safety. Reconstruction includes replacement of surface rock; reconditioning and reshaping road surfaces; replacement of up to 20 ditch relief culverts; culvert inlet and catch basin modifications to prevent plugging; replacement of 18 undersized or deteriorated stream crossing culverts on roads 2241, 23, 2300-721, 2301, and 2328; two stream crossing repairs to unplug barrels in deep fill situations; minor road realignment of a small section of the 2531-760 road; installing drivable cross ditches and abandoning sections of

ditchline on the 2300-708, 2300-721, 2301, 2301-742, 2328-739, and 2531-760 roads, in areas due to cut slope stability issues; repair of bridge approaches and wearing surfaces; stabilizing road fills and road shoulders; and repair of three slumps on the 2301-436, 2301-742, and 2328 roads. Further information on reconstruction can be found in the Quartz Roads Analysis report in the project record.

Maintenance activities are designed to accommodate flood flows, minimize the disruption of natural water flow pathways, and lessen risk of erosion. Maintenance includes danger tree removal; roadside brushing; blading roadbeds; replacing or place surface rock; cleaning ditches and culverts; grading and shaping roads; constructing or installing water bars and cross ditches; and bridge maintenance.

No new rock pits will be established for this project but the Shane Saddle Rock Pit on the North Umpqua Ranger District will be expanded about 100 feet into previously undisturbed area above the pit. Waste disposal areas for material collected during road maintenance would be located on road 23, 2300-721 as well as three locations on the 2301 road.

Alternatives 2 and 3 propose 1.6 miles of road inactivation on the 2241-841 road and include removing culverts, installing water bars and blocking the entrance. Road decommissioning is proposed on 1.5 miles of the 2300-106 and 2300-808 roads and includes removing culverts and a failing wooden bridge, restoring stream channels at crossings, ripping and out sloping road surfaces, stabilizing fill slopes, and blocking entrances. Figure 5 in Chapter 1 displays proposed road inactivation and decommissioning roads.

CONNECTED AND SIMILAR ACTIONS

Connected actions (actions closely related to the proposed alternatives and similar regarding timing and geography) must be considered when determining the combined effects 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. The projects listed below would be implemented as funding becomes available (See Figure 7).

- Generate coarse woody habitat by girdling up to 3 trees per acre in all harvest units and falling up to 7 trees per acre for down wood in managed stands.
- Treat up to 107 acres of noxious weeds within harvest units, along roads and other areas of disturbance for up to three years following sale closure. Proposed weed treatments are mechanical or manual. Management of these high priority noxious weeds by early detection and rapid response methods would include the ability to chemically treat new infestations that may be found in the planning area over time (not to exceed an additional 1 acre/year)
- Revegetate up to 21 acres of bare ground for weed control as needed in areas such as landings, temporary roads, etc.
- Plant a big game forage seed mixture on 10 acres on a combination of openings, revegetated temporary roads, and helicopter landings.

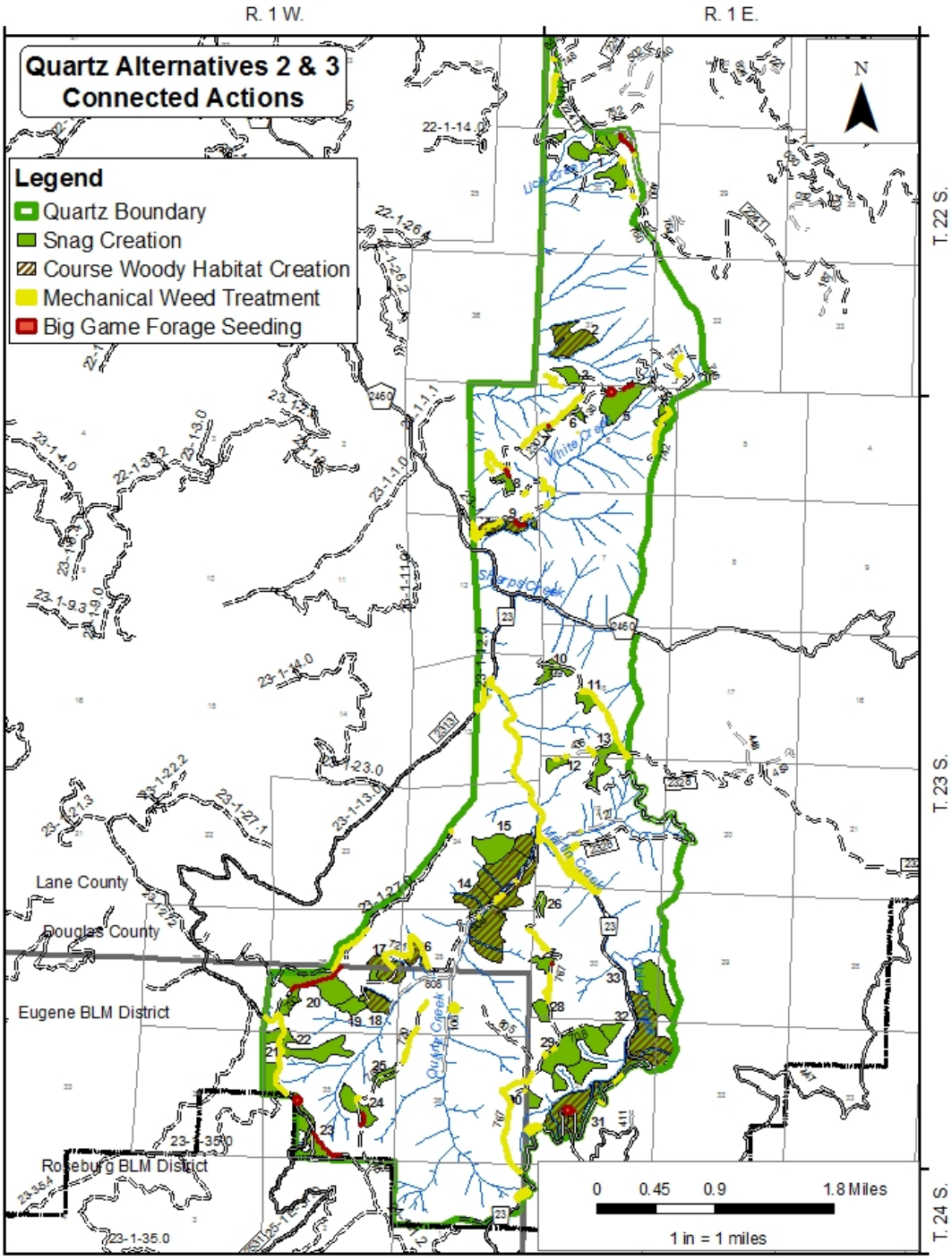

Figure 7. Connected Actions

ALTERNATIVE 3

Alternative 3 was developed to meet the purpose and need, and address the two key issues of economic viability and of harvesting in mature older forest. Specifically, Alternative 3 differs from Alternative 2 in that it reduces the amount of helicopter logging by 176 acres, thins heavier in the younger stands and withdraws 99 acres of commercial thinning in the older stands. Units 2, 22, 33, and portions of 14, 16 and 21 are dropped from harvest. The silvicultural prescriptions for the remaining 90 to 130-year-old stands are the same as Alternative 2. The remaining 45 to 65-year-old stands would have a heavier thin and include ¼ acre gaps. Figure 5 found in Chapter 1 displays the proposed action, which is the same as Alternative 3, except for the removal of the above mentioned acres.

Alternative 3 includes the following:

- Commercial thin approximately 850 acres of stands 45 to 130 years old including 1/10th acre pine release gaps in Matrix and Riparian Reserves generating about 16 million board feet of timber. No treatment (or skips) would occur on approximately 335 acres within the stands proposed for treatment. See Table 5.

- Harvest systems for this project would include roughly 68% skyline logging, 27% helicopter logging, and 5% ground based logging. One landing for helicopter logging would be used with each opening up to 1 acre in size. See Figure 8.

- No harvesting of the Riparian Reserves within the 90 to 130-year-old fire regenerated stands is proposed. Within the 45 to 65-year old plantations, harvesting is proposed in the outer portions of the Reserves with a 60-foot no harvest buffer on perennial streams and a 30-foot no harvest buffer on intermittent streams.

- Treat activity generated fuels on approximately 496 acres within the commercial thinning areas using a combination of underburning, machine piling, and hand piling and burning.

- Outside of the commercial thin areas, treat surface and ladder fuels over 334 acres within 200 feet of strategic ridgeline roads. Understory fuel treatments would include thinning trees (<10” dbh) and shrubs, pruning, piling and burning, or chipping. Biomass utilization and opportunities for public firewood would be considered.

- Meadow maintenance and restoration on 18 acres within dry meadows and the 30 acres of transitional zone surrounding the meadows. Activities would include meadow burning, cutting encroaching conifers, pulling non-native and invasive weeds, and underburning the area surrounding the meadows.

- No new permanent (system) roads would be constructed. Approximately 0.7 miles of existing temporary roads would be used and another 1.0 miles of temporary roads would be created. All temporary roads would be obliterated after use.

- Road reconstruction and maintenance work on approximately 54 miles of existing roads.

- Expansion of the existing Shane Saddle rock pit on the North Umpqua Ranger District as one of the rock sources for the road work. The expansion would include about 100 horizontal feet into the previously undisturbed rock outcrop area above the current top of the pit.

- Road decommissioning on approximately 1.5 miles on the 2300-106 and 2300-808 roads near Quartz Creek. Activities include removing culverts and a failing wooden

bridge, restoring stream channels at stream crossings, ripping and out sloping road surfaces, stabilizing fill slopes, and blocking entrances.

- Road inactivation on approximately 1.6 miles on the 2241-841 road. Activities include removing culverts, installing water bars and blocking entrances.
- All connected and similar actions are the same as those listed under Alternative 2, with the following exceptions:

  Planting of a big game forage seed mixture is reduced from 55 to 53 acres on closed temp roads, landings and helicopter landings.

  Planting trees in the ¼ acre gaps for species and structural diversity is added.

VEGETATION AND FUELS

Commercial thinning is proposed in 850 acres. Thinning would occur at two different intensities: The 90 to 130-year-old stands would be thinned from below to 60 to 80 trees per acre to an average residual canopy cover of 51% while the 45 to 65-year-old stands would be thinned from below to 40 to 60 trees per acre to an average residual canopy cover of 38%. In addition, the 45 to 65-year-old stands would have ¼-acre dominant tree release gaps comprising up to 5% of the unit. Like Alternative 2, Pine release gaps 1/10th acre in size are proposed in the 90 to 130-year-old stands to reduce competition and stress on the sugar and western white pines scattered throughout the stands. Variable density thinning is promoted through the retention of legacy trees (32-inch plus diameter trees), hardwoods, and minor conifer species; no harvesting areas within stands on about 25 to 28% of the original stand boundaries; and creation of small gaps. Table 5 provides a unit summary.

Fuel treatments in the commercial thin areas on 496 acres include underburning, machine piling and hand pilling and burning. Table 5 provides a unit summary.

Fuel treatments outside of the commercial thin areas for roadside surface and ladder fuels include 334 acres within 200 feet of strategic ridgelines roads. These understory treatments would include, where needed, thinning understory trees <10” in diameter and shrubs, pruning, as well as pile and burning or chipping created slash. Biomass utilization and opportunities for public firewood would be considered in these areas. Figure 5 in Chapter 1 shows the roadside understory fuel treatment areas.

Meadow restoration activities are the same as Alternative 2.

ROADS

Activities associated with roads are the same as Alternative 2.

Table 5. Alternative 3 Unit Summary

Unit	Unit Acres	Stand Age	Harvest Unit Acres	Harvest Rx (trees per acre left)	1/4 or 1/2 Acre Gaps (5-15% of treatment area)	MBF Volume Removed	Logging Systems	Fuels Prescription
1	76	130	55	60-80	1/10-ac. pine release	1430	ground, skyline, helicopter	Underburn
3	26	123	11	60-80	1/10-ac. pine release	213	skyline	Underburn
4	5	105	12	60-80		248	ground, skyline	Underburn
5	69	105	37	60-80		925	ground, skyline	Underburn
6	13	107	7	60-80		138	skyline	Underburn
7	5	113	2	60-80		38	skyline	Underburn
8	9	106	9	60-80	1/10-ac. pine release	203	skyline	Underburn
9	32	59	23	40-60	1/4 –ac. gaps (1 ac.)	370	ground, skyline	Hand Pile
10	15	117	14	60-80	1/10-ac. pine release	294	skyline	Underburn
11	12	117	12	60-80		258	skyline	Underburn
12	14	99	8	60-80	1/10-ac. pine release	172	skyline	Underburn
13	30	111	23	60-80	1/10-ac. pine release	621	helicopter	Underburn
14	179	63	128	40-60	1/4 –ac. gaps (1 ac.)	2056	ground, skyline, helicopter	Hand Pile
15	30	91	30	60-80	1/10-ac. pine release	630	helicopter	No Treatment
16	92	49	20	40-60		280	skyline	Hand Pile
17	4	126	4	60-80	1/10-ac. pine release	88	helicopter	Hand Pile
18	20	49	17	40-60	1/4 –ac.	200	skyline	No Treatment

Unit	Unit Acres	Stand Age	Harvest Unit Acres	Harvest Rx (trees per acre left)	1/4 or 1/2 Acre Gaps (5-15% of treatment area)	MBF Volume Removed	Logging Systems	Fuels Prescription
					gaps (0.5 ac.)			
19	18	130	12	60-80	1/10-ac. pine release	342	helicopter	Underburn
20	100	125	63	60-80	1/10-ac. pine release	1103	skyline	Underburn
21	40	108	19	60-80	1/10-ac. pine release	304	skyline	Underburn
23	41	100	38	60-80		456	ground, skyline	Underburn
24	23	115	23	60-80	1/10-ac. pine release	414	skyline	Hand Pile
25	9	115	9	60-80		162	skyline	Hand Pile
26	7	98	7	60-80		117	skyline	Hand Pile
27	10	108	10	60-80		250	skyline	Hand Pile
28	11	98	11	60-80		184	skyline	Hand Pile
29	116	106	95	60-80	1/10-ac. pine release	2280	skyline, helicopter	Hand Pile
30	12	107	9	60-80	1/10-ac. pine release	162	skyline	Hand Pile
31	84	53	75	40-60	1/4 –ac. gaps (4 ac.)	1502	ground, skyline	Hand Pile
32	83	53	67	40-60	1/4 –ac. gaps (3 ac.)	1162	skyline, helicopter	Hand Pile
Total	**1185**		**850**		**¼-ac. gaps = 9.5 acres**	**16,602**	**Ground based – 42 ac.; Skyline – 578 ac.; Helicopter – 230 ac.**	**496 ac. fuel treatment, 354 ac. no treatment**

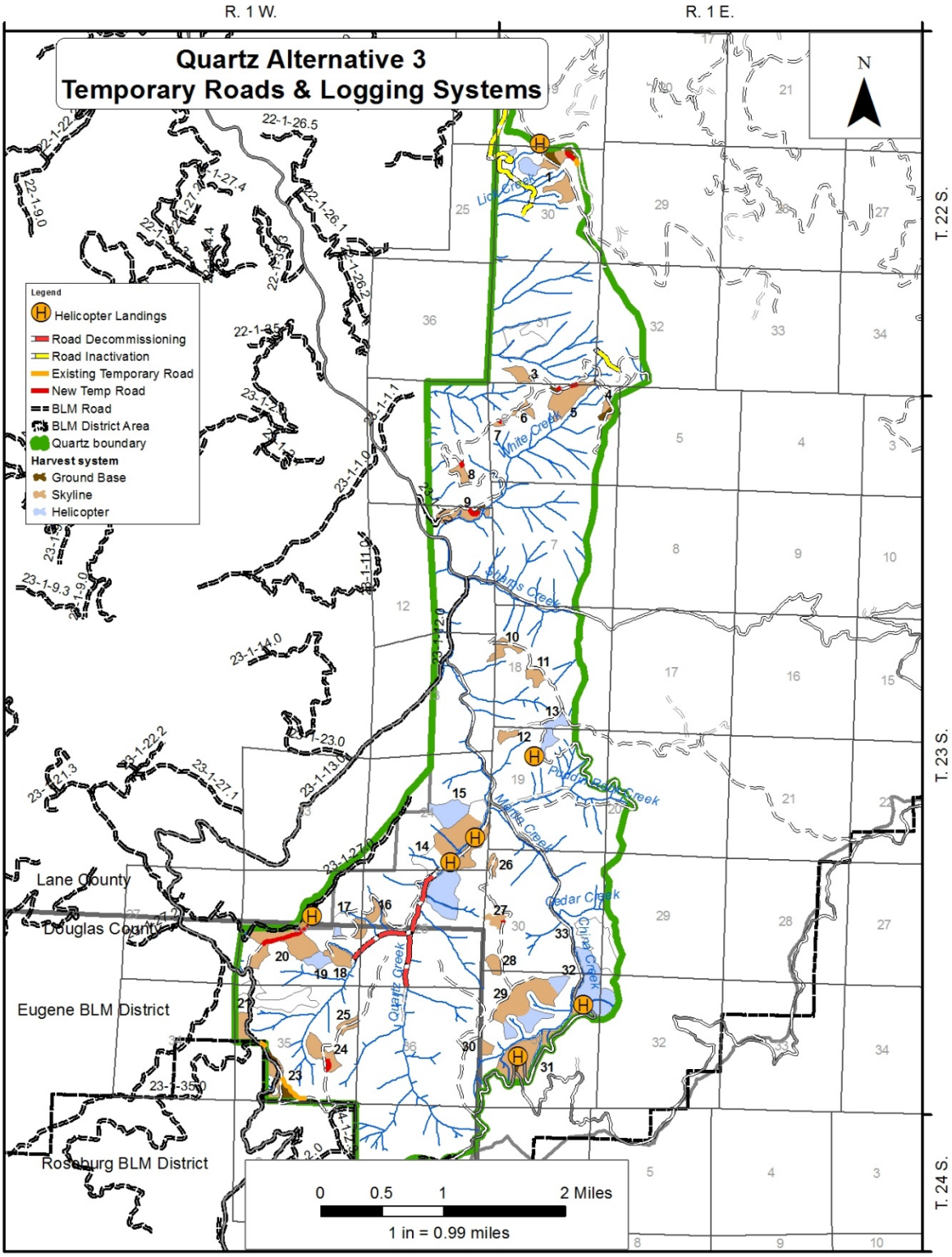

Figure 8. Alternative 3 Temporary Roads and Logging Systems

COMPARISON OF ALTERNATIVES

Table 6 provides a comparison of the alternatives for this project.

Table 6. Comparison of Alternatives

Project Element	Unit of Measure	Alternative 1	Alternative 2	Alternative 3
Element 1 – Stand Growth, Health and Diversity				
Thinned, leaving 60-80 trees/acre	Acres	0	1026	520
Thinned, leaving 40-60 trees/acre	Acres	0	0	330
Total thinned	Acres	0	1026	850
¼ acre gaps	Acres	0	0	9.5
Skips (unthinned areas in stand)	Acres	1366	340	300
Stands with sugar pine thinned to improve resiliency to insect and disease	Acres	0	421	375
Riparian Reserves thinned to improve species composition and structural diversity	Acres	0	202	169
Element 2 – Fire Resilience and Wildfire Spread				
Ground fuels reduced to limit flame length to 8 feet	Acres	0	856	830
Tree canopy base height increased to achieve a torching index of moderate or better	Acres	0	334	334
Canopy fuels reduced to achieve a crowning index of moderate or better	Acres	0	1026	850
Element 3 – Timber Production				
Volume of wood products	MMBF	0	19.2	16.6
Predicted stumpage price/thousand board-foot volume	$$	0$	66.32	97.73
Element 4 – Meadow Restoration				
Meadow habitat underburned	Acres	0	18	18
Meadow habitat treated for invasive weeds	Acres	0	107	107
Meadow habitat treated for conifer encroachment	Acres	0	30	30
Element 5 – Aquatic Habitat Restoration				
Road decommissioning	Miles	0	1.5	1.5
Road inactivation	Miles	0	1.6	1.6
Road treated for storm damage risk reduction	Miles	0	56.35	56.35
Riparian Reserves thinned to improve species composition and structural diversity	Acres	0	202	169

Project Element	Unit of Measure	Alternative 1	Alternative 2	Alternative 3
Logging Systems				
Ground-based	Acres	0	42	42
Skyline	Acres	0	578	578
Helicopter	Acres	0	406	230
New landings established for helicopter logging	Acres	0	3	2
Existing landings expanded for helicopter logging	Acres	0	6	5
Activity-Generated Fuel Treatments				
Underburn	Acres	0	330	322
Handpile and burn	Acres	0	192	174
Machine pile and burn	Acres	0	33	33
No fuel treatment	Acres	0	504	354
Transportation System				
Existing temporary roads reconstructed	Miles	0	0.7	0.7
New temporary road construction	Miles	0	1.0	1.0
Road maintenance through timber sale contract:				
Forest Service	Miles	0	54	54
Bureau of Land Management	Miles	0	9	9
Road Reconstruction:				
Ditch relief culverts replaced	Number	0	20	20
Stream culverts replaced	Number	0	18	18
Key Issue: Economic Viability				
Helicopter logging	Acres	0	406	230
Thousand board-feet of volume/acre harvested	MBF/acre	0	18.5	19.5
Key Issue: Older Forest Management				
Stands 90 to 130 years old commercially thinned	Acres	0	612	436
Benefit/Cost Ratio for Integrated Project				
Estimated value of timber	$$	0	9,702,373	8,353,291
Costs of integrated projects (includes cost related to the timber sale + costs for all proposed restoration work)	$$	0	9,646,099	7,883,785
Benefit/cost ratio of integrated projects		0	1.01	1.06

BEST MANAGEMENT PRACTICES, PROJECT DESIGN FEATURES, 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. Project Design Features are defined as actions that:

- avoid the impact all together (such as avoiding harvest on unstable land);
- minimize effects 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 1988 and 2012) and project design features are symbolized by a (✓); these protect the beneficial uses of water and address water quality objectives as required by the Federal Clean Water Act (USC 2002b) and the 1990 Forest LRMP. The BMPs are listed by codes used in the Pacific Northwest Region's General Best Management Practices guide (USDA 1988) and is available at the Cottage Grove Ranger District.

Other management requirements not related to compliance with the Clean Water 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.

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/cross drains would be located and identified on the ground by the Forest Service before construction.
- ✓ Ground based equipment skid trails would be subsoiled and have effective ground cover on them by the end of the normal operating season in which the road was used.
- ✓ Cut-and-fill slopes would have all erosion control work completed the same year as constructed.
- ✓ All required erosion control work shall be kept current starting September 15th of a given year and completed by end of normal operating season each year (October 31).

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 effects 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 to protect leave trees, soil resources and aquatic resources prior to felling.
- ✓ Location of all ground based equipment trails, at an average of 100 feet apart would be agreed to prior to felling unless otherwise agreed to in writing. When possible, skid trail location should be in previously disturbed areas (i.e. on old skid trails).
- ✓ Locate landings so that timber can be yarded with minimal disturbance to Riparian Reserves.
- ✓ Landing size should be no larger than needed for safe, efficient yarding and loading operations.

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 ; NBMP fac-2, S&G 11 LMRP IV-71

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

ACTIONS:

- ✓ To prevent damage to water quality during harvest and logging operations 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.
- ✓ The Normal Operating Season will be from May 1 through October 31.
- ✓ Restrict ground based equipment use to slopes under 25% and short pitches under 35%.
- ✓ All ground based trail locations would be approved by the Forest Service prior to use.
- ✓ Purchaser shall routinely inspect and maintain erosion and storm water controls as necessary to ensure proper and effective function in restricting off-site movement of soil sediment.
- ✓ 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 reconstruction 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. 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, ditches and residual trees.

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, and 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 minimum of a 50-foot no-harvest buffer, logs should be fully suspended when yarded or hauled across protected stream courses (USDA 1990b) or wetlands, and not igniting fire in the wetlands or buffers during fuel treatments.
- ✓ During ground-based logging, restrict equipment entry to within 50 feet of a protected stream and wet area or outside of the no-cut buffer whichever is further.
- ✓ Apply no-harvest buffers to all perennial streams in the managed stands by following guidance in the Northwest Forest Plan Temperature TMDL Implementation Strategies (USDA/USDI 2010) 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 strategy (Table 7). The Riparian Reserves (180 ft.) in the fire-regenerated stands will not be thinned.

Table 7. No Thin TMDL Strategy Buffer Widths (USDA/USDI 2010)

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	55’ buffer	60’ buffer
Trees >100 feet	70’ buffer	75’ buffer	85’ buffer

- ✓ Apply no-harvest buffers within 30 feet of intermittent streams. The Riparian Reserves (180ft) in the fire regenerated stands will not be thinned for intermittent streams.
- ✓ Burning within the riparian zone to reduce fuel hazard near stream channels would be carefully controlled. Low intensity fire may be allowed to back into the no-harvest buffers (from previously ignited areas outside the buffers) in order to reduce fuel accumulations. It

would be managed to minimize both fire intensity and mortality of fire-susceptible species such as hemlock, cedar and true fir.

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 bridge and 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 May 15-November 30, unless otherwise approved by the ODFW District Fisheries Biologist.
- ✓ To prevent erosion, all areas of exposed soils including landings, roadsides and waste areas would be seeded and or mulched with implementation occurring during the appropriate conditions, (usually between August 1 and April 1, depending on elevation) and not during the dry summer months.

TEMPORARY AND SYSTEM ROAD CONSTRUCTION, RECONSTRUCTION, AND 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 twenty ditch relief culverts and eighteen stream crossing pipes and maintenance of approximately 54 miles for Alternatives 2 and 3. 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 Timber Sale Contract.
- ✓ Additional erosion control measures (e.g. silt fences, weed-free straw/straw bales, etc.) will be implemented at sites where there is point-of-delivery sediment from roads or ditches that could be delivered to the stream network.
- ✓ Seed and ground cover (certified weed free straw, chips, hydromulch, etc.) shall be applied to bare soil and drainage areas around landings (straw at 2 tons per acre). Seeding should be kept current, proceeding expected periods of rain. The seed mix to be used will be provided by the Forest Service or agreed to by the Forest Service.
- ✓ 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 and 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, as identified on the Sale Area Map. These areas shall stay outside riparian, fish, wildlife, cultural, and botanical resources and be located on stable areas.
- ✓ 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.
- ✓ Provide relief culverts within 150 feet of any naturally defined channel to minimize the cumulative road drainage entering a stream-course.
- ✓ Road re-construction activities that may expose new soil (including clearing, grubbing, excavating, and fill placement) would be limited to the Normal Operating Season. However, construction activities may be suspended anytime during wet weather to protect water quality of affected streams.
- ✓ Surface spot rock placement may be done outside Normal Operating Season, as weather and road conditions permit and with the Contracting Officer's approval.
- ✓ Spot rocking of less than 75 cubic yards per mile of approved aggregate may be required for road maintenance at locations designated by the Forest Service. Roads requiring more than 75 cubic yards of aggregate for more than a mile would fall under road reconstruction (USFS-R6 Road Maintenance Handbook 7709.59 Chapter 60) requiring work to be completed within the normal operating season. Only those roads preapproved by Engineering for wet weather haul or that have been brought up to Forest Service standards for wet weather haul during the normal operating season would be considered suitable for wet weather haul outside the Normal Operating Season. Roads approved for wet weather haul, but later found to require more than 75 cubic yards per mile of spot rocking in order to prevent "road distress" would no longer be considered suitable for wet weather haul until reconstructed during the "normal operating season".
- ✓ All temporary roads would be blocked, before October 31, for the winter wet season. Earth-surface roads, including uncompleted roads to be rocked, would be cross drained before October 31.
- ✓ All required erosion control work shall be kept current starting September 15th of a given year and completed by end of normal operating season each year (October 31).
- ✓ Road surface and roadside sediment controls shall be adequate to restrict the off-site movement of sediment. Erosion controls shall be applied in anticipation of wet weather haul or at the first signs of erosion, road distress, or road subgrade pumping. Refer to Commercial Road Use Rules and Road Use Permit Requirements, pages 6 and 7 (USDA 2012). Materials for sediment control commonly include straw mulch, woodchips, and/or straw bale structures along roadsides, increased rock aggregate on road surfaces and surface shaping. The effectiveness of these materials will depend on actual surface water runoff rates, erosiveness of the soil and road surfaces, and the application rates of materials applied (Supplements BT6.67).

    a. Straw mulch is typically applied at a 2-inch depth (minimum application rate of 2 tons per acre) of well distributed straw (certified weed-free wood, grass, or rice straw) covering 80% or more of the treated area.
    b. Woodchips or fine logging slash would typically be applied at a minimum 2 inch depth covering 80% or more of the treated area.

c. Sediment Traps using multiple straw bales can be effective when placed in a way that water escapes over and not around or under the structure.
d. Existing native vegetation, surface rock, or slash cover can often be considered effective for erosion control when it is both stable and provides adequate coverage to trap sediment and prevent scour (generally 70% to 80% coverage).
e. Temporary silt fencing made of permeable geotextile will be buried at the bottom, stretched, and supported by steel posts. Properly placed silt fencing can be used to intercepts sheet erosion from bare soil surfaces such as landings. Silt fences shall not be installed across streams, ditches, or other areas of concentrated flow that may exceed 1 cfs.
f. Grass seeding would only be considered as a suitable form of erosion control once it has established rooted to a 2-inch depth.
g. Erosion control mattings and wattles shall be made of natural fibers without nylon netting.

- ✓ When needed, road cut slopes, fill slopes, and ditch lines would be stabilized with grass or grass/forbs.
- ✓ Heavy vehicles would be restricted to all-weather roads outside the Normal Operating Season. 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 (05/08/2012).
- ✓ Over load permits will be required when hauling over weight loads across the Row River Bridge on the 1700 road at MP 0.30, Prather Creek Bridge on the 1700 road at MP 2.10, Layng Creek Bridge on the 1746 road at MP 0.02, Champion Creek Bridge on the 2200 road at MP 8.29, Sharps-Wyatt Creek Bridge on the 2200 road at MP 10.89 and East Fork Sharps Creek Bridge on the 2200 road at MP 13.8. Specific requirement for the above bridges can be obtained from the Umpqua National Forest Bridge Engineer.
- ✓ Displaced soil from construction of all new landings and temporary roads will be bermed or temporarily pulled back in a way that it can be replaced over the soil surface when the landings and roads are being subsoiled and restored. It is assumed that the returned soil may contain logging slash. The objective of this action is to provide a fertile seedbed to the temporary road by returning the most developed portion of the soil to the road surface.
- ✓ Water bars sufficient to disperse water shall be designated by the Forest Service to disperse surface water and prevent future traffic.
- ✓ In order to initiate and finalize the restoration prescription, all temporary roads would be reviewed by the Sale Administrator prior to restoration activities. The effectiveness of the temporary road restoration prescription in preventing erosion and providing suitable plant habitat may be monitored by a resource specialist.
- ✓ 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.
- ✓ No new temporary roads without previous ground disturbance will be constructed on slopes greater than 25% and short pitches under 35%. All sections of new temporary roads on slopes between 25 to 35% shall be identified during the planning process to receive special consideration for restoration, including surface soil pull-back and erosion control.

FIRE SUPPRESION AND FUELS MANAGEMENT

General Water Quality BMPs F-1, F-2, F-3; UNF LRMP S&Gs IV-25 (10); IV-33 (4); IV-36 (2); IV-37 (6); IV-42 (1a); IV-60 (7); IV-67 (1d); IV-92-4, 5, 11; 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. Project Design Features 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.
- All machine and landing piles shall be covered with black polyethylene plastic 0.004 inch (4 mil) thick or its equivalent as approved by Forest Service. The entire top of the pile will be covered, with coverage extending halfway down the sides. While this may exceed the 100 square feet prescribed by ODEQ, the resulting piles will burn cleaner and with less emission, as allowed by waiver in Oregon Smoke Management rules. This is necessary in order to achieve consumption and air quality objectives.
- ✓ General burning guidelines are designed to minimize erosion.
- ✓ As needed, fire lines 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.
- ✓ 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; machine would be equipped with a brush grapple or articulating brush grapple mechanism. To further distribute weight and prevent soil displacement equipment shall operate on top of slash and on slopes under 25 percent and short pitches under 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 and duration in areas of particular concern.
- ✓ 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, USDA 1990b, p. IV-71). Ground skidded units shall be given high priority for soils monitoring).

SILVICULTURE

Umpqua Forest Plan S&Gs:

- IV-42 (1f): practices on lands selected for timber production include commercial thinning to promote growth and utilize merchantable material.
- IV-44 (6a): Harvest activities may occur on unsuitable lands if the activity is needed to enhance other resource objectives.
- IV-47 (13): Stand treatment in managed commercial forests shall provide for species diversity. Vegetation management activities and hardwood management prescriptions should allow for all natural species to function.

ACTIONS:

✓ Commercial thinning will be conducted within the Riparian Reserves of the managed stands only and outside the no-harvest buffers described in the "Riparian Areas Within or Adjacent to Cutting Units".

- Legacy trees should be retained unless removal is required during logging operations to meet safety requirements. Legacy trees are defined as trees left from previous stands that are typically larger and older than the remaining trees. Based upon stand examination information, legacy trees for the Quartz project are defined as all trees ≥32" DBH. If cut, they will be left on site.

- Only conifers will be considered for removal in commercial harvest. All hardwoods and minor conifers should be retained to maintain and promote species and structural diversity unless otherwise specified in the silviculture prescription.

- Pine release gaps are prescribed around all sugar and western white pines within harvest units. Each pine will have up to 1/10th acre opening created around them with all conifers 7 to 31.9" dbh removed (unless prescription identifies minor conifers to remain) within that opening. Openings are limited to ¼ acre in size where multiple pines are adjacent to each other. Where falling or yarding trees within the gaps may injure the boles or crowns of the retained pine, the competing tree should not be cut.

- 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.

✓ The Silviculturist shall review marking guides and prescriptions with the presale crew prior to marking, and would 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% of the target. If not, remarking or amending the silvicultural prescription would be necessary.

SOIL AND SITE PRODUCTIVITY

BMP T-9, T-12; Forest Plan S&Gs IV-67-1, 2, 3, IV-71-12

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.
- ✓ Between November 1st and April 30th, no more than ½ acre of exposed soil (S&G#13, USDA 1990b, p. IV-71), including landings, skid trails, and temporary roads shall exist at any time.
- ✓ For soil disturbance occurring before September 30th, all seeding for erosion control and other erosion control measures shall be in place by September 30. A minimum of one ton straw shall be staged, kept dry, and available as need for erosion control. After September 30, all bare soil associated with the sale shall be effectively covered with wood chips, wood straw, weed free straw, slash sufficient to restrict off-site movement of sediment regardless of its potential for delivery to streams. Erosion control measures and drainage structures will be maintained current with operations. Any soil disturbed outside the normal operating season (October 30 through June 1) or during wet weather conditions in excess of 0.5 acre will have stable and effective ground cover provided (LMRP pp IV-71).
- ✓ No Ground based harvest or subsoiling would occur outside the normal operating season or during wet weather conditions (S&G 1 LMRP pp IV-67).
- ✓ 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).
- ✓ Monitoring Element 1: Determine the effectiveness of subsoiling, surface soil pull-back, slash cover, and soil amendments in obliterating the footprint and preventing erosion on new temporary roads.

BOTANY

Only selected applicable goals, objectives, standards, and design criteria are listed below. For a more complete list of standards and Best Management Practices (BMP) that would be applied to this project, refer to the following:

Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants, FEIS Record of Decision, October 2005 (USDA 2005a)

Decision Notice and Finding of No Significant Impact for the Umpqua National Forest Integrated Weed Management Project Environmental Assessment, 2003 (USDA 2003a)

United States Department of Agriculture, Forest Service, Timber Sale Contract, Division BT, June 2006, B6.35

REVEGETATION – BEST PRACTICES

- All revegetation requirements would be met using genetically local native species (USDA 2005a).
- Use weed-free straw and mulch for all projects conducted or authorized by the Forest Service, on National Forest System Lands (Standard #3)[5].
- Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur (Standard #13). Use native revegetation techniques to re-establish native plants on sites where weeds are removed as well as in areas where exposed mineral soil provides optimal conditions for weeds to colonize.

INVASIVE PLANTS AND NOXIOUS WEEDS

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

Objective: Reduce soil disturbance while achieving project objectives through timber harvest, fuel treatments, and other activities that potentially produce large amounts of bare ground.

OBJECTIVE: Retain native vegetation consistent with site capability and integrated resource management objectives to suppress invasive plants and prevent their establishment and growth.

ACTIONS:

- Actions conducted or authorized by written permit by the Forest Service that will 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 (Standard #2).
- 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 by District or Forest weed specialists (Standard #7).
- 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 (Standard #8).
- Areas known by the Forest Service to be infested with invasive species of concern will be shown on the sale area map. Purchasers will avoid activities that have the potential to spread weed seed in these areas or adhere to restrictions placed on such activities, as identified on the sale area map. When needed, the Forest Service will use flagging and/or

[5] All standards referenced in the Botany section are from the Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants, FEIS Record of Decision, October 2005 (USDA 2005a)

marking posts on the ground to identify locations of invasive species of concern prior to work commencing.

- Purchaser shall adhere to the requirements with regard to cleaning "Off-Road Equipment" as stated in the BT6.35 provision. This includes that "prior to moving off-road equipment (all logging and construction machinery, except for log trucks, chip vans, service vehicles, water trucks, pickup trucks, cars and similar vehicles) from a cutting unit that is shown on the Sale Area Map to be infested with invasive species of concern to, or through, any other area that is shown as being free of invasive species of concern or infested with a different invasive species, the Purchaser shall clean such equipment of seeds, soil, vegetative matter, and other debris that could contain or hold seed.
- After harvest, treat infestations of noxious weeds for up to three years following sale closure.

PROTECTION OF TES/SURVEY AND MANAGE 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 Federal listing of any species. (Forest Service Manual 2672.41).

ACTIONS:

- 100' no-entry buffers (no thinning, no yarding, no skyline corridors, no fuels treatments, no burning, etc.) would be established around the following:
    - One population of *Romanzoffia thompsonii* (Thompson's mistmaiden) occurring in a dry meadow between harvest units 6 and 7.
- As per Timber Sale Contract provision BT6.24, areas needing special measures for the protection of plants are to be shown on the sale area map and unless agreed otherwise, trees would not be felled into areas identified as needing special measures.

UNIQUE HABITATS

Umpqua National Forest Land and Resource Management Plan, 1990, Prescription C5-1 (USDA 1990, p. 200-201) amended with this project.

OBJECTIVE: To provide maximum protection for areas of high wildlife [and plant] values (USDA 1990, p. 200).

ACTIONS:

- No commercial thinning or yarding would occur, or skyline corridors constructed, within unique habitats and surrounding buffer zones (Table 8).
- Avoid burning areas where bryophyte (moss) mats cover rock outcrops during prescribed burns in meadows. A sensitive plant species, *Romanzoffia thompsonii* (Thompson's mistmaiden) occurs within a dry meadow between harvest units 6 and 7. The consequences of fire on population viability of this species are unknown; therefore, avoid burning through the population and surrounding 100' no-entry buffer zone.

Table 8. Unique Habitats and Design Criteria

Unique Habitat	Within or Near Harvest Unit or Fuel Treatment Area	Acres	Design Criteria	Buffer Width (ft.)
Mesic to Wet Meadows/Shrublands	1, 31, 32, F	6	No entry	150’
Hardwood Dominated Inclusions	8, 15, E, U	14	No entry	0-150’
Rock Outcrops/Talus	5, 9, 20, 21, 22, 30, 31, J	26	No entry	0-150’
Dry Meadows/Balds	1, 2, 3, 6, 7, 13	24	No entry	150’

WILDLIFE MANAGEMENT

OBJECTIVE: To provide habitat for viable populations of all existing native wildlife species and to maintain or enhance the overall quality of wildlife habitat across the forest.

ACTIONS:

- During treatment (harvest, burning), retain and protect all snags except those within 70 feet of road-side edge of the fuel break. Protect all existing down wood greater than six inches diameter (on small end), except those within 35 feet of the road-side edge of the fuel break to the extent practical from disturbances that might otherwise destroy the integrity of the substrate.
- 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.
- During treatment (harvest and burning) retain and protect all hard wood trees greater than eight inches diameter, to the extent practical, from disturbances that might otherwise destroy the integrity of those trees.
- During treatment (harvest and burning) retain and protect all yew (*Taxus brevifolia*) trees greater than eight inches diameter to the extent practical from disturbances that might otherwise destroy the integrity of those trees.
- To achieve moderate levels of snags, retain three trees/acre (>15 inch dbh or greater) for snag creation. This applies to all units.
- Following the use of temporary roads and associated landings, and appropriate helicopter landings, utilize a native big game forage mix to seed when conditions are appropriate. This applies under all action alternatives.
- To reduce impacts to nesting land birds, burning of hand piles and machine piles will occur in the fall/winter months and not in spring or summer.
- To reduce impacts to Crater Lake tightcoils (*Pristiloma arcticum crateris*), perennial wetlands considered to be suitable habitat (those located between 2750 and 6400 feet elevation) for the species would be buffered by 33 feet to reduce potential impacts to the species and changes to habitat conditions
- Retain existing large down wood (>6 inch diameter) and snags (>9 inch dbh) to the extent practical and safe. Where feasible, avoid mechanical impacts and movement of large down

wood and leave felled snags on site. Care will be taken when yarding to attempt to avoid loss of bark on downed wood. If possible, directionally fall and yard trees away from large downed wood.

- If feasible, in skyline units, retain all trees used as anchors in the skyline operation as long as they do not pose a hazard.
- OSHA requires that hazardous trees/snags be felled to protect workers on the ground during forest operations. Snags that must be felled for safety reasons should be retained to help attain down wood requirements.
- When felling hazard trees retain as high of a stump as is operationally safe to do so.
- To protect nesting spotted owls, for proposed and connected actions that create above-ambient noise levels (i.e. road maintenance, brushing, subsoiling, etc.), abide by the terms and conditions in the programmatic Biological Opinion (FWS-1-15-03-F-0454). When possible, do not schedule these activities to occur between March 1 and July 15.
- To protect nesting and young northern spotted owls (NSO's), no timber felling or yarding will occur in units 4, 5, 6, and 7 between March 1 through July 15 unless non-nesting status has been determined for NSO 655 for that breeding period.
- Underburning proposed in Units 5 and 6 should occur outside of the critical nesting period (March 1 through July 15) if possible. If burning outside the critical nesting period is not possible, south winds need to be included in the burn prescription for these units, and contact needs to be made with the District biologists to determine the status of NSO 655 before burning occurs.
- To protect nesting spotted owls, rock pit blasting operations will occur outside of the critical nesting period (March 1 through July 15).
- To protect nesting spotted owls, road decommissioning activities planned on the 2300-106 and 2300-808 roads will take place outside of the critical nesting period (March 1 through July 15).
- Anchor Tree Selection: Cable logging systems may use healthy green trees to anchor rigging (tail-holds) and yarders (guyline trees). Anchor tree removal will not occur in any habitat type. The smallest possible anchor trees will be selected in all instances, trees with suitable spotted owl nest structures will be avoided when possible, and anchor trees will be left standing when feasible. These measures will help to reduce impacts to spotted owl habitat features. Anchor Tree felling of occupied nest trees will be strongly avoided where- and whenever possible. The following features will minimize the likelihood of felling occupied nest trees:
    - When large guyline trees are necessary, trees closer to the road will be selected in lieu of trees farther into the adjacent stand;
    - Trees with characteristics suitable for spotted owl nesting will be avoided wherever possible;
    - Use of guyline trees necessitating felling of large snags in the adjacent stands will be avoided wherever possible;
    - Use of guyline trees close enough to possible nest trees that felling them will disrupt the current micro-climatic conditions associated with said possible nest trees will be avoided wherever possible.

- o Guyline trees felled for safety reasons will be left on site when felled outside of units after the cessation of logging operations. All anchor trees outside of unit boundaries are to be retained as either live trees or snags if they have been topped. A portion of unit 20 (approximately 4 acres) has proposed hand pile burning within this potential disturbance distance of .25 miles. Smoke-related disturbance during the critical breeding period could affect nesting owls at site ID 666. The hand piles within unit 20 will be burned outside of the NSO breeding season (March 1 through September 30).

RECREATION, VISUALS, AND HERITAGE RESOURCES

OBJECTIVE: To ensure that Forest Service actions do not cause safety issues to main travel routes during logging operations. In addition, protect potential historical and prehistoric sites if discovered during logging operations.

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.
- Operator to provide Cottage Grove Ranger District, Minerals Administrator with Operating Schedule at least one month prior to harvesting units 14 & 15.
- Operator is to leave access to dispersed camping locations near the junction of FS Road 2300 & 2300-721 during the Holiday Weekends of Memorial Day, July 4th, and Labor Day.
- ✓ Heritage resource field surveys indicated approximately 2% of the project acres should be monitored for heritage resources. Dense vegetation, downed timber, and duff in some units limited the efficacy of the primary field surveys. Implementation of the timber sales under this EA may expose soil, thereby providing better ground visibility than was typical during surveys.

CHAPTER THREE

AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

INTRODUCTION

This Chapter summarizes the terrestrial, aquatic and social environments of the affected project area and describes the potential direct, indirect and cumulative effects to those environments due to implementation of the all alternatives. It presents the scientific and analytical basis for comparison of alternatives. This chapter provides a summary of the specialists input in adequate detail to support the rational for the decisions. The Project Record contains supplemental information and other technical documentation used to support the analysis and conclusion in this EA and is incorporated by reference. The Project Record is available for review at the Cottage Grove Ranger District office. A complete description of each alternative is found in Chapter Two.

ACTIVITIES THAT MAY CONTRIBUTE TO ENVIRONMENTAL EFFECTS

CUMULATIVE EFFECTS

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

CURRENT CONDITIONS PROXY FOR PAST ACTIONS

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the effects of past actions. Current conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. The cumulative effects analysis in this document does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at current conditions, because there is limited information on the environmental effects of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing only on the effects of past human actions puts us at risk of ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. Looking at the current condition helps to

ensure that we capture all of the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions."

The cumulative effects analysis in this EA is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008), which state, in part:

> "CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives would add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making. (40 CFR 1508.7)"

For these reasons, the analysis of past actions in this section of the document is based on current environmental conditions.

SETTING THE STAGE

Extensive timber harvest, mostly regeneration harvesting, has occurred on both public and private lands in this project area and the Sharps Creek watershed. In order to access harvest areas, an extensive road system was developed with 56 miles of road in the planning area and 259 miles in the watershed. For some resources these past activities are still contributing to continuing effects and for some resources they are not. Roughly 21,000 acres of timber harvest occurred in the Sharps Creek watershed in the last 60 years (see Figure 9). Most of the harvest that occurred was regeneration harvest followed by broadcast burning for slash treatment. It can be inferred that broadcast burning is on the same level of magnitude as timber harvest.

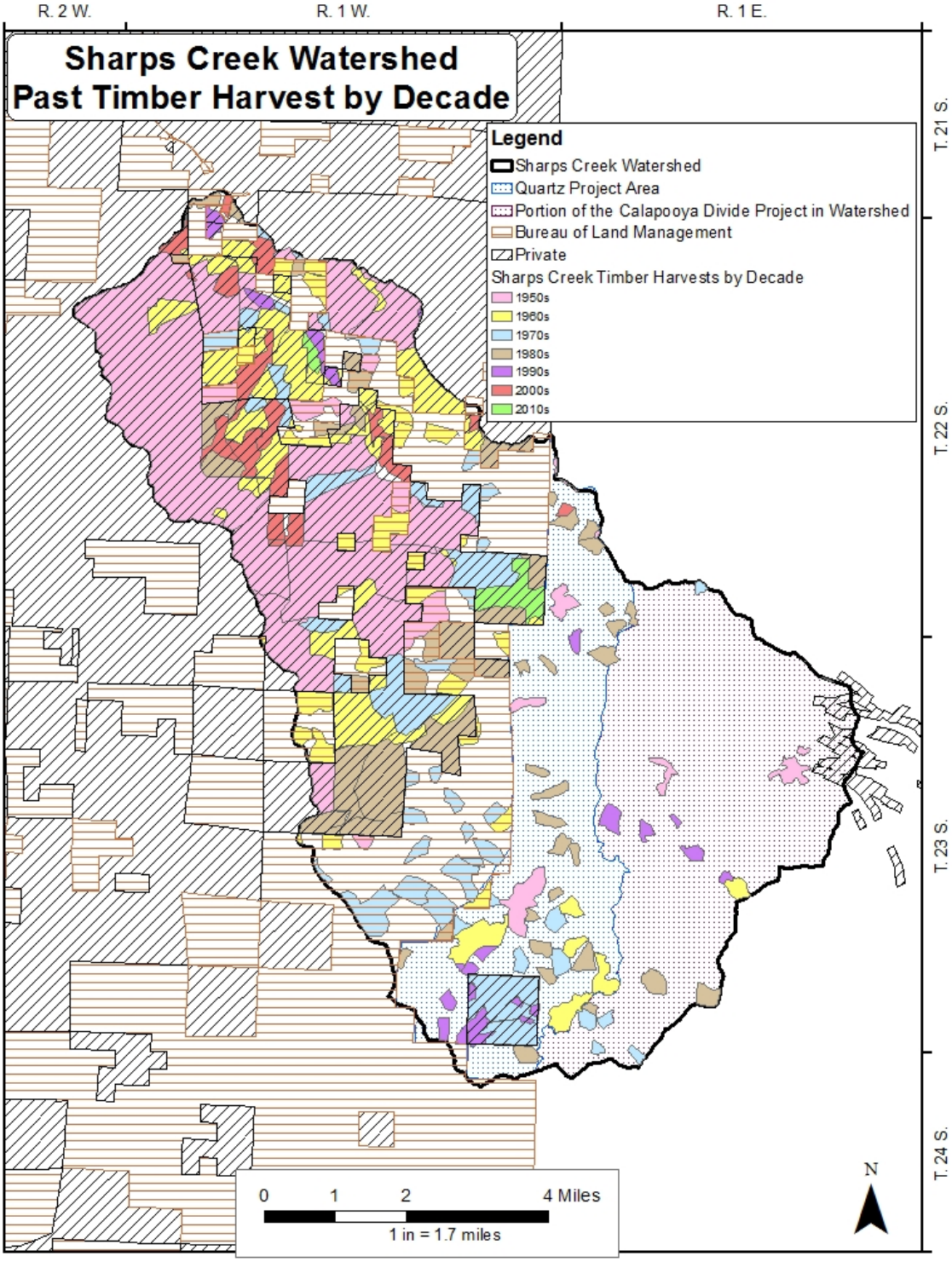

Figure 9. Past Timber Harvest by Decade [6]

[6] Harvesting by decade on BLM and privately owned land was estimated using historical aerial photographs.

PRESENT ACTIONS

Alternative 2 would thin 1,026 acres of stands 45 to 130 years old including 1/10th acre pine release gaps. No treatment (or skips) would occur on approximately 340 acres within the stands proposed for treatment. Alternative 3 would thin 850 acres of stands 45 to 130 years old including 1/10th acre pine release gaps and ¼ acre gaps in the younger managed stands. No treatments would occur on approximately 335 acres.

REASONABLY FORESEEABLE FUTURE ACTIONS

In the foreseeable future, the Cottage Grove Ranger District is planning the Calapooya Divide Project which would commercially thin about 1,200 acres within the Sharps Creek watershed, This project is similar in design to the Quartz project and it is expected that up to a 1,000 of those acres would be in fire regenerated similar in age to those proposed for harvest in Quartz.

With 37% of the land privately owned within the 42,509-acre Sharps Creek Watershed, some regeneration harvest would likely occur on these lands in the near future. Based on the harvesting rates noted on private land in the last decade we anticipate regeneration harvest to average around 150 acres per year, depending upon market prices. No timber harvest is currently anticipated in the next five years on the portion of the watershed administered by BLM.

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

No permanent road building is expected on public land in the next five years. Since the privately owned land within the watershed has largely been previously logged it assumed that the current road system will meet immediate future needs and no permanent road building will occur in the next five years.

It is also likely that some wind thrown trees from natural and managed stands would be salvaged through firewood collections in the next 5 years. Such salvage would likely be confined to existing road prisms.

AQUATIC CONSERVATION STRATEGY

The Riparian Reserve land allocation was established in the Northwest Forest Plan as part of the Aquatic Conservation Strategy (USDA/USDI 1994). Riparian Reserves widths for this project, based on the Sharps Creek Watershed Analysis, are 180 feet on non-fish bearing streams and 360 feet on fish bearing streams (USDA/USDI 1999).

RELEVANT STANDARDS AND GUIDELINES

Relevant standard and guideline from the Northwest Forest Plan 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.

1999 SHARPS CREEK WATERSHED ANALYSIS RECOMMENDATIONS

- Retain recommended Riparian Reserves standards from the Northwest Forest Plan for all stream classes including reserve widths. Reserve width average 180 feet for non-fish bearing streams and 360 feet for fish-bearing streams on lands managed by the Forest Service.
- Priority should be given to enhancement of large coarse woody debris habitat within Riparian Reserves.
- Manage Riparian Reserves to enhance late-successional conditions; consider the impacts to microclimate and associated riparian species prior to management.
- As feasible, remove roads located within Riparian Reserves.
- Maintain Riparian Reserves in a condition that reflects the natural range of successional vegetation and processes within the watershed.
- Evaluate opportunities to manage for a high density of snags to mitigate loss of habitat on Matrix and private lands.
- Minimize the impact of campgrounds and dispersed camp sites on riparian habitat.

AQUATIC CONSERVATION STRATEGY OBJECTIVES

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. The Quartz project would manage approximately 1% of the Riparian Reserves in the Sharps Creek subwatershed at the stand scale to move ACS objectives toward restoration at the landscape scale.

The harvest in outer portions of Riparian Reserves would occur for the purpose of restoration of species composition and structural diversity of plant communities to achieve the intent of the ACS objectives. Treatment is proposed within Units 1, 2, 3, 5, 6, 7, 10, 12, and 13-23 for a total of 185 acres (Figure 42 and Figure 43). Road reconstruction, maintenance, and inactivation within the Riparian Reserves would occur for the purpose of reducing the risk of potential impacts to riparian areas.

Since the effects of Riparian Reserve management cross many discipline boundaries, this document addresses the ACS objectives by weaving the discussion throughout Chapter Three. Discussions regarding ACS objectives are found in the sections identified below (Table 9).

Table 9. Aquatic Conservation Objectives

ACS Objectives	Section(s) Addressing ACS Objectives
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.	Terrestrial Environment Forest Vegetation, Coarse Woody Debris, Forest Wildlife Aquatic Environment Water Quality, Riparian

ACS Objectives	Section(s) Addressing ACS Objectives
	Forest Conditions, Fisheries
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.	Aquatic Environment Riparian Forest Conditions, Stream Channels
3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.	Aquatic Environment Riparian Forest Conditions, Stream Channels
4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.	Aquatic Environment Water Quality
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.	Aquatic Environment Erosion and Sedimentation Mass Wasting
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.	Aquatic Environment Stream Flows
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.	Terrestrial Environment Botany – Unique Habitats
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.	Terrestrial Environment Forest Vegetation, Botany-Unique Habitats, Coarse Woody Debris, Forest Wildlife Aquatic Environment Riparian Forest Conditions, Stream Channels
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.	Terrestrial Environment Botany Unique Habitat, Coarse Woody Debris, Forest Wildlife Aquatic Environment Riparian Forest Conditions, Fisheries

TERRESTRIAL ENVIRONMENT

A detailed description of the terrestrial environment can be found in the Sharps Creek Watershed Analysis (USDA/USDI 1999). Site-specific field work and analysis for this project produced additional information, which is provided in the following sections and in the project record.

FOREST VEGETATION

Summary of Effects

Alternatives 2 and 3 reduce overstory canopy cover, leave skips, and create gaps to offer a greater opportunity to promote structural and species diversity than Alternative 1. Since Alternative 2 proposes to treat 176 more acres than Alternative 3, it offers the greatest opportunity to promote structural and species diversity. Alternatives 2 and 3 increase tree growth to offer a greater opportunity to provide for vigorous growing, healthy stands. Since Alternative 2 proposes to treat 176 more acres than Alternative 3, it offers the greatest opportunity to improve tree growth.

The proposed non-commercial fuel treatments and meadow restoration activities in Alternatives 2 and 3 are not expected to have any appreciable effect on stand growth, canopy cover or current structural and species diversity. The proposed thinning in this project would have no cumulative effect on the seral stage distribution. The proposed ¼-acre gaps in Alternative 3 would convert less than 0.02% of the watershed to an early seral forest.

METHODOLOGY

Existing stand conditions were quantified using stand examination data. The Forest Vegetation Simulator Growth and Yield Model (FVS) Westside Cascade Variant was used to estimate post treatment conditions and future stand growth (USDA 2014). In addition, ArcGIS version 10-1 was used for mapping analysis.

EXISTING CONDITIONS

Current Landscape Conditions

The project area is in the Sharps Creek watershed where the primary large-scale disturbances influencing landscape vegetation patterns have been fire and timber harvesting. Historically, lightning fires determined vegetation conditions and the watershed had a mix of low, moderate, and high severity fires over time. Current stand conditions indicate there was a large stand replacement fire or series of fires in the area around 150 years ago. In the last 100 years, timber harvest and fire suppression have been the dominant influences determining vegetation conditions. Timber harvesting has been more focused in the lower portion of the watershed in the private ownership. Harvesting on Forest Service land has been dispersed patch clearcuts producing small patches of young forest over time interspersed among larger blocks of older forest. A policy of fire suppression has led to changes in the vegetation by allowing understory trees and shrubs to mature and fuels to accumulate.

Today, the watershed retains large areas of older forest in the upper portion and large areas of intensively managed younger forest in the lower portion. Areas that typically burned frequently

before European settlement are now the older forest and the areas where old growth dominated are now the young forest. This pattern is a reversal from historical vegetation patterns (USDA/USDI 1999).

Smaller-scale disturbances have also impacted the landscape. Various tree pathogens and insects are causing low levels of scattered tree mortality. White pine blister rust (caused by *Cronartium ribicola*) is prevalent and has had an impact on the western white and sugar pine population. The two five-needle pines in the watershed are a minor species making up less than 10% of the trees. *Cronartium ribicola* is an exotic fungus; it was introduced to the west coast of North America in 1910 and rapidly spread throughout the range of five-needle pines, substantially decreasing their populations (Goheen and Willhite 2006; Goheen and Goheen 2014). Mountain pine beetle (*Dendroctonus ponderosae*) which typically attacks pine trees under stress due to competition or disease has further reduced the western white and sugar pine populations in the watershed.

Table 10 and Figure 10 display the current vegetation distribution using the following classification system used in the Fire Regime Condition Class (Barret et al 2010):

Class A – early seral post replacement forest. In this stage forest stands are young with open canopies. New trees and shrubs are seeding in and growing as resources are readily available. In Sharps Creek this stage usually occurs between 0-30 years after a disturbance.

Class B – mid-seral closed canopy forest. In this stage forest stands have developed dense, closed canopies where new trees and understory vegetation are generally prevented from establishing and where existing live trees may die due to competition for sunlight, water, and nutrients. This stage is often referred to as the **stem exclusion stage** (Oliver and Larson 1996) and in Sharps Creek generally occurs between ages 31-80 years but can range up to 150 years depending on site productivity.

Class C – mid-seral open canopy forest. In this stage the stands are generally the same as the mid-seral closed canopy forest but have been opened up by small disturbances such as low to moderate severity fires or insects and diseases.

Class D – late-seral open canopy forest. In this stage the stands are mature to old-growth forest that have been opened up by disturbances to the degree where canopy openings may be sufficient to allow recruiting shade-intolerant species such as Douglas-fir or western white pine. In Sharps Creek, these stands are typically 150 years and older.

Class E – late-seral closed canopy forest. In this stage the stands are mature to old-growth forest where the understory recruitment is more dominated by shade-tolerant species such as western hemlock. In Sharps Creek, these stands are typically 150 years and older.

Table 10. Distribution of Seral Stages in the Sharps Creek Watershed

Succession or Seral class	Percentage of watershed[7]
A – Early Seral Forest	10%
B – Mid Seral Closed Forest	36%
C – Mid Seral Open Forest	9%
D – Late Seral Open Forest	2%
E – Late Seral Closed Forest	42%
Non-forested	1%

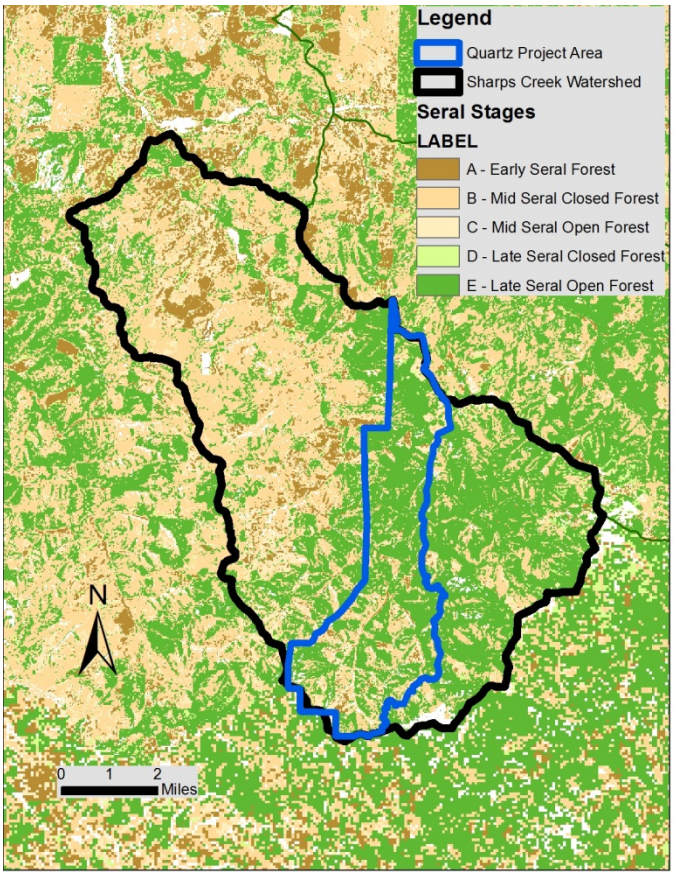

Figure 10. Watershed Seral Stages

[7]Estimation of seral stage percentages is derived from the information used in the 2010 development of the Fire Regime Condition Class and is based on the predominant biophysical setting in the watershed (Douglas-fir hemlock dry mesic).

As Table 10 and Figure 10 indicate, almost 80% of the Sharps Creek watershed is currently in a closed canopy forest. There are large areas of continuous high canopy cover across the watershed. The mid-seral closed forest is concentrated in the lower northern portion which is primarily private land. The late-seral closed forest is concentrated in the upper southern portion managed by Forest Service and Bureau of Land Management.

Current Stand Conditions

Commercial Thinning Stands

The 45 to 130-year-old stands proposed for thinning are a combination of managed stands created after clearcut harvesting and fire regenerated stands. The 45 to 65-year-old managed stands in the planning area are concentrated in the lower slopes of the drainages (Units 2, 9, 14, 16, 18, 31, 32). These stands were regeneration harvested, burned, planted with Douglas-fir at a close spacing and managed for uniformity in both species and structure for timber production. Today, they are densely-stocked, dominated by a single overstory tree species and with little understory diversity or natural canopy gaps.

The 90 to 130-year-old fire regenerated stands proposed for thinning are concentrated in the mid to upper slopes near ridgelines (Units 1, 3-8, 10-13, 15, 17, 19-31, 33). These are primarily even-aged stands that naturally regenerated following stand and partial stand replacement fires that dominated the watershed at the turn of the last century. Today, like the managed stands described above, they are densely-stocked, dominated by a single overstory tree species and with little understory diversity or natural canopy gaps.

The stands are dominated by Douglas-fir trees with minor amounts of other conifers including western hemlock, western red cedar, incense cedar, and with a scattering of sugar pine and western white pine in the older stands. Scattered hardwood trees, like Pacific madrone and golden chinquapin, are found on drier slopes while red alder and bigleaf maple are found near the riparian areas. On average, hardwood trees in total comprise less than 4% of the stands trees per acre. The understory shrubs include Pacific rhododendron, vine maple, salal and dwarf Oregon grape.

All stands proposed for commercial thinning are considered to be in the mid-seral closed forest stage. These mid-seral or stem exclusion stands have dense crowns that block out light to the forest floor and limit understory development. The trees are competing for sunlight, water and nutrients causing reduced tree growth and vigor as well as limiting understory vegetation. The understory is mostly limited to shrubs and herbs with few small trees scattered throughout. Average stand conditions can found in Table 11.

Table 11. Average Stand Conditions

	Age (total years)	Overstory diameter (inches)	Overstory trees per acre	Overstory canopy cover
All stands (45 to 130 years old)				
Average	100	15.1	230	78
Range	49-130	9.4-21.2	119-409	64-90
Managed stands only (45 to 65 years old)				
Average	49-62	11.9	227	76
Range	55	9.4-13.3	185-261	70-80

	Age (total years)	Overstory diameter (inches)	Overstory trees per acre	Overstory canopy cover
Fire regenerated stands only (90 to 130 years old)				
Average	111	15.9	231	78
Range	91-130	13.1-21.2	119-409	58-90

Curtis' relative density is a measure used for determining the need and timing of density management (Curtis 1982). Relative densities of 50 or greater indicate tree stocking levels sufficient to cause competition mortality and reduced stand growth and vigor. The relative densities of the stands proposed for thinning average 71 with all stands near or above 50.

Many of the older stands have scattered sugar and western white pine that is in decline due to heavy competition from other trees coupled with the occurrence of mountain pine beetle and white pine blister rust. Stand exams noted five-needle pines in Units 3,8,10,12,13,15,17,19,20-26,29, and 30 ranging from one tree per stand up to three trees per acre. These pines likely exist within some of the other older stands proposed for thinning but are so scarce they were not noted during stand examinations.

Non-Commercial Fuel Treatment Areas

There are fourteen areas proposed for non-commercial fuel treatments along seven road systems. The areas are up to 200 feet on either side of a road, depending upon existing fuel conditions. They are a mix of stand types including 20 to 50-year-old stands (45% of the acres) as well as stands 90 to 150 years old and older (55% of the acres)). All of the stands are adjacent to roads and have been influenced by the construction and maintenance of those roads. Increased light from the roads has created pockets of ground and ladder fuels from shrubs and small trees in the older stands. There are a variety of shrubs within these pockets including vine maple and Pacific rhododendron. The smaller trees are primarily Douglas-fir, western hemlock, incense cedar, or western red cedar less than 40 feet tall. In the younger stands, the trees immediately adjacent to the roads have responded to the increased light by retaining branches further down to the ground than trees within the stand providing ladder fuels.

DESIRED CONDITIONS

The Matrix, MA10 and MA13 designated land will provide timber production while meeting other resource goals such as maintaining biodiversity and emphasizing mineral resources. Stand treatments in the outer portion of the managed stands' Riparian Reserves will be consistent with the Aquatic Conservation Strategy by increasing structural diversity, restoring species composition and accelerating the large conifer development. Within the South Cascades Late-Successional Reserve, non-commercial fuel treatments along the BLM 23-1-27 road will be used to provide shaded fuel breaks and increase the ability to safely and effectively conduct initial attack fire control activities.

The desired condition for both the younger managed stands and older fire regenerated stands is a healthy, more diverse condition that approximates what would typically exist in a mixed severity fire regime benefiting a wider range of flora and fauna species. The younger stands located in the lower slopes of drainages, which historically were refuge areas from fire, would be on an accelerated trajectory developing multiple canopy layers and understory species diversity to enhance habitat for old growth species. The older stands nearer the ridgelines, which historically had more frequent fire activity, would be more open with less competition between trees, more reflective of historic conditions, and benefiting a wider range of flora and fauna

species. Removing trees around the scattered sugar and western white pine in the stands would increase structural diversity and reduce the likelihood of mortality from insects and white pine blister rust.

CONSISTENCY WITH DIRECTION AND REGULATIONS

In accordance with the National Forest Management Act, all proposed harvesting units are 1) classified as suitable for timber management or 2) classified as tentatively unsuitable due to regeneration capability. Commercial thinning within the areas classified as tentatively unsuitable due to regeneration capability is consistent with Prescription C5-V Wildlife – Management of Unsuitable Timberlands of the 1990 Umpqua LRMP (USDA 1990). This prescription is intended to enhance wildlife areas through vegetation manipulation and the proposed thinning is consistent based upon:

- The desired condition for stands is a healthy, more diverse condition that approximates what would typically exist in a mixed severity fire regime benefiting a wider range of flora and fauna species.
- Stands located in the lower slopes of drainages, which historically were refuge areas from fire, would be on an accelerated trajectory of developing multiple canopy layers and a diversity of understory species to enhance habitat for old growth species.
- Stands nearer the ridgelines, which historically had more frequent fire activity, would be more open with less competition between trees, more reflective of historic conditions, and benefiting a wider range of flora and fauna species.

The silvicultural treatments proposed within the South Cascades LSR 222 are consistent with NWFP standards and guidelines within Late-Successional Reserves (S&G C-12) based upon:

- An LSR assessment was completed, reviewed and signed by the Regional Ecosystem Office in 1998.
- The proposed roadside understory fuel treatments are consistent with the activities described in Chapter 5 of the LSR assessment to reduce large-scale fire risk through the creation of shaded fuel breaks.

DIRECT AND INDIRECT EFFECTS

Direct and indirect effects of the alternatives are analyzed at the stand scale and demonstrated using Units 5, 9, 30, or 32. These units are used as sample stands because they are considered representative of the other stands in terms of average diameter and density.

Commercial Thinning – structural & species diversity

Table 12 provides an example of the expected average canopy cover by treatments based upon FVS modeling.

Table 12. Comparison of Canopy Cover by Alternative

Unit (age)	Alternative 1 (No thinning)	Alternatives 2 & 3 (Thin all stands to 70-90 trees per acre)	Alternative 3 (Thin older stands to 70-90 trees per acre and younger stands to 40-60 trees per acre)
5 (age 105)	85%	61%	61%
9 (age 59)	70%	45%	37%
30 (age 107)	79%	54%	54%
32 (age 53)	78%	45%	37%

Alternative 1 – As demonstrated in Table 12, the no thinning alternative maintains a higher overstory canopy cover than the action alternatives. This higher canopy cover allows minimal light to the forest floor and continues to suppress vegetation development in the understory.

Alternative 2 and 3 – An immediate direct effect of alternatives 2 & 3 is reduced overstory canopy cover. Thinning reduces tree density and opens the canopy. This allows additional light to the forest floor thereby promoting understory vegetation development and natural tree regeneration which can lead to more structurally complex stands (Bailey and Tappeiner, 1998; Bailey et al, 1998; Muir et al, 2002; Harrington et al, 2005; Chan et al, 2006; Ares et al 2009; Davis and Puettman, 2009).

These alternatives also promote variable density by leaving skips, retaining legacy trees, minor tree species and hardwoods as well as introducing gaps into selected stands. The unthinned areas within stands (skips) range from around 1/4 to 34 acres in size. Leaving skips within a stand can provide opportunities to protect resources and increase spatial heterogeneity. Overall, about 25% of the original stands' acres are expected to be in skips.

Alternatives 2 and 3 introduce 1/10-acre pine release gaps into the 90 to 130-year-old fire regenerated stands. Alternative 3 also introduces ¼-acre gaps into the 45 to 65-year-old managed stands. Gaps can introduce fine-scale variation in homogeneous forest canopies which can widen the range of understory light and microhabitat conditions suitable for understory diversity development (Aukema and Carey, 2008). This creation of spatial heterogeneity in canopies can promote heterogeneity in understory composition and structure (Carey et al, 1999b). Figure 11 provides a visual representation of how complexity can be introduced into a stand using skips, gaps and thinning.

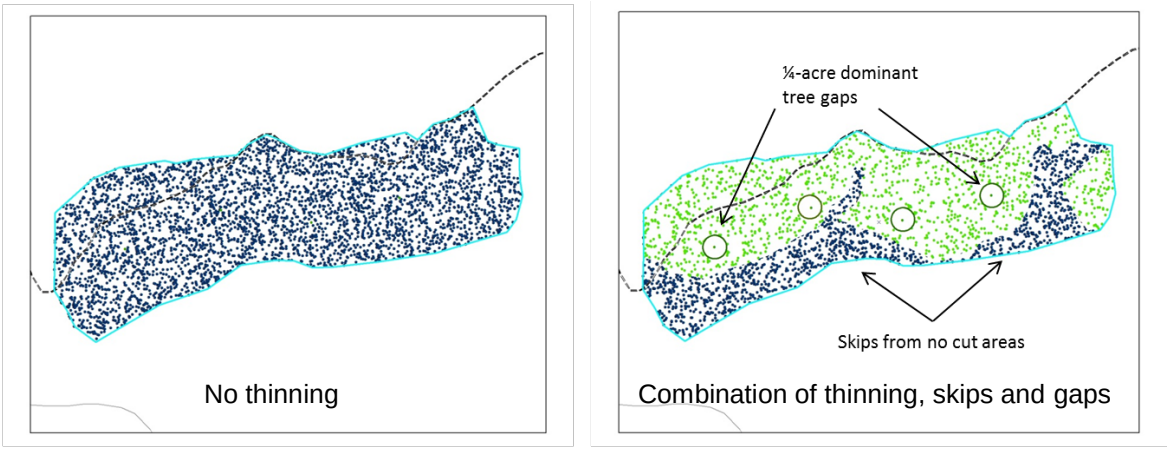

Figure 11. Depiction of Unit 9 Showing Treatments

Conclusion – Alternatives 2 and 3 reduce overstory canopy cover, leave skips, and create gaps to offer a greater opportunity to promote structural and species diversity than Alternative 1. Table 12 shows, using four example stands, that thinning can reduce average overstory canopy cover by 24 to 41% to promote understory development. Figure 11 illustrates that by incorporating skips and gaps, structural and species diversity can be further enhanced. Since Alternative 2 proposes treating 176 more acres than Alternative 3, it offers the greatest opportunity to promote structural and species diversity.

Commercial Thinning – growth & vigor; large tree development

Table 13 below shows an example of the expected overstory stand diameter growth modeled over fifty years based upon FVS modelling.

Table 13. Comparison of Overstory Diameter Growth by Alternative

	Average diameter growth over 50 years of trees ≥ 7" diameter		
Unit	**Alternative 1** (no thinning)	**Alternative 2** (thin all to 70-90 trees per acre)	**Alternative 3** (thin younger stands to 40-60 trees per acre)
Unit 9 (59 years old):			
Average diameter growth from 2014 to 2064	5.5 inches	7.5 inches	8.5 inches
Unit 30 (107 years old):			
Average diameter growth from 2014 to 2064	3.1 inches	4.2 inches	same as Alt. 2

Alternative 1 - As Table 13 shows, the current and projected average overstory diameters would be lower than in the Alternatives 2 and 3. The stands would continue to grow, but at slower rates as trees continue to compete for growing space and resources. Diameter growth would decline as this competition continues resulting in smaller less vigorous trees with a higher susceptibility to insect and diseases.

Alternatives 2 and 3 – Table 13 shows that diameter growth rates of the overstory would increase as a result of thinning and the action alternatives provide increased tree growth. Thinning accelerates the development of large diameter trees and promotes vigorous growing, healthy stands (Tappeiner et al, 2007) with a more diverse, multilayered understory.

The stands are all similar in terms of tree size, structural and species diversity, and stocking level but vary in stand age from 45 to 130 years old. There are several studies that indicate although the growth response of older forests may not be as great as younger forests, there can be a positive response to thinning stands over 100-years old (Steele, 1948; Williamson and Price, 1971; Williamson, 1982; Newton and Cole, 1987; Latham and Tappeiner, 2002).

Conclusion - Both Alternatives 2 and 3 increase tree growth over the alternative 1. Table 13 shows, using two example stands, in fifty years the average overstory diameter can be expected to grow three to six more inches in Alternative 1. By thinning to 70-90 trees per acre, that average diameter can be expected to grow four to eight more inches in the next fifty years. By thinning the younger managed stands to 40-60 trees acre that average diameter can be expected to grow up to nine more inches in the next fifty years. The result is that by thinning we can expect around at least a 35% increase in diameter growth. Since Alternative 2 proposes to thin 176 more acres than Alternative 3, it offers the greatest opportunity to improve tree growth for vigorous growing, healthy stands and accelerates large tree development and a diverse multistoried stand in Riparian Reserves.

Non-commercial fuel treatments

Fourteen areas along seven road systems are proposed for understory thinning and/or pruning. Within these areas, trees less than 10 inches in diameter and brush may be thinned to a 15 to 20 foot spacing leaving up to 100 to 200 trees per acres in the understory. Trees of all sizes may also have their lower branches pruned to reduce ladder fuel. These areas are portions of stands ranging from single storied 25-year-old managed stands to stands 150 years and older with multiple canopy layers. The understory vegetation is high adjacent to the roads because of the available light and growing space.

Alternative 1 – The proposed areas are adjacent to roads and would continue to have a higher amount of understory vegetation and lower branches because of the available light and growing space.

Alternatives 2 and 3 – Thinning and pruning are expected to reduce the amount of understory vegetation adjacent to the roads. Thinning and pruning, however, would not eliminate any understory canopy layer only reduce the amount of vegetation within a layer.

Conclusion – The proposed fuel treatments within the action alternatives is not expected to have any appreciable effect on stand growth or current structural and species diversity**.**

Meadow restoration

The restoration of four dry meadows near Units 3, 6, 7 and 13 is proposed and includes prescribed underburning in the surrounding 150 foot forested buffer areas.

Alternative 1 – The surrounding forested buffer area would continue to have a high canopy cover.

Alternatives 2 and 3 – The immediate effect of underburning the buffered forested area is reduced overstory canopy cover. The tree mortality in the buffer area could be up to 100% for trees less than 8” dbh and 15-30% of trees greater than 8” dbh. This could reduce the overstory

canopy cover by up to 6 to 12% but is unlikely to open up the stand enough to increase understory vegetation or cause any change to residual tree growth.

Conclusion – Alternatives 2 and 3 reduce tree density through anticipated mortality from underburning the meadows' buffered forested area but it is unlikely to open the stand enough to increase the understory or residual tree growth.

CUMULATIVE EFFECTS

Cumulative effects of the alternatives are analyzed at the landscape scale and focus on larger scale conditions in the Sharps Creek Watershed. This scale is appropriate for this analysis because 1) it encompasses the treatment areas and 2) is large enough to show the effects of the dominant large-scale disturbances on the various seral stages.

Past, present and reasonably foreseeable vegetation management activities can alter vegetation patterns across the landscape by changing the distribution of seral stages. As stated previously fire and timber harvesting have been the dominant disturbance agents in the Sharps Creek Watershed resulting in a mix of seral stages (see Landscape Conditions). Reasonably foreseeable future actions in the next five years affecting vegetation within the watershed include commercial thinning and regeneration harvesting. Thinning will not change seral stage distribution but gaps and/or regeneration harvesting will move forest land into early seral forest. The watershed is about 42,500 acres with about 4,300 acres currently in early forest. On private land we estimate that about 750 acres of regeneration harvesting may occur within the watershed in the next five years (1.6% of the watershed). The Quartz project proposes 9.5 acres of ¼- acre gaps in Alternative 3 (0.02% of the watershed) and it is expected up to 10 acres of gaps may be proposed in the adjacent Calapooya Divide Project (another 0.02% of the watershed). The proposed 1/10th-acre pine release gaps in the Quartz project are not considered large enough to create early seral forest conditions.

Alternative 1 – the no action alternative would not change the stands' current seral stage and therefore would have no cumulative impact on the seral stage distribution in the watershed.

Alternatives 2 and 3 – Alternative 2 proposes to commercial thin 1,026 acres and understory thin about 380 acres in non-commercial fuel treatment areas. Alternative 3 proposes to commercial thin 850 acres and understory thin about 380 acres in non-commercial fuel treatment areas. Thinning changes the density of the trees in the treated stands, but does not alters a stand's current seral stage. The proposed gaps in Alternative 3, however, would change the seral stage of some acres from mid to early seral forest. The 9.5 acres of ¼-acre gaps proposed in Alternative 3 would affect 0.02% of the watershed.

Conclusion – the proposed thinning would have no cumulative effect on the seral stage distribution. It is estimated that up to 1.6% of the mid to late seral forest stands in the watershed may convert to early seral forest in the next five years through timber harvesting. The proposed gaps in Alternative 3 would add another 0.02% of the watershed acres causing no substantial cumulative effect on seral stage distribution.

AQUATIC CONSERVATION STRATEGY

Commercial thinning is proposed within the outer portions of the 45 to 65-year-old managed stands. Alternatives 2 and 3 create uneven structure within stands and across the stands using a combination of thin and no thin areas to diversify homogenous stands. Hardwood and minor tree species retention will further enhance the creation of uneven structure within the stands. This is in keeping with ACS objective #8 of maintaining and restoring species composition and

structural diversity of plant communities in riparian areas. The variable treatment within and across Riparian Reserves provides a balance of:

- Accelerating the development of large trees as well as species and structural complexity in the outer portion of Riparian Reserves,
- Retaining effective stream shade to provide thermal regulation,
- Eliminating treatment from wetland, floodplain and headwater areas that are critical to nutrient filtering,
- Minimizing risk to bank and channel stability by buffering the inner portion of Riparian Reserves,
- Continuing the development of coarse woody debris over time.

BOTANY

UNIQUE HABITATS

Summary of Effects

Protection measures consistent with Forest Plan direction will be applied to all unique habitats within the project area in both action alternatives. Buffering around unique habitats will generally protect these sites from physical disturbances, as well as minimize any indirect effects to microclimate as a result of thinning activities.

Unique habitats, or special habitats, are highly localized non-forested plant and animal communities varying in size from 1 to 75 acres and include meadows, hardwood inclusions, rock outcrops, and other natural openings (USDA 1990). Hickman (1976) found that 85% of the plant diversity in the Cascade Range occurred within these sites and provide valuable habitat for a range of wildlife species. Unique habitats comprise about 3% of the land area in the Umpqua National Forest, and approximately 9% of the portion of Sharps Creek watershed that is managed by the Forest Service (USDA/USDI 1999) where the Quartz Integrated Project planning area is located. Management activities in unique habitats are guided by the Umpqua National Forest Land and Resource Management Plan (1990) and the Northwest Forest Plan (USDA/USDI 1994 and 2001).

EXISTING AND DESIRED CONDITIONS

Within the Quartz planning area, unique habitats occupy approximately 454 acres and can be roughly categorized as mesic/moist meadows and shrublands (4%), dry to mesic hardwood inclusions (55%), rock outcrops/talus (6%), and dry meadows/balds (36%). Because of the high plant diversity found in unique habitats, these areas were surveyed for rare species by a qualified botanist during the 2013 field season. Seventy acres of unique habitat occur within or adjacent to proposed harvest units and fuel treatment areas (Table 14).

Table 14. Unique Habitats and Design Criteria

Unique Habitat	Within or Near Harvest Unit or Fuel Treatment Area	Acres	Design Criteria	Buffer Width (ft.)
Mesic to Wet Meadows/Shrublands	1, 31, 32, F	6	No entry	150’
Hardwood Dominated Inclusions	8, 15, E, U	14	No entry	0-150’
Rock Outcrops/Talus	5, 9, 20, 21, 22, 30, 31, J	26	No entry	0-150’
Dry Meadows/Balds	1, 2, 3, 6, 7, 13	24	No entry	150’

Mesic to moist meadows are generally dominated by graminoids and forbs, though there are also instances where some have a large shrub component. The meadows have soils that are moist to saturate throughout most of the year and are often part of a meadow/conifer mosaic at the landscape level. Graminoids include panicled bulrush (*Scirpus microcarpus*), fowl mannagrass (*Glyceria striata*), rushes (*Juncus sp.*), and sedges (*Carex sp.*). Coastal hedgenettle (*Stachys chamissonis* var. *cooleyae*), youth on age (*Tolmiea menziesii*), liverleaf wintergreen (*Pyrola asarifolia*), and woodland buttercup (*Ranunculus uncinatus*) are dominant forbs, and shrub species include elderberry (*Sambucus sp.*) and currant (*Ribes sp.*).

Grasslands with shallow soils over bedrock, often called “balds”, typically occur on steep south- or west-facing slopes (Chappell et al. 2001). Vegetation in balds typically consists of bunchgrasses and forbs, with mosses and lichens dominating the space between vascular plants. Most balds are unable to support trees due to shallow soils and drought-like conditions in the summer; thus are unlikely to be threatened by encroachment. Balds are not as fire dependent as other shrub or hardwood ecosystems (Chappell et al. 2001) and short-term dynamics of native and introduced vegetation remained unchanged after burning (Kaye et al. 2004). However, fire may have prevented encroachment into more mesic areas of balds historically, and decades of fires suppression have probably resulted in only the driest and shallow-soiled sites remaining open. Encroachment into these meadow complexes have occurred for nearly two centuries, with the result being that meadow species are replaced with forest herbs (Halpern et al. 2010). Over time, meadow seed banks become depleted of resident meadow species and are instead dominated by ruderal (weedy) species (Lang and Halpern 2007). Forest encroachment has also led to changes in soil chemical and biological properties (Griffiths et al. 2005).

The desired condition is to maintain the quality of all unique habitats by preserving or improving vegetative composition and structure for the benefit of wildlife (USDA 1990) as well as to improve or maintain plant biodiversity within unique habitats. An additional desired condition for wetlands and wet meadows is maintenance of water tables so that the areas continued to function as such, meeting Objective #7 of the Aquatic Conservation Strategy (USDA/USDI 1994, p. B-11).

DIRECT AND INDIRECT EFFECTS

Direct effects to unique habitats are those that could result from implementation of activities within the habitats or their immediate surroundings. Indirect effects could result later in time or beyond the immediate spatial area of unique habitats.

Alternative 1

No direct effects to unique habitats would occur under Alternative 1 because no actions or activities would be implemented in or near them. Under this alternative, the habitats would indirectly be affected by an increased risk of uncharacteristic wildfire due to dense stand conditions in the forest surrounding them. Alternative 1 could result in an increase of meadow acreage if stand-replacing wildfires were to burn through the planning area. In some meadows, conifers may continue to encroach and convert habitat to forest. This could result in meadow herbaceous species being replaced by forest herbaceous species that could have cascading negative effects on associated meadow wildlife species that depend on meadow habitat.

Alternatives 2 and 3

Measures to eliminate any direct effects to unique habitats under Alternatives 2 and 3 include "no entry" into these areas (Table 8). These measures are discussed below and also in the Best Management Practices, Project Design Features, Management Requirements, and Monitoring section of Chapter 2. Prescription C5-1 of the Land and Resource Management Plan (LRMP) for the Umpqua National Forest prevents timber harvest within 150 feet of inventoried unique habitats (non-forested openings of at least one acre) unless vegetation manipulation or structural improvement is designed to enhance wildlife (USDA 1990, p. IV-200). No commercial thinning is proposed within unique habitats or the 150-foot buffers; however, prescribed fire for wildlife habitat enhancement (meadow restoration) would simulate thinning in the buffers by killing encroaching conifers.

Four dry meadows have been identified for restoration as part of Alternative 2 and 3. These are within or near Units 3, 6, 7, and 13 (Figure 5). Prescribed burns would be initiated within the meadow habitat and allowed to burn into the forested buffer areas. Target tree mortality in the buffer area would be up to 100% for trees below 8" and 15-30% mortality in the overstory. This action would have the effect of killing encroaching seedling and sapling conifers and also creating snags from some of the larger diameter trees. Direct beneficial effects to the meadows would be to reduce thatch build-up from graminoids, potentially release native seed banks, and increase vigor of vegetation (Haugo and Halpern 2007; Lang and Halpern 2007; MacDougall and Turkington 2007). Negative direct effects may be to open the meadow itself to exotic plant invasion because of the disturbance caused by the prescribed fire. Vigor of existing exotic plants may also increase. However, Kaye et al. (2004) found that plant communities were not substantially changed by prescribed burns conducted on similar dry meadows on Cottage Grove Ranger District; therefore, negative effects of exotic plants are not expected to occur. Bryophyte diversity could decrease if fire were allowed to burn the bryophyte mats that occupy rock outcrops (Morgan 2004); however, project design features would be in place to avoid that outcome. The meadow near Unit 3 and the one between Units 6 and 7 have white oaks along the upper ridgeline that are over-topped by Douglas-fir trees. There are Douglas-fir saplings along the southern edge of two smaller meadows near Unit 13. Using prescribed fire to thin along the edges of these meadows would have the direct beneficial effect of releasing the oaks from competition. Hardwoods are relatively uncommon against the backdrop of conifers and are an important habitat component for a variety of bryophytes, lichens and wildlife species. Indirect effects would be to reestablish open canopy conditions that favor meadow vegetation in the buffer areas.

Under Alternative 2, the timber harvest prescription is thinning to 70-90 trees per acre, and under Alternative 3 prescriptions are a little heavier in some harvest units with 40-60 trees per acre left. For both Alternative 2 and 3, the no-entry 150-foot buffers will prevent direct effects to inventoried unique habitats by prohibiting timber harvest, yarding logs, or building logging corridors through habitats and buffer areas. Vegetation in mesic to wet meadows and

shrublands may be adversely affected immediately following ground-disturbing activities and woody species in particular may require active restoration (Hough-Snee et al. 2013). Additionally, mosses and lichens that inhabit the soil surface and rock surfaces of both dry and wet meadows are ecologically important (Turetsky 2003) and may take years to recover from disturbance. The buffers should also be sufficient to minimize indirect effects of thinning. For example, buffers should provide some protection from changes to microclimate (e.g., light levels, wind speed, humidity) that take place because of timber harvesting in surrounding stands (Chen et al. 1995). Riparian areas are particularly vulnerable to invasion by exotic plants (Hood and Naiman 2000); thus, buffers would also reduce the indirect effect of disturbance-induced weed invasion. Under the third alternative Units 2, 22, and 33 would be dropped from commercial harvest. Alternative 3 also drops the helicopter portion of Units 14, 16, and 21. Therefore, the unique habitats located within or near where commercial harvesting was dropped would not be directly affected due to thinning activities. Thinning these stands help strategically improve fire resilience across the landscape. Therefore, by leaving pockets of dense stands the risk of sustained crown fires increases near those stands and may indirectly affect unique habitats nearby.

Fuels created by thinning activities would be treated by underburning 322-330 acres or hand piling and burning 481-566 acres, depending on which action alternative is implemented. Disposing of fuels is typically conducted during a time of year when the likelihood of fire spread is very low because moisture is elevated in soil and live fuel. In units where the fuel prescription is hand piling and burning, direct effects to unique habitats are non-existent and indirect effects minimal. Hand piles would be constructed and burned where logging activity resulted in slash. Since there is no commercial harvest activity permitted within unique habitats or their 150-foot 'no entry' buffer, there would be no slash to dispose of in those areas. In units where underburning is proposed, there is a chance that fire would spread through unique habitats. In mesic to wet meadows and shrublands, fire would likely not carry through the habitat because of elevated soil moisture, and in some cases, standing water. Fire would not carry through rock and talus outcrops because there is not enough fuel to sustain it. Hardwood inclusions and dry meadows may have enough ground fuel to carry a low-intensity fire. Direct effects may include mortality of smaller diameter trees and herbaceous ground cover. Short-term increases in vegetation, particularly exotic and native forbs, are expected subsequent to fire (Metlen and Fiedler 2006). Fire in dry meadows can be beneficial if encroaching conifer seedlings are killed.

Both Alternative 2 and 3 include creating shaded fuel breaks along 374 acres of ridgeline roads to improve fire resiliency and create opportunities to manage wildfires that threaten values at risk. Ground and ladder fuels would be mechanically removed for 200 feet on either side of the ridgeline and piled and burned. There are three unique habitats that occur within the proposed shaded fuel breaks: wet meadow, dry meadow and bigleaf maple hardwood inclusion. There would be no direct effects of creating the shaded fuel breaks on these unique habitats because no actions would occur within the habitats. Indirect effects would be virtually non-existent. Because only ground and ladder fuels are being removed, canopy cover of the surrounding forest would not change; therefore, these unique habitats are unlikely to experience indirect effects such as changes in microclimate.

No new system roads would be constructed in both action alternatives. Approximately 0.7 miles of existing temporary roads would be utilized and approximately 1 mile of new temporary roads would be constructed. All temporary roads would be obliterated after use. A segment of temporary road in Unit 20 crosses the buffer of a rocky, talus unique habitat. This habitat has minimal vegetation potential but does provide habitat for a diversity of bryophytes and lichens. The unique habitat itself will not be directly impacted as the proposed temporary road does not cross through it. However, because this section of the temporary road would be going through

skeletal soils, it cannot be effectively subsoiled or obliterated. Roads provide suitable disturbed habitat for invasive species and can act as corridors for further invasion into a landscape (Parendes and Jones 2000). Because invasive species are associated with disturbance, activities associated with obliterating this temporary road could also indirectly affect the unique habitat by increasing the risk of disturbance-related weed invasion. Connected actions under both action alternatives include inactivation of roads which involve removing culverts, installing water bars, and blocking access. The risk for this particular unique habitat is minimal because it is rocky land with little favorable habitat for weed establishment.

Nine landings for helicopter logging would be created for Alternative 2; 7 would be created for Alternative 3. The landings are primarily located in previously disturbed areas and are up to 1 acre in size. No direct effects to unique habitats are anticipated because none of the landings are located within the habitats or their buffers.

CUMULATIVE EFFECTS

The scope of analysis for cumulative effects is the Sharps Creek watershed scale and includes past and future activities that may have impacted unique habitats in the planning area. Unique habitats have been protected from many activities including thinning, regeneration harvest, and road/trail construction since 1990 (USDA 1990, p. IV-200). The exception to this is if treatments are designed to enhance quality of unique habitats to benefit wildlife.

Other than the four meadows identified for restoration, no commercial thinning or other activities would occur within the remaining unique habitats in the planning area. Since this direction has existed for the past two decades, there would be no direct impacts contributing to cumulative effects by implementing this project.

Road building and other ground-disturbing activities associated with past timber harvests have indirectly facilitated the spread of invasive plants in the planning area. When these activities occur near unique habitats, the potential exists for weeds to invade into them. Noxious weed control activities and no-entry buffers surrounding unique habitats are designed to minimize this risk. Proposed activities under Alternative 2 and 3 have limited potential to add to cumulative weed infestations in unique habitats overall within the planning area. Within the four meadows identified for restoration in Alternatives 2 and 3, prescribed fire could indirectly facilitate invasive weed invasion and would add to past cumulative effects of weed invasion.

The cumulative effects of past fire suppression activities have allowed for conifer encroachment around the edges of many meadows and gradual succession of meadow are to forest. No meadow restoration activities would occur under Alternative 1; therefore, conifer encroachment into the meadows would continue to change plant community composition along the transition zone between meadow and forest. Meadow restoration proposed in Alternatives 2 and 3 would counteract this trend in four dry meadows by killing encroaching conifers using prescribed fire. With implementation of best management practices and project design features to minimize negative effects, Alternatives 2 or 3 would be beneficial overall to unique habitats within the planning area, specifically to the four dry meadows identified for restoration.

AQUATIC CONSERVATION STRATEGY

No impacts to wetlands are expected by the proposed activities and connected actions. Wetlands are buffered and partial harvest of trees adjacent to buffers is not expected to change water table levels; therefore, proposed activities under both action alternatives are consistent with Objective #7 of the Aquatic Conservation Strategy (USDA/USDI 1994, p. B-11). Additionally, plant species composition and structural diversity in unique habitats that occur in riparian areas and wetlands would be maintained (Objectives #8 and #9).

INVASIVE PLANTS/NOXIOUS WEEDS

Summary of Effects

Ground disturbing activities associated with thinning activities will increase the risk of introducing or spreading known populations of invasive plants. Connected actions for both action alternatives propose to treat up to 107 acres of noxious weeds within harvest units, along roads and other areas of disturbance for up to three years following sale closure. Additional weed control measures are identified under the Best Management Practices, Project Design Features, Management Requirements, and Monitoring section in Chapter 2.

Invasive plant species are plants whose introduction to a new ecosystem is likely to cause economic or environmental harm, or harm to human health (USDA 2005a). Noxious weeds are plant species that are designated as such by a federal, state, or county government as being a threat to public health, agriculture, recreation, wildlife or property (Sheley et al. 1999). Noxious weeds infest over 420,000 acres of National Forests and Grasslands in the Pacific Northwest Region (USDA 2005a).

EXISTING AND DESIRED CONDITIONS

Noxious weeds and other invasive plants put native plant communities throughout the Pacific Northwest at risk. Introduced plant species can be highly successful in new ecosystems for a variety of reasons including lack of natural enemies, adaptation, change in disturbance regime, and allelopathy (chemical toxins released by the plant). As a result, invasive species have the capacity to displace native species and alter native plant communities. Some invasive species are capable of altering ecosystem processes in a way that is detrimental to native communities, such as changes to fire regimes (Brooks et al. 2004) and soil nutrient cycling (Ehrenfeld 2003).

Invasive plants can be introduced to an uninfested area in various ways. Roads are considered the first point of entry for exotic species into a landscape and can serve as corridors along which plants move (Parendes and Jones 2000). Weed seeds can also be moved by water, animals and humans. Disturbed areas such as roadsides, trails, logged units, burns, rock quarries, mined sites and areas around human structures provide suitable habitat for weed establishment. Existing populations serve as seed sources for further dispersal. The increase of invasive plants on the Umpqua National Forest is directly related to expanding weed populations on nearby federal, state, and private lands. For example, populations of yellow star-thistle (*Centaurea solstitialis*), rush skeletonweed (*Chondrilla juncea*), false brome (*Brachypodium sylvaticum*), and meadow knapweed (*Centaurea* x *moncktonii*) have become roadside weeds on heavily traveled highways 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 plant species in the Quartz planning area were conducted during the summer of 2013. Management attention will be first given to the high priority species, followed by the lower priority species. These species have been identified using the Umpqua National Forest Integrated Weed Management Project Environmental Assessment (USDA 2003a) and local professional knowledge. The Umpqua National Forest has classified its noxious weeds into four categories: high priority annuals, low priority annuals, high priority perennials and biennials, and low priority perennials and biennials. “Detection” species are those that have not been located on the Umpqua National Forest but their current range and habitat requirements

suggest they could move onto the forest. Noxious weeds known to occur in the Quartz planning area are displayed in Table 15.

Table 15. Noxious Weeds in the Quartz Planning Area

Common Name	Scientific Name
High Priority Perennials and Biennials	
false brome	*Brachypodium sylvaticum*
meadow knapweed	*Centaurea x moncktoni*
Scotch broom	*Cytisus scoparius*
Low Priority Perennials and Biennials	
Canada thistle	*Cirsium arvense*
bull thistle	*Cirsium vulgare*
English ivy	*Hedera helix*
St. Johnswort	*Hypericum perforatum*
Himalayan blackberry	*Rubus armeniacus*
tansy ragwort	*Senecio jacobaea*
Other Weed Species of Interest	
cheatgrass	*Bromus tectorum*
oxeye daisy	*Chrysanthemum leucanthemum*
evergreen blackberry	*Rubus laciniatus*

The desired condition for the subwatershed and planning area is to be free of priority weed infestations and to maintain plant communities that are resilient to the introduction and spread of invasive plants. The desired outcome of treating the false brome infestation is to completely remove the species from the planning area and prevent its spread to other parts of the subwatershed. Additionally, rock quarries and other disturbed areas will be maintained as weed-free as practically possible.

NOXIOUS WEED TREATMENT

The majority of high priority weed infestations are Scotch broom (*Cytisus scoparius*) occurring in patches along roadsides and in rock quarries. Connected actions for both action alternatives propose to treat up to 107 acres of noxious weeds within harvest units, along roads and other areas of disturbance for up to three years following sale closure. Early detection and rapid response to new infestations is critical to controlling the spread of invasive species and district personnel have a window of opportunity to completely eradicate these infestations.

Where necessary, competitive seeding and planting of native plants would occur under both action alternatives. Revegetation would target landings, skid trails, temporary roads, and other sites disturbed by logging activities. As supported by the integrated weed management prevention and treatment strategies on the Umpqua National Forest (USDA 2003a), these weeds would be treated using manual control methods (e.g., mowing, clipping, grubbing) within disturbed sites including roads, trailheads, landings, and administrative sites for up to three years following sale closure.

RELEVANT STANDARDS AND GUIDELINES

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 (USDA

2005a). The 2005 ROD added a set of standards to Forest Plans. Several of the standards that are pertinent to this project are incorporated into the Botany section of the Best Management Practices, Project Design Features, Management Requirements, and Monitoring section in Chapter Two.

The Umpqua National Forest Land and Resource Management Plan was also amended with the following relevant standards and guidelines (USDA 2003a):

- 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 to desired cover standards.

DIRECT AND INDIRECT EFFECTS

Alternative 1

No direct or indirect effects would result under Alternative 1 because ground disturbing activities with the potential to encourage new noxious weed invasions would not occur. Because most invasive species also prefer open habitat, maintaining a closed canopy would decrease the risk that weeds would spread into stands. Additionally, there would be no equipment potentially moving weed seeds around. Continued noxious weed inventory, monitoring, and management would be subject to funding levels and district priorities.

Alternatives 2 and 3

Alternatives 2 and 3 may contribute to the introduction and spread of noxious weeds in the subwatershed through the use of ground-based heavy equipment used in project operations. Equipment 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 distributing seeds 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.

Weed spread and establishment would be indirectly facilitated by removing competing vegetation and disturbing soil in the timber harvest units, and by fuels activities associated with both action alternatives. Spread is further compounded where vegetation is removed immediately adjacent to priority weed infestations along roadsides which act as corridors for seed movement. The effect of thinning this vegetation would be partially mitigated by monitoring and treating sites prior to timber harvest and fuels management activities, having

effective groundcover on temporary roads, landings, and skid trails, and post-project monitoring to detect and treat invasive weeds before they can get a foothold. The amount of mitigation that would occur would be dependent upon available funding. If weed mitigation is not funded, or funding is delayed, there is the potential for weed infestations to become established that would be much more expensive to manage over the long-term.

In an effort to reduce the introduction and spread of noxious weeds via equipment, heavy equipment that would operate outside the limits of the road prism would be required to be cleaned prior to entering National Forest System lands. Additionally, prior to moving off-road equipment from a harvest unit that is infested with invasive species of concern to, or through any other area that is shown as being free of invasive species of concern, or infested with a different invasive species, shall be cleaned of seeds, soil, vegetative matter, and other debris that could contain or hold seeds. See Best Management Practices, Project Design Features, Management Requirements, and Monitoring section in Chapter Two for more details.

Roads create prime invasive weed habitat and corridors for movement of weeds. Under both action alternatives no new system roads would be constructed, 0.7 miles of existing temporary roads would be utilized, and approximately 1 mile of new temporary roads would be constructed. Road decommissioning and road inactivation, weed prevention measures during timber sale operations, and post-harvest monitoring should mitigate the potential for weed spread. Roads that are closed may eventually be shaded by canopy closure which may then subsequently reduce the number of weeds on that road and into adjacent stands (Parendes and Jones 2000). After use all new landings, skid trails, and temporary roads would be subsoiled and covered with effective ground cover such as organic material (slash, mulch, or seed) or filter cloth. Using slash to cover exposed soil has the added benefit of reducing vector traffic, both people and wildlife, which would help prevent the spread of weeds. Road maintenance activities such as mowing, grading and shaping the road prism, and ditch pulling could contribute to spreading weed seed along roads as well as creating disturbance favorable to invasive species establishment. Design features include equipment use restrictions and strategic timing of work, as described in the Botany section of the Best Management Practices, Project Design Features, Management Requirements, and Monitoring section in Chapter Two.

The rock pit on road 3828 just south of the Calapooya Divide and the border between Cottage Grove and North Umpqua ranger districts will be used as the rock source for the road work in both action alternatives. In 2013, the quarry was inspected and found to contain St. Johnswort and tansy ragwort, both low priority noxious weeds. The weeds were adjacent to the road and not in the immediate vicinity of the rock source so it is unlikely that rock from this quarry will be contaminated with weed seeds.

Reduction of logging slash by hand piling/burning and underburning could create areas ideal for the establishment and spread of weeds (bare soil, opened canopy, and soil disturbance). Short-term increases in vegetation, particularly exotic and native forbs, are expected subsequent to fire (Metlen and Fiedler 2006). There is an infestation of meadow knapweed that is just over a tenth-acre in size along the road adjacent to Unit 31. There is also meadow knapweed in Fuel Treatment Area I. Low-intensity fire has the potential to increase some knapweed populations, whereas a high-severity fire may consume the plants and incinerate seeds in the soil seed bank. Hand piles in Unit 31 could be placed directly over the infested area to increase the likelihood that meadow knapweed individuals are killed.

Disturbed sites such as burned areas, landings, skid roads, and temporary roads, would be revegetated 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 to desired cover

standards. All revegetation requirements would be met using genetically local native species (USDA 2005a), and all seed and mulch would be certified weed free (USDA 2003a, 2005a).

CUMULATIVE EFFECTS

Cumulative effects for this project are analyzed at the subwatershed scale. Numerous past activities including timber harvests, road building and maintenance, burning/fuels treatments, and recreation have contributed to movement of invasive plant seed into and within the subwatershed and also provide conditions conducive to weed invasion. Continued timber harvest on adjacent private lands, vehicular traffic, recreation-related activities, movement of wildlife, and wind driven seed dispersal as well as implementation of other projects would continue into the foreseeable future. All of these actions are likely to spread or introduce weed seed and potentially lead to new infestations.

The spread of invasive weeds would be minimized in both action alternatives through preventative measures taken prior to, during, and after thinning operations. Application of the standards and guidelines, best management practices, and project design features related to revegetation, erosion control, and noxious weed monitoring/treatment would greatly reduce direct effects by restricting the potential for introduction of weed seeds. These measures, along with post-harvest monitoring and treatment would minimize the indirect effects of soil disturbance and canopy opening. However, despite best efforts, the measures mentioned above cannot be regarded as absolutely effective. Even the best prevention efforts cannot stop weed spread as many weed species have seeds that are dispersed by wind and/or animals. Furthermore, the weed seed bank in the soil around pre-existing weed sites would remain in the area for some time.

The potential negative effects of spreading noxious weeds resulting from the action alternatives would contribute to the ongoing and past activities mentioned above. However, cumulative effects can be reduced by the use of early detection and rapid response methods and implementation of preventative design criteria.

THREATENED, ENDANGERED, SENSITIVE, RARE & UNCOMMON PLANT, LICHEN, AND FUNGI SPECIES

SUMMARY OF EFFECTS

There is no suitable habitat for the two threatened and endangered species known to occur on the Umpqua National Forest in the project area; therefore, the Biological Evaluation determination for those species is No Effect. The determination for sensitive bryophytes, lichens, and vascular plants known or suspected to occur on the Umpqua National Forest is No Impact for the proposed project. The determination for sensitive fungi known or suspected to occur on the Umpqua National Forest is May Impact Individuals or Habitat but would not likely contribute to a trend towards Federal listing, or cause a loss of viability to the population or species. For the full list of species considered in the Biological Evaluation, please refer to the project record.

The Biological Evaluation assesses impacts to Threatened, Endangered, or Sensitive (TES) vascular plants, lichens, and bryophytes from the Quartz Integrated Project. It is 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… trends towards Federal listing of any species” (FSM 2672.41). There are currently 38 vascular plant species, 41 bryophytes, 13 lichens, and 40 fungi that receive special status on the Umpqua National Forest.

BIOLOGICAL EVALUATION

Pre-field Review

No TES vascular plants, bryophytes, or lichen were previously known to occur in the Quartz planning area. Two vascular plant species listed under the Endangered Species Act are known or suspected to occur on the Umpqua National Forest. Kincaids's lupine (*Lupinus oreganus* ssp. *kincaidii*) is federally threatened and has been documented on the Tiller Ranger District. This species occurs in low-elevation upland prairies and is primarily known from Willamette Valley grasslands although there are isolated occurrences documented throughout the Umpqua basin as well. Rough popcorn flower (*Plagiobothrys hirtus*) is listed as federally endangered and is confined to low-elevation wetlands in the vicinity of Sutherlin in northern Douglas County. It has not been documented on Umpqua National Forest to date. Whitebark pine (*Pinus albicaulis*) has been documented on North Umpqua and Diamond Lake Ranger Districts and is currently a candidate species for listing under the Endangered Species Act. Whitebark pine is found in high-elevation geographically isolated stands across western North America. None of the known populations of Kincaid's lupine, Rough popcorn flower or Whitebark pine occur near the Quartz planning area, nor is there suitable habitat for any of these three species within the planning area. Within the Quartz planning area there is potential habitat for a number of sensitive species for which surveys were targeted.

Because of their unreliable and often cryptic fruiting characteristics, pre-project surveys are not considered to be a reliable conservation tool for fungi. Conservation of fungi on Forest Service lands entails management of known sites, targeted surveys based on Regional priorities, and consideration of habitat elements for fungi during project planning. Known habitat requirements for most rare fungi species are very general and not well understood (Arora 1986, Castellano et al. 1999, Castellano et al. 2003, Exeter et al. 2006) which makes it difficult to confidently predict presence or absence of specific species. Nine of the eleven sensitive fungi belong to the ectomycorrhizal (ECM) functional guild. ECM fungi are most abundant and diverse in areas with well-developed surface litter and organic material, and a higher density of large-diameter trees with greater canopy closure (Amaranthus et al. 1994, Smith et al. 2005). The two remaining sensitive fungi are saprobic, feeding on litter and downed wood. Therefore, they are also more likely to occur in areas with well-developed surface litter and organic debris.

There are no known sites of sensitive fungi in the Quartz planning area. Proposed thinning and fuel treatment areas range in elevation from approximately 1,600 to 4,400 feet. The proposed timber harvest targets overstocked, managed stands as well as naturally regenerated stands. The managed stands likely represent poor habitat for most sensitive species of fungi. Habitat modeling indicates that the Quartz planning area does not provide habitat for *Ramaria amyloidea* (York and Helliwell 2007). *Dermocybe humboldtensis* is known from a couple of sites on Roseburg BLM in the Myrtle Creek and Riddle area but is otherwise known from the Northern California coast. *Gastroboletus vividus* is only known from above 5,400 feet while *Gymnomyces fragrans* is only known from above 4,900 feet in elevation. The species mentioned above prefer high elevations or coastal habitats; therefore, it is unlikely that these species would occur in proposed thinning units or fuel treatment areas since these areas occur under 4,400 feet and are not coastal. Occurrences of any of these species in thinning units would represent an expansion of their currently recognized habitat niche.

Boletus pulcherrimus, Cortinarius barlowensis, and *Pseudorhizina californica* are all documented on the Forest and could possibly occur within the planning area. There is a single known site on the Forest of *Boletus pulcherrimus* along the North Umpqua Trail, one site of *Cortinarius barlowensis* on the Cottage Grove Ranger District, and two sites of *Pseudorhizina californica* on the Diamond Lake District. The described habitat for each of these species is

quite general but most of these species are thought to be associated with late-successional or old-growth stands. The majorities of natural stands in the planning area consist of older trees but is of an even-aged cohort and does not possess many other old-growth characteristics and complexity. Sections of natural stands that display old-growth characteristics were dropped from consideration because of the potential to have the sensitive fungi species mentioned above occupying those areas.

Ramaria spinulosa var. *diminutiva* has only one known site in Oregon. That site is in a Douglas-fir stand at 1,470 feet in the Myrtle Creek area on Roseburg BLM. *Rhizopogon exiguus* and *R. inquinatus* are false truffles that are known from a handful of sites at low to moderate elevations in Douglas-fir and western hemlock forest. There is a site of *Stagnicola perplexa,* a wood saprobe, known from the Rogue River National Forest in the vicinity of Crater Lake National Park. There is a reasonable chance that these species could occur in the planning area because elements of their documented habitat match elements in the Quartz project area. .

Field Reconnaissance

Intuitive controlled surveys[8] were conducted throughout the 2013 field season by qualified botanists. No new occurrences of sensitive species were found within any proposed thinning units or fuel treatment areas. A population of Thompson's mistmaiden (*Romanzoffia thompsonii)* was found in a dry meadow that occurs between harvest units.

DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Threatened and Endangered Species

There is no suitable habitat for either species that are listed under the Endangered Species Act. Kincaid's lupine occurs in low-elevation upland prairies and is primarily known from Willamette Valley grasslands, although there are isolated occurrences documented throughout the Umpqua basin. Rough popcorn flower is confined to low-elevation wetlands in the vicinity of Sutherlin, OR in northern Douglas County. There are no known sites of either species near the planning area.

Because the project is far removed from known populations Kincaid's lupine and rough popcorn flower, and since there is no potential habitat for either species within the Quartz planning 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 Effect" on these listed species.

Sensitive Species Other Than Fungi

Thompson's mistmaiden is a diminutive annual that grows to 10 cm tall. Its flowers are white with a gold-yellow spot at the base of each petal and they can appear from March to August. It grows in vernally moist seeps on rock outcrops in fully-open to partially-shaded sites at elevations on the Umpqua National Forest from 2,000 to 5,100 feet. Thompson's mistmaiden (*Romanzoffia thompsonii*) is currently known from the western Cascades and foothills in Douglas, Jackson, Linn, Lane, and Marion counties. There is one new occurrence of a population of Thompson's mistmaiden in the planning area. Alternative 1 would not cause any direct, indirect, or cumulative effects to Thompson's mistmaiden as no actions would occur. The population occurs within a dry meadow and is therefore not subjected to direct effects from thinning and fuel treatment activities under either action alternative. Furthermore, a 100-ft buffer

[8] Proposed thinning units and fuel treatment areas are traversed so that all major habitats and topographic features have been investigated. Identified suitable habitats receive a complete survey.

surrounding the population protects it from implementation of activities associated with meadow restoration. Indirect effects include an increased risk of noxious weed invasion into the meadow because of the disturbance caused by logging activities. A new temporary road will also be constructed to the north of the meadow which has implications as a conduit for weed invasion. Noxious weeds could potentially negatively impact Thompson's mistmaiden by outcompeting it for resources. Cumulative effects of thinning activities and fuel treatments will increase noxious weed pressure over time and may negatively affect the population. Best management practices to decrease the risk of noxious weed invasion and actively restoring the meadow by treating existing weeds in the meadow mechanically will help moderate the impact that weeds will have on this population of Thompson's mistmaiden over the long-term. Consequently, execution of either Alternative 2 or 3 would have "No Impact" on this sensitive species.

Sensitive Fungi Species

Under Alternative 1 there would be no direct, indirect, or cumulative effects to sensitive fungi due to the absence of ground disturbing activities, and a determination of "No Impact" is made.

There is the potential for direct adverse effects to the species of fungi forming symbiotic ectomycorrhizal connections by removal of host trees in the two action alternatives. Alternative 3 emphasizes heavier thinning in the managed stands where sensitive fungi are likely not present and drops 99 acres of natural stands. However, all thinning prescriptions leave between 40-80 trees per acre in both action alternatives. Thinning stands rather than clearcutting can preserve much or most of the fungal biomass and diversity. In a study evaluating the effects of various patch and dispersed retention timber harvest patterns on ectomycorrhizal fungi in Western Oregon (including the Umpqua NF), researchers found that retention of 40% of the green trees in a dispersed pattern led to no significant drop in the fall mushroom or truffle standing crop (Luoma et al. 2004). Light and moderate thinning (40-80 tpa) also has little effect on ectomycorrhizal fungal diversity (Norvell and Exeter 2004) and species richness, which drops sharply outside the drip line of individual trees following harvest but was largely retained within the drip line (Luoma et al. 2006). Retention trees also have the potential to act as refugia which can contribute to recolonization (Luoma et al. 2006).

There is also the potential for indirect effects to rare fungi due to diminishment of habitat quality by opening of the canopy and soil disturbance under both action alternatives. This Umpqua National Forest plan prescription is intended to favor relatively open conditions for wildlife so there would be some parts of these stands that would be much more open than is currently the case. Closed canopy areas that are converted to more open stands could likewise result in a conversion of fungal species composition in some areas to species associated with early-seral habitats (Waters et al. 1994, Kropp and Albee 1996).

Measures would be implemented in both action alternatives that would reduce the adverse effects that could occur by thinning. This would be achieved by retaining current substrate (decaying wood), retaining elements for creating near-future substrate, and retaining downed logs to maintain microsite moisture and a source of inoculum.

The risk of negatively impacting sensitive fungi from herbicide applications to treat false brome and meadow knapweed is anticipated to be extremely low. The sites proposed for spraying in both action alternatives are along roadsides. Most of the sensitive fungi have habitat preferences for late successional stands; therefore, the habitat and proposed spray sites do not overlap. Furthermore, roadsides have experienced ground disturbance and have little downed wood, further reducing the chances of rare fungi being present.

Historical management has created changes in forested areas from timber harvest and fire suppression in the Quartz planning area. This has resulted in second-growth stands (among

other outcomes) which appear to represent poor habitat for most sensitive species of fungi. Past management practices most likely removed host trees for mycorrhizal species and reduced input of down wood. The naturally fire regenerated stands in the planning area are mostly even-aged and generally do not display the complexity associated with late-seral forests; however, natural stands are better habitat for sensitive fungi than younger managed stands. Implementation of Alternative 2 or 3 could contribute to changes in habitat that could be detrimental or beneficial. There is the potential for adding negative cumulative effects to the habitat of rare fungi from the diminishment of habitat quality in the short-term by opening the canopy and soil disturbance. However, beneficial effects are expected from promoting development of late-successional conditions and providing for diverse stands through the proposed thinning. Negative effects would be lessened by implementing design criteria to retain snags, down wood, hardwood trees, old-growth legacy trees, and the largest diameter second-growth trees.

A determination of “May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend toward federal listing” is made for all fungi species with suitable habitat in the planning area for implementation of Alternative 2 or Alternative 3 based on the following:

1. The chance of a rare fungi species occurring in managed stands is low.
2. The habitat effects are anticipated to be of low to moderate intensity and of short duration.
3. No-thin buffers would be applied to all perennial streams and unique habitats providing additional protective measures for potentially suitable habitat.
4. Areas within the planning area that display old-growth characteristics, the habitat thought to be favored by most rare fungi species are not proposed for thinning.

EFFECTS TO SURVEY AND MANAGE SPECIES

See the Wildlife section for a more detailed history of Survey and Manage litigation.

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in Conservation Northwest, et al. v. Sherman, et al., No. 08-1067-JCC (W.D. Wash.), granting Plaintiffs’ motion for partial summary judgment and finding NEPA violations in the Final Supplemental to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines (USDA and USDI, June 2007). In response, parties entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. Projects that are within the range of the northern spotted owl are subject to the survey and management standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement.

The Defendant-Intervenor subsequently appealed the 2011 Consent Decree to the Ninth Circuit Court of Appeals. The April 25, 2013 ruling in favor of Defendant-Intervener remanded the case back to the District Court. On February 18, 2014, the District Court vacated the 2007 RODs. Vacatur of the 2007 RODs has the result of returning the Forest Service to the status quo in existence prior to the 2007 RODs.

The Quartz project applies the Survey and Manage species list in the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*.

Pre-disturbance surveys are required only for those Survey and Manage species in Category A and C. Surveys for vascular plants, bryophytes and lichens were conducted in accordance with

current survey protocols (USDA 2005b). All but one fungal species are in Survey and Manage categories where pre-disturbance surveys are impractical or insufficient information exists to determine what management is needed for a reasonable assurance of species persistence (USDA/USDI 2001). *Bridgeoporus nobilissimus* is the only Survey and Manage fungal species for which pre-disturbance surveys are required.

DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

Under Alternative 1, there would be no direct or indirect adverse effects to Survey and Manage species due to the lack of ground disturbing activities.

The potential impact to undocumented occurrences of fungi in these stands under both action alternatives would be similar to what was discussed above for Sensitive fungal species. Little direct or indirect impact would be anticipated in variable density thinning units because a much greater amount of basal area is retained, including the larger trees, than that in which effects to species diversity has been documented.

Past management practices most likely removed host trees for mycorrhizal species and reduced input of down wood. Implementation of Alternative 2 or 3 could contribute to changes in habitat that could support rare fungi in both negative and positive ways. There is the potential for adding negative cumulative effects to the habitat of rare fungi from the diminishment of habitat quality in the short-term by opening the canopy and soil disturbance. However, beneficial effects are expected from promoting development of late-successional conditions and providing for diverse stands through the proposed thinning. Negative effects would be lessened by implementing design criteria to retain snags, down wood, hardwood trees, old-growth legacy trees, and the largest diameter second-growth trees. Conversely, fire suppression has likely contributed additional closed canopy habitat with greater biomass of logs and duff that otherwise would not have occurred under the historic fire regime.

It is anticipated that the pre-harvest fungal diversity would be largely retained. The potential for one of the survey and manage species being present and being directly or indirectly impacted by timber harvest is relatively low while the potential for rapid recovery to pre-harvest diversity and abundance is good. Thinning and fuels reduction activities in both action alternatives “may impact individuals or habitat but would not likely contribute towards Federal listing or cause a loss of viability to the population or species”.

SOIL PRODUCTIVITY

Summary of Effects

Legacy soil compaction remains unchanged in Alternative 1. Following harvest and subsoiling, all units in the action alternatives would meet soil standards and guidelines for acceptable levels of soil disturbance for compaction.

Harvest and fuel treatments are expected to maintain at least 80 to 90% effective ground cover and meet Umpqua LRMP standards and guidelines.

The action alternatives are expected to result in little to no effect on soil carbon and the amount of potential disturbance from proposed treatments would be considered acceptable for maintaining long-term soil productivity.

All three 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.

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 standards and guidelines from the Umpqua Land Resource Management Plan (LRMP) related to soil productivity (USDA 1990) 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, S&G #13, p IV-71: Requires maintenance of effective ground cover to prevent loss of topsoil through erosion.

Soil Productivity S&G #3, p. IV-68: Requires maintenance of ground cover for surface organic material (defined as litter, duff and wood) to maintain long-term soil productivity of the site.

Soil productivity S&G # 4, 5, 10, 11, and 12 and other Northwest Forest Plan requirements also apply and are described in this section or are listed as best management practices, project design features, management requirements and monitoring in Chapter Two.

Soil Suitability - Exceptions to harvesting only on suitable (regeneration) lands shall be documented during NEPA (S&G #6, LRMP IV-44).

Soil Productivity Standards and Guidelines and Best Management Practices were developed to limit management related impacts to soil tilth, soil carbon, surface organic matter, and large woody material to a level that provides protection of the soil hydrology, soil biology and flora and fungi, soil stability and erosion, and soil fertility.

EXISTING CONDITIONS

Past timber harvest activities in the Quartz planning area utilized a combination of highlead, skyline, tractor yarding. Following harvest during this period prescribed fires to reduce this fuel concentration often resulted in relatively high intensity fall burns that left the upper slopes bare.

Around 1975, skyline logging systems were primarily used to harvest the moderate to steeper slopes in Sharps Creek watershed, greatly reducing the soil disturbance to three percent or less of the harvest area, as well as reducing soil compaction. The effects of tractor yarding were reduced after 1985 by restricting ground skidding to designated skid trails over approximately 18% to 20% of the area harvested. During this period, skid trails were designated away from streams and saturated soils. As a result of past timber activities and the associated road building, it is estimated there is 87 acres of unacceptable soil disturbance in the planning area (Table 17).

Soil interpretations for the planning area were made using the Umpqua Soil Resource Inventory (SRI, USDA 1976), field review, and further refined with GIS (Figure 12). The SRI 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 project planning. The geology of Quartz Creek subwatershed is

associated with rock units of the Western Cascades, consisting of a complex mixture of massive to highly fractured volcanic tuff, breccia, andesitic, and dacitic mid-elevation (2,000 to 3,000 feet) faceted mountains and mid to higher elevation (2,000 to 4,000 feet) stratal mountains. They are characterized by steep to very steep topography with deeply incised drainages and side drainages with high stream densities of 41 miles per square mile of watershed.

Table 16. Stream and Road Densities by Landform

Landform	Planning Area %	Stream Density (mi/mi^2)	Landslide Density (mi/mi^2)	Erosion Risk
Mountain Crest and Shoulder slopes Units:1,3,4,5,6,7,8,10,11,12,13,15,19,20,21,22,24,25,26,27,29,30,31	18%	0.2	0.001	Low
Side slopes and headwalls Units:1,2,3,4,5,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28, 29,30,31,32,33	62%	2	0.003	Low to moderate
Colluvial bench and footslopes Units: 9, 2,14, 31	19%	12	0.003	Low to moderate
Riparian Terrace and Flats Units: 2, 9,14, 22	1%	41	0.0005	Low

Mountain Crest and Shoulder Slopes

Twenty-seven percent of the proposed harvest and fuel treatments would occur on the moderately steep, shallow to moderately deep mountain crest and shoulder slope landforms. These landforms are dominated by Landtype 46, with inclusions of Landtype complex 461; characterized by elongated ridges with narrow ridgetops consisting of volcanic tuffs and dacites of variable competency. Soils are typically coarse skeletal loams. These landforms have relatively high water detention storage capacity and a low rate of runoff. Drainage patterns are weakly expressed (0.2 stream miles per square mile). Mass wasting hazard is moderately unstable with reduced root strength and in road cuts and fills (0.001 unstable miles per miles of landform). Surface water erosion potential is low. Ten acres of this landform in this planning area have been mapped as unstable. Precipitation contributes primarily to base flows. Streams in this landform are weakly to moderately to deeply incised, often discontinuous, flowing over a bedrock and cobble streambed emerging from shallower soils on slopes greater than 35% and flowing subsurface in the deep flatter section with slopes under 35%. There is a low risk for rill and gully erosion, and a moderate turbidity hazard if surface water runoff is not effectively dispersed and becomes concentrated along roads, and skid trails. These landforms typically have low productivity with low to moderate nutrient holding capacity. Thirty-nine percent of this landform has been mapped as too rocky for planting trees and seedling survival. Grass competition can be very high and a moderate brush competition where the forest floor is opened up to light. Windthrow hazard is considered to be moderate.

Side Slopes and Headwalls

Fifty-seven percent of the proposed harvest and fuel treatments would occur on the moderately steep to steep, shallow to moderately deep side slope and headwall landforms. These landforms are dominated by Landtype 46 with inclusions of Landtype complex 461; making up

deeply incised drainages of volcanic tuffs and dacites of variable competency. Soils are typically coarse skeletal loams. These landforms have relatively moderate water detention storage capacity and a moderate rate of runoff. Drainage patterns typically emerge from below the shoulder slopes and become deeply expressed on the side slopes (2.0 stream miles per square mile). Mass wasting hazard is moderately unstable with reduced root strength and in road cuts and fills (0.003 unstable miles per miles of landform) resulting in debris slides and channel scour. Surface water erosion potential is low to moderate. Thirty-one acres of this landform in this planning area have been mapped as unstable. Precipitation contributes primarily to base flows. Streams in this landform are deeply incised, flows are often discontinuous, flowing over a bedrock and cobble streambed emerging from shallower soils on slopes greater than 35% and flowing subsurface in the deep flatter section with slopes under 35%. There is a high risk for rill and gully erosion, and a moderate turbidity hazard if surface water runoff is not effectively dispersed and becomes concentrated along roads, and skid trails. These landforms typically have low productivity with low to moderate nutrient holding capacity. Sixty-three percent of this landform has been mapped as too rocky for planting trees and seedling survival. Grass competition can be very high and a moderate brush competition where the forest floor is opened up to light. Windthrow hazard is considered to be moderate.

Colluvial Bench and Footslopes

Thirteen percent of the proposed harvest and fuel treatments would occur on the moderately steep, moderately deep colluvial bench and footslope landforms. These landforms are dominated by Landtype 46 with inclusions of Landtype complex 461; making up colluvial bench and toe deposits of volcanic tuffs and dacites of variable competency. Soils are typically coarse skeletal loams. These landforms have relatively high water detention storage capacity and a low to moderate rate of runoff. These deposits are often associated with drainages with flows emerging from them (12 stream miles per square mile). Mass wasting hazard is moderately to highly unstable with reduced root strength and in road cuts and fills (0.003 unstable miles per miles of landform) resulting in debris slides and channel scour. Thirty acres of this landform in this planning area have been mapped as unstable. Surface water erosion potential is low to moderate. Precipitation contributes primarily to base flows. Streams emerging from these landforms are deeply incised, flows are often discontinuous, flowing over a bedrock and cobble streambed emerging from shallower soils on slopes greater than 35% and flowing subsurface in the deep flatter section with slopes under 35%. There is a high risk for rill and gully erosion, and a moderate turbidity hazard if surface water runoff is not effectively dispersed and becomes concentrated along roads, and skid trails. These landforms typically have low productivity with low to moderate nutrient holding capacity. Fifty percent of this landform has been mapped as too rocky for planting trees and seedling survival. Grass competition can be very high and a moderate brush competition where the forest floor is opened up to light. Windthrow hazard is considered to be moderate.

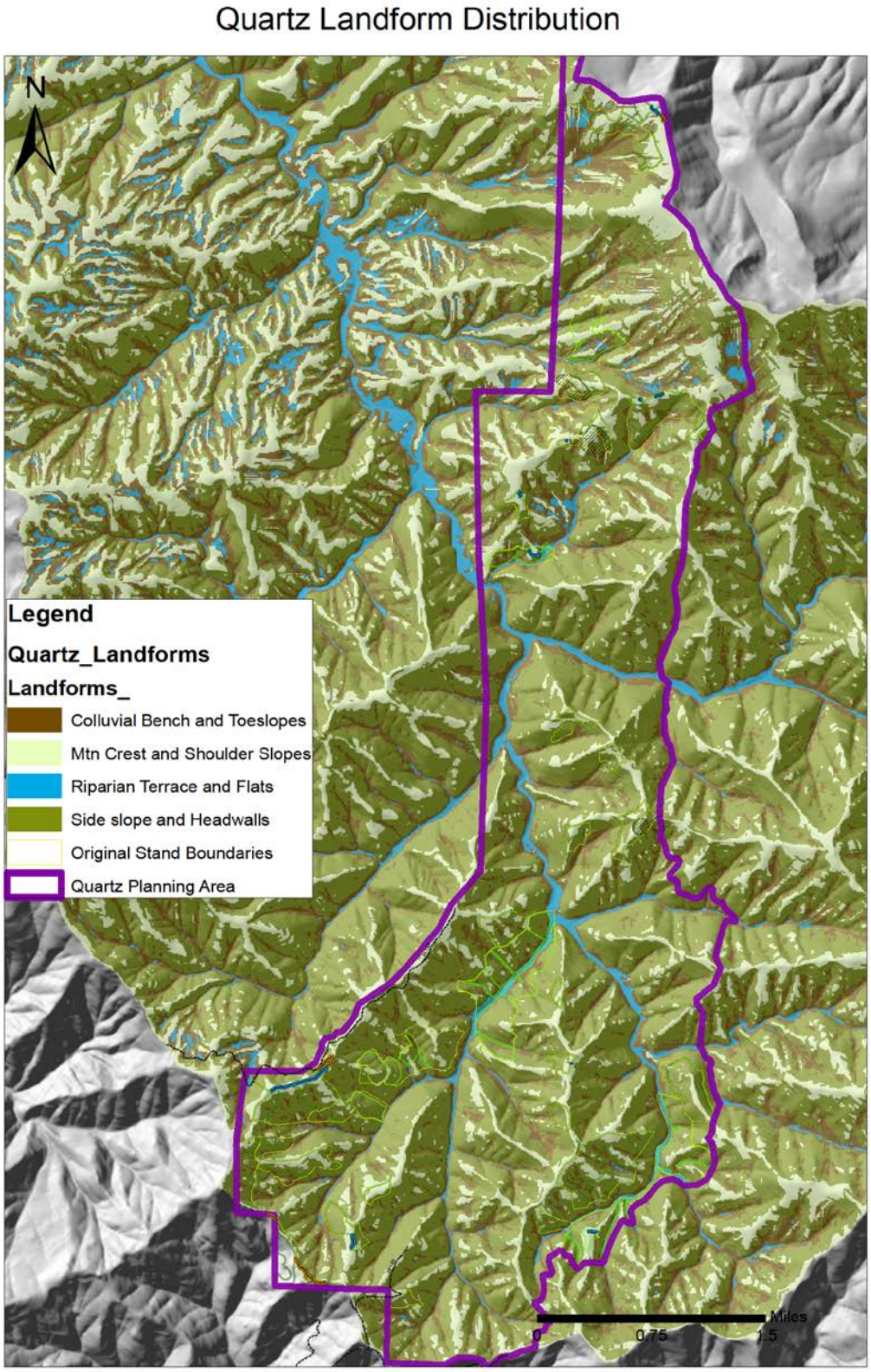

Figure 12. Landform Distribution

Riparian Terrace and Flats

Three percent of the proposed harvest and fuel treatments would occur on the gentle to moderately steep, moderately deep to deep riparian terrace and flats landforms. These landforms are dominated by Landtype 46 with inclusions of Landtype complex 153; making up flats and terraces in the bottom of stream channels. Soils are typically coarse skeletal sands and sandy loams. Mass wasting hazard is considered to be mostly stable with reduced root strength and in road cuts and fills (0.0005 unstable miles per miles of landform) primarily associated with stream bank failures and slumping. Five acres of this landform in this planning area have been mapped as unstable. Precipitation contributes primarily to peak flows. Surface water erosion potential is low with low to moderate turbidity hazard if surface water runoff is not effectively dispersed and becomes concentrated along roads, and skid trails. These landforms typically have moderate productivity with moderate nutrient holding capacity. Thirty-one percent of this landform has been mapped as too rocky for planting trees and seedling survival. Grass competition can be low to moderate with high brush competition where the forest floor is opened up to light. Windthrow hazard is considered to be moderate.

UNSUITABLE – POOR REGENERATION CAPABILITIES

Lands unsuitable for timber management due to poor regeneration capabilities are recognizes as those land areas where the regeneration potential is so low that the minimum stocking level (125 well distributed seedlings per acre surviving five years or more) cannot be reasonably assured within five years of harvest (LRMP pp B-9). Two land conditions are described where adequate stocking cannot be obtained within five years. These conditions classes are a) physical limitations to planting seedlings, and b) environmental limitations to seedling survival. Timber cutting may occur to meet seven different objectives one of which when it is needed to enhance other resource objectives such as wildlife openings (LRMP pp D-27).

Approximately 55% of the harvest under Alternative 2 and 56% under Alternative 3 would occur on lands identified as having poor regeneration capabilities (Refer to Figure 13). These are sites with skeletal soils that have low moisture and nutrient holding capacities. All harvest would rely on natural regeneration. Openings created on these soils, such as those proposed for meadow restoration would remain open for longer periods than those placed on more fertile sites.

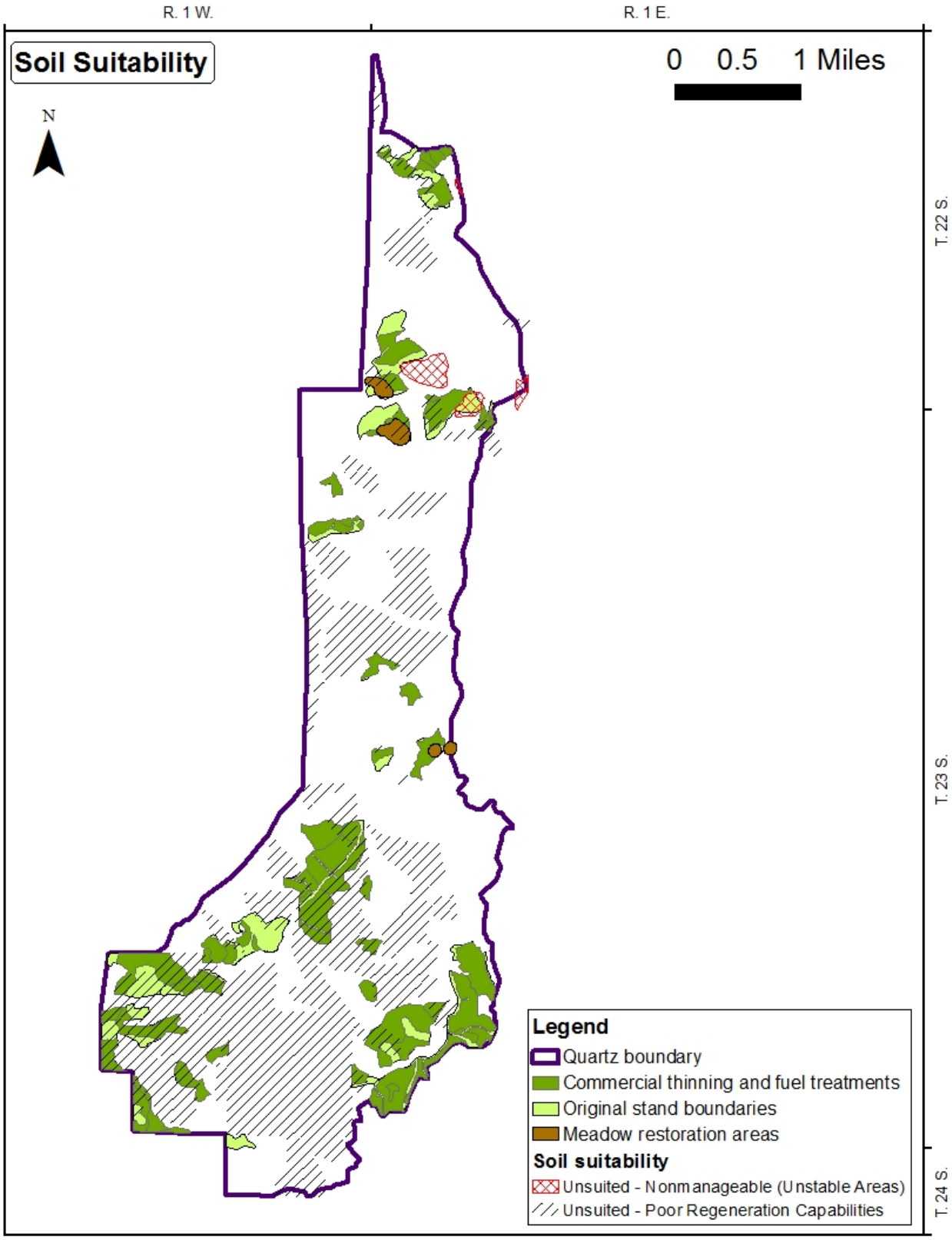

Figure 13. Soil Suitability

DIRECT AND INDIRECT EFFECTS

The direct and indirect effects are discussed at the scale of the 1,366 acres (17%) analyzed for treatment within the 8,331-acre Quartz Planning Area. Alternatives 2 and 3 prescribe “no treatment” on 335 to 340 of the analyzed acres (23%) and some form of stand modification on the remaining 850 to 1,026 acres (62 to 75%). Alternative 3 prescribes 176 fewer acres for helicopter harvest and 6 fewer acres for jackpot fuel treatments. Alternative 2 potentially treats through subsoiling 3 more acres of legacy soil compaction than Alternative 3. Both Alternatives result in similar effects to the soil environment.

Under Alternative 1, legacy soil displacement and compaction would remain unchanged at around 87 acres of the planning area (Table 17). Overall legacy compaction units previously tractor logged averaged 25% to 30% compaction within the tractor logged areas. However, Alternatives 2 and 3 would not include these areas of concern (LRMP pp. IV-68). The action alternatives would re-use 0.7 miles (approximately 1.53 acres) of previously compacted and abandoned temporary roads and landings. New compaction would occur from 1.0 mile (approximately 2.18 acres) of newly constructed temporary roads, and roughly 17 acres from landing and yarding disturbances.

The project design features for compaction using subsoiling has the direct effect of reducing disturbance, improving water infiltration, and decreasing the risk of erosion. Alternatives 2 and 3 would subsoil all temporary roads, landings, and skid trails used by the purchaser as a normal operating procedure. In addition approximately 1.5 miles of existing legacy roads would be subsoiled. These treatments would begin soil restoration on roughly 26 to 30 acres of soil disturbance and have the potential to move compacted soils towards a more acceptable condition with increased infiltration and permeability. Soil compaction would remain as a long-term effect (>50 years) over approximately 77 to 87 acres of untreated legacy compaction in the planning area (5 to 6%). Following harvest and subsoiling, all units in the action alternatives would meet soil standards and guidelines for acceptable levels of 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). However, full recovery of soil productivity on these sites is a biological process that takes time (10+ years).

Table 17. Unacceptable Soil Disturbance Estimates for Quartz Timber Sale

Type of Soil Disturbance	Alt 1	Alt 2	Alt 3
EXISTING CONDITION, identified legacy compaction			
Legacy skid trails and landings	20 ac	20 ac	20 ac
Legacy abandoned roads	3.5 ac	3.5 ac	3.5 ac
Permanent system roads	63 ac	63 ac	63 ac
PROPOSED DISTURBANCE, new soil compaction			
New Permanent roads	0 ac	0 ac	0 ac
New Temporary roads	0 ac	3 ac	3 ac
Landings & logging disturbance	0 ac	17 ac	17 ac
Fuels Treatment (Severely Burned)	0	0.1 ac	0.1 ac
SOIL RESTORATION, subsoiling			
Legacy Roads	0 ac	6 ac	6 ac
New temporary roads)	0 ac	3 ac	3 ac
Landings and skid trails)	0 ac	21 ac	17 ac
Estimated total compaction after subsoiling	**87 ac**	**77 ac**	**81 ac**

Fuel treatments would occur under “spring like conditions” over approximately 8% of the original 2,810 acres that were analyzed for this project. Under these conditions grapple piles would potentially expose approximately 3% of the treated area, resulting in severely burned soil conditions over less than 0.3% of the area treated. Hand piles and jackpot burning would result in even less disturbance (0.01 to 0.2%).

Together, harvest and fuel treatments would maintain 80% to 90% or more effective ground cover (USDA 1997b). Effective ground cover is defined as all herbaceous or stable 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 mychorrizal 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, and fire management.

The combined effects of harvest, landings, and fuels treatment would potentially expose soil over about 12% of tractor harvest unit acres and 2 to 3 percent of skyline units. Helicopter harvested area would receive little if any surface disturbance. The amount of potential disturbance anticipated to occur under the Quartz alternatives would be considered acceptable for maintaining long-term soil productivity (LRMP 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 1 a future wildfire would potentially reduce the effective ground cover by 40% to 72%. 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. Under Alternatives 2 and 3 the potential risks from wildfire would remain the same over 92% of the acres analyzed in the Quartz Planning area.

Under the worst case scenario all predicted soil disturbances created under Alternatives 2 and 3 would meet all long-term soil productivity standards and guidelines. There would be no adverse direct, indirect, or cumulative effects associated with connected actions outside the natural range of disturbance.

CUMULATIVE EFFECTS

All three 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 Quartz Creek subwatershed, there may be a minor cumulative net beneficial effect to long-term soil productivity. Fuel treatments have resulted in low impact, low intensity, and short duration burns that result in acceptable levels of soil disturbance[9] 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 Quartz Creek subwatershed may potentially reduce the risk of severe wildfire effects to soils and result in a beneficial cumulative effect. Conversely, because Alternative 1 has the potential to result in severe soil effects from a wildfire, it may continue to add to adverse soil impacts in the Sharps Creek watershed, but because there is no action taken, no cumulative effects can occur.

FUELS

Summary of Effects

See Table 19 for a summary of effects by treatment.

EXISTING CONDITION

Existing conditions within the planning area were determined using stand exams, remote sensing (satellite and aerial photography), and field data collection and validation. Grouping of like stands and prescriptions was used to characterize the various stands, describe treatments, and display output. Forest Vegetation Simulator (FVS) and it's Fire and Fuels Extension (FFE) (USDA 2014) was used to characterize general current conditions, based on representative stands, as well as estimate effects to key indicators over time for each alternative.

Fire History

Fire, anthropogenic and lightning-caused, has driven ecological processes in northwest landscapes for many centuries (Agee 1993). Within the planning area, forested stands are heavily influenced by land management policies that exclude wildfire.

[9] Fuel monitoring fuels summaries from 1998, on file at the Umpqua National Forest.

The planning area is best characterized by biophysical settings where fire was historically a dominant ecological force. The vast majority of the planning area is characterized by LANDFIRE as Douglas-fir hemlock – dry mesic potential natural vegetation group (LANDFIRE 2013). In this vegetation type, comprised mostly of Douglas fir with western hemlock, white pine, and several other associates, fire historically burned at intervals of about every 50 to 150 years. Stand replacement fires occurred over larger parts of the landscape every 250 to 500 years. Although within the historic range of variability for this biophysical setting, large stand replacement wildfires are not considered desirable today due to proximity of values at risk and the presence of northern spotted owl critical habitat and other values associated with mature forest conditions.

The watershed can be characterized as having a mixed fire severity fire regime that created a constantly changing mosaic of stand structures and ages across the landscape (USDA/USDI 1999). Within this matrix, at the stand scale, there are several vegetation types where frequent fire maintained a low severity fire regime which historically supported patches of early seral tree species such as knobcone and other pine species as well as early seral stand conditions (i.e. brush) that are currently underrepresented on the landscape.

According to fire occurrence data over the last 8 decades, a wildfire occurs about once every two years in the Sharps Creek watershed (USDA/USDI 1999). A policy of fire exclusion has suppressed many lightning caused fires within the watershed over the last century – these fires would historically burn for weeks, or even months, substantially impacting the fuels matrix at the stand and landscape scales. Exclusion of fire has caused drastic changes to the vegetation and fuels conditions within the planning area in general and disturbance dependent vegetation and habitat conditions are now under represented. Within the planning area, these changes have contributed to conifer encroachment into former meadows, buildup of surface fuels in general, and increasing stand density and canopy closure. Large stand replacement fire and former timber harvest activities have also contributed to what is now a more even age closed canopy stand structure than what would have been expected under historic conditions.

Fire Regime Condition Class

Fire regime condition classes (FRCC) are coarse-scale measures of the degree of departure observed from the natural fire regime (Barrett et al 2010). 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 disturbance processes. Departure from the natural or historic regime is measured at three scales (landscape, strata, and stand) and in three broad classes: low (FRCC 1), moderate (FRCC 2) and high (FRCC 3)). Generally only strata and particularly stand scale departure is relevant at the project planning scale. 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.

Although FRCC was originally developed as a landscape scale metric, it is also modified to be used to characterize stand scale departure relevant at the project scale. However, stand scale FRCC is better quantified by focusing on the driving variable; relative abundance of stand structure. Relative abundance is a stand scale metric which quantifies how common a given stand's current structure class is compared to reference conditions within the respective biophysical setting. A stand is considered "over represented" if that stand's structural class and characteristic is more common in the landscape than it was during reference conditions. The

term “scarce” indicates that the structural class is currently very rare relative to reference conditions.

The delineation of strata and stand scale fire regime condition classes for the Quartz planning area identifies areas in each class, with only a very minor component in FRCC 3. The vast majority of the watershed is identified as either a FRCC 1 or an FRCC 2 (see project file). At the stand scale, an assessment of relative abundance using LANDFIRE data revealed that the FRCC 2 is found in closed mid seral stands that are over represented on the landscape compared to reference conditions. Although early seral conditions are considered similar to reference conditions due in large part to the adjacent industrial timberlands management practices, high quality early seral habitat is probably below reference conditions. Action alternatives will also accelerate development of late seral conditions with open canopy in the currently over represented mid seral structure classes. Because action alternatives will reduce over represented stand conditions and create stand conditions currently under represented, proposed actions will effectively lower the stand scale Condition Class within treated units.

In the planning area, the fire regime condition classes indicate that the natural fire regimes have been moderately altered from their historical ranges. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by more than one return interval. Vegetation attributes have been moderately altered from their historical range.

Wildland Urban Interface (WUI) and Values at Risk (VAR)

Wildland-Urban Interface areas occur where a cluster of homes and other structures are adjacent to natural or undeveloped areas containing burnable vegetation. The presence of WUI increases the risk of human-caused wildfire ignition and the location adjacent to wildland fuels makes these areas vulnerable to wildfire. A WUI exists around the Bohemia Mining District. The planning area overlaps a portion of the western edge of this WUI. A campground and several trailheads and shelters are also within close proximity to the planning area.

The planning area is also within the “border lands”, a term used to describe areas on the forest adjacent and near the forest border with private timber lands. These lands contain millions of dollars’ worth of uninsured timber resources and improvements. Other VAR within and near the planning area include high value northern spotted owl habitat, red tree vole habitat, and other late seral habitat values. Each of these VAR could be jeopardized by large scale high severity wildfire and its effects.

Relevant Fuels and Fire Behavior Principles and Metrics

Factors that influence fire behavior in the planning area include wind, topography, physical characteristics and amounts of fuels (i.e. fuel model), fuel moistures and fire weather factors such as temperature, relative humidity, atmospheric stability, etc. Of these variables, land management has the capacity to impact only fuels characteristics, and to a lesser extent, fire weather at the micro-climate scale (through changes in stand conditions).

Fuel can be broadly characterized into surface, ladder, and canopy (or crown) fuels. Surface fuel loading is a result of dead and dying woody debris collecting over time on the forest floor. Ladder fuels are made up of small diameter trees, brush, and to some extent dead and down fuels that are supported above the ground. Ladder fuels can carry fire burning through surface fuels off the ground and into the canopy. Ladder fuels can also increase fire intensity, limiting opportunities for firefighters to directly attack the fire, and can torch, throwing embers and causing spot fires hindering fire management abilities to safely protect values at risk. The canopy fuel profile consists of leaves and branch wood in the canopy of the dominant overstory vegetation. Fires burning through the canopy (crown fires) are often considered the primary

threat to forest resources as well as human values and firefighter and public safety. Crown fires also present the greatest challenges in terms of resistance to control and are most likely to become large and costly (Graham *et al.*, 2004).

The best available science indicates there are competing variables that are impacted by thinning a forest stand that drive fire behavior calculations. Thinning a stand tends to open the forest floor up to more wind and solar penetration of the canopy. These factors can cause an increase in some fire behavior metrics, most notably midflame wind speed, a key variable in Rate of Spread calculations (Weatherspoon, 1996; van Wagtendonk, 1996).

Numerous models and metrics have been devised to describe and communicate fire hazard or fuel characteristics in each fuel profile. A thorough assessment of fuels and fire hazard should take a hard look at impacts to each fuel profile. This analysis uses FVS-FFE to quantify hazards and fire behavior associated with surface, ladder, and canopy fuels as well as how these metrics develop with time.

FVS-FFE is a vegetation growth and yield model used in this analysis to describe existing conditions and make predictions about future conditions at a stand scale. FVS-FFE is also useful for quantifying the effects of specific prescriptions. FVS-FFE has the capability to model key fire behavior and fuel loading metrics and how they change with time, but is limited to a stand or treatment unit scale. Key metrics generated in FVS-FFE used in this analysis include: Crowning Index (CI), Torching Index (TI), and flame length (from surface fuels). CI and TI are defined respectively as the 20 ft. wind speed needed to sustain an active crown fire and initiate torching or carry a fire into the canopy (higher values are a lower hazard). A CI of below 25 mph is considered a “high” hazard, a value between 25 and 50 is a “moderate” hazard, and above 50 mph is considered a “low” hazard (Fiedler et al. 2004). Flame length is the distance in feet from the combustible fuel to the tip of the flames under a given set of fire weather and fuel moisture conditions. Flame length is a good metric to quantify the hazard associated with surface fuels, as well as indicate resistance to control. For example, according to the “Hauling Chart” found in the Fireline Handbook (NWCG 2004), flame lengths under 4 feet can generally be fought using crews with hand tools at the head of the fire, while flame lengths of 4 to 8 feet require mechanical support (i.e. engines or dozers). Flame lengths over 8 feet generally require aerial support and present serious control problems.

Assessment at the stand scale using FVS-FFE provides the ability to accurately model existing conditions in specific locations based on detailed data gathered in the field (stand exams). The model is also useful because its vegetation and fuels dynamics modeling capabilities allow the projection of treatment effects into the future. The 20 year projection period chosen for fuels analysis represents the estimated maintenance interval when additional non-commercial work and additional burning is predicted to be required to maintain the treatment effectiveness. Output was calculated at time intervals that include: immediately pre-treatment (the existing condition), the first year following all treatment, and two cycles of ten year intervals (from post-treatment). A complete analysis and detailed description can be found in the project record. A limitation of the models and analysis is that they are not sensitive to within-stand variation. Thus, the condition at any given point within a stand may not resemble the composite condition provided by the output. Outputs represent a stand composite, or average across the stand.

Fire Hazard

Fire (wildfire) hazard is defined as the physical condition of vegetation and fuels that influences how the area would burn in the event of a wildfire. Fire hazard can be measured at the scale of landscape and the scale of the individual stand. Both landscape and stand scale fire hazard are discussed to help set the stage for existing conditions. Because the influences of proposed

actions are mainly limited to the stand scale, effects analysis is focused on stand scale metrics to describe relative impacts of alternatives.

Landscape Fire Hazard

Current landscape fire hazard within the planning area can be characterized using Wildfire Suitability mapping (Davis et al 2011). Wildfire Suitability consists of fire behavior model output calibrated specifically for the western Cascades by examining factors contributing to large fire growth in the past. The output is robust and useful at landscape scale assessments to generalize fire hazard. Wildfire Suitability measures an areas propensity for large fire growth and is therefore sensitive to variables effecting crown fire potential and resistance to control. Using historic fire perimeters, the model has proved remarkably accurate at identifying large fire growth potential on the Umpqua National Forest and indeed there are only a few areas of high potential remaining that haven't recently burned (Figure 14). The Quartz planning area is one of the few areas with high potential that have not already burned in a large wildfire.

Most of the planning area includes, or is adjacent to, areas of high risk to large fire growth (Figure 14). Large fire growth is expected to threaten values at risk and potentially degrade habitat quality including northern spotted owl critical habitat. Large high severity fires are also dangerous to manage, are more costly, and can cause long duration impacts to air quality. Treatments designed to modify fire behavior in key locations may provide opportunities to manage large and undesirable fire growth and/or to provide fire refugia, for example by designing prescriptions that increase the likelihood of retaining a living overstory of larger diameter trees within treatment units.

Stand Scale Fire Hazard

Canopy cover within treatment areas is currently fairly dense with a canopy covers averaging around 78%. Crown fire potential in most units is high based on average Crowning Index (CI) of about a 15 mph. The average Torching Index (TI) of between 50 and 100 mph represents a lower hazard, in general, in the ladder fuel profile. Due to the overabundant closed canopy conditions and continuity, patch sizes of severe fire effects would likely be uncharacteristically large compared to reference conditions. The loss of important ecological features, such as large fire resistant trees, may occur.

FVS-FFE simulates fuel accumulation from stand dynamics and management activities, and the removal of fuel through decay, mechanical treatments and prescribed or wildfires. FVS-FFE and field data indicate that current flame lengths from surface fuels under severe weather conditions would range from about 7 to 9 feet.

Fire Hazard and Climate Change

Climate change is expected to drastically change the fire environment in Pacific Northwest forests in the decades to come. Longer dry seasons, lower snowpack, higher peak temperatures, and multi-year droughts are expected to trigger uncharacteristically large and severe disturbance events, including wildfire. The pace of change is expected to exceed the resistance and resilience capacity of most forests, leading to more frequent and intense ecological disturbances. In the Pacific Northwest, area burned and biomass consumed is expected to greatly increase (Vose et al. 2012). Creating forest conditions that are more resilient to large scale disturbance events and that incorporate design features that increase management response options to large scale wildfire should be approached with increased urgency. Forests near the ecotone between moist and drier forest types are particularly vulnerable to climate change.

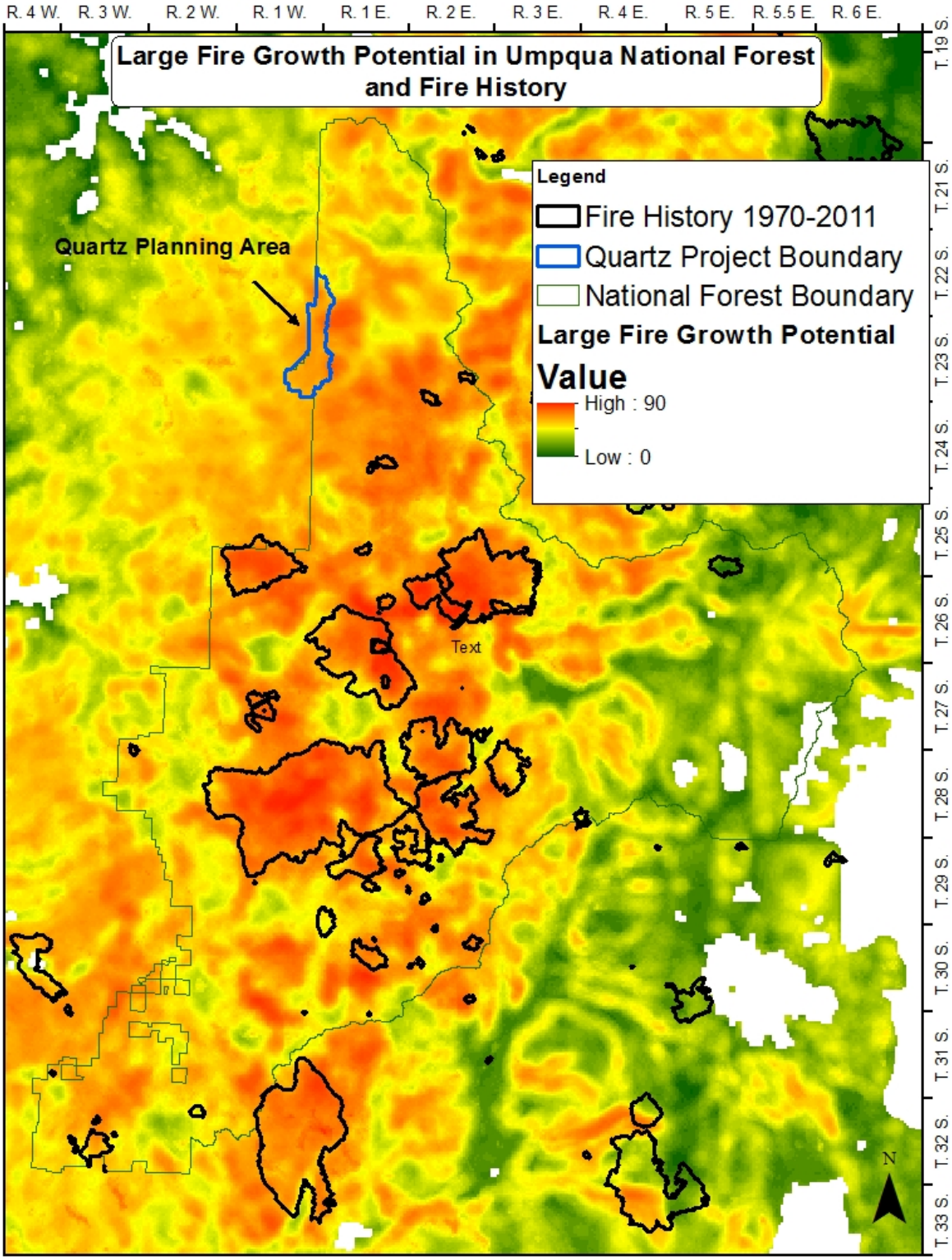

Figure 14. Wildfire Suitability Map for the Umpqua National Forest

DESIRED FUTURE CONDITION

For the Quartz planning area, the expected outcome upon completion of activities would be:

- Reduce activity generated fuels in key locations with post-harvest underburning or pile burning to the extent that hazard is reduced and forest guidelines are achieved, while balancing the need for economic viability.
- Develop and maintain fuel loadings and vegetative conditions that can be maintained with periodic burning in key locations, mimic historic conditions, and protect large fire resistant trees and other ecological features from uncharacteristically high severity fire effects.
- Create stand conditions that more closely mimic those found during reference conditions under the natural fire regime at a stand scale and, at the landscape scale, are more representative of the proportions of the landscape in various structural classes found during reference conditions.
- Maintain meadows and increase palatability of brush through prescribed fire removing encroaching conifers and reinvigorating decadent brush.
- Decrease canopy bulk density, crown closure, and crown continuity that would lessen the potential of fire carrying through the crowns.
- Increases in some potential fire behavior metrics for certain periods of time and where necessary to meet the purpose and need, are acceptable.
- In stands with a mature pine component, vegetative and fuel conditions are desired that increase the likelihood of their survival following wildfire.

DIRECT AND INDIRECT EFFECTS

Effects analysis for planning area units were determined using Stand Exams, field data collection, remotely sensed data (LANDFIRE), model output from FVS-FFE and BehavePlus, professional opinion, and discussions with local fire managers with extensive experience in the planning area. Proposed treatments were grouped into three prescription categories: harvesting with underburn, harvesting with hand pile and burn and harvesting with natural abatement

The environmental effects discussed display how fuel loadings, fire behavior characteristics, and fire effects would differ between alternatives over time. In most cases, the output for alternatives is identical; the difference being the number of acres treated varies by alternative.

As with any project, tradeoffs in a given biophysical metric(s) need to be estimated, known, and accepted. For this project, some temporary increases in certain fire behavior metrics are deemed an acceptable tradeoff within some prescription categories to the goal of long term hazard reduction, creating high quality habitat and meeting other ecological goals. In some units and portions of units where an increase in fire behavior would not pose a direct risk to structures or other areas where humans regularly congregate, activity fuels will be allowed to abate naturally, presenting an increase in surface fuel loads (as well as flame lengths) for a period of time. The risk occurs during the period of time between when the activity fuels are created until when they are either treated (handpiled or underburned) or until they abate naturally through decay on the forest floor to a point that the increased hazard is largely diminished. During the first couple years, the red needles and small twigs fall from the larger branch wood, substantially reducing this increase in hazard. Over the next several years, larger branch wood begins to come in contact with the forest floor and decay, particularly where snowpack settles the slash, further reducing this hazard. In about 7 to 10 years, this hazard is largely abated and may differ only slightly from natural fuel loads in the context of potential fire behavior.

For fire and fuels, direct effects are those that would occur in the short term within the units. Indirect effects are those that would occur at a larger scale and later in time.

Alternative 1

FVS indicates that CI would remain stable in a high hazard state over the analysis period at about 15 mph (see project record). TI, currently between about 50 and 100 mph, gradually increases (decreases in hazard) over the analysis period.

Surface fire hazard (flame length), as described under Existing Conditions, would remain fairly stable in the absence of disturbance over the analysis period. As surface fuel loads gradually increase, more reactive fuel models may develop in the longer term.

Without commercial thinning and fuels treatments, a fire occurring under hot and dry weather conditions would likely result in a mosaic pattern of understory, partial-stand replacing and stand replacement fire (i.e. a mixed severity fire). Although mixed severity fire effects are within the range of variability within the planning area, the proportion and patch sizes of high severity fire effects would likely be higher under current conditions than occurred during reference conditions and threaten key values at risk. This is because continuous areas of high canopy closure stand conditions increase the risk of crown fire across the planning area at an uncharacteristic extent. Desirable ecosystem components, such as late seral habitat, large snags, and large fire resistant trees, can be lost at large scales.

In summary, Alternative 1 would maintain the unit's current propensity for high crown fire potential and fairly moderate and static surface fuel loadings within proposed units for the duration of the analysis period.

Alternatives 2 and 3

The action alternatives reduce the potential for crown fire to carry through or initiate within treatment units. Table 18 provides a comparison of fire hazard metrics by alternative over time. CI increases substantially in all prescriptions categories moving, in most cases, from a high to a moderate crown fire rating (Table 19), or from the high toward the low side of the range (Figure 15). In units proposed for non-commercial thin only, there would be no response in CI because noncommercial thinning would have a very limited impact on crown fuel within the dominant overstory, except where the dominant overstory is within the specifications of the thin (generally under 8" diameter at breast height). The fuels treatment within commercial thin units does not impact CI.

The TI post treatment is dependent on if and how activity fuels are treated. TI is expected to decrease (increase in hazard) temporarily in portions of units where activity fuels are allowed to abate naturally. Higher surface fuel loads increase flame length which decreases the wind speed necessary to carry a surface fire into the crown. In areas where an underburn or pile and burn is planned to reduce activity generated fuels, TI will increase slightly and be of lower hazard than conditions found in the no action alternative (Figure 15). This increase (decrease in hazard) is a result of increasing canopy base height from thinning smaller diameter trees and reducing flame lengths with underburning of activity (and some natural) fuels or hand piling and burning of this material. Burning will also increase canopy base height through scorch of the lower branches.

Crown fires require a combination of wind speed and canopy continuity to sustain combustion. The action alternative would thin and remove trees and fuels from the stands, reducing canopy continuity, canopy bulk density, and the potential for crown fire spread. In the event of an uncharacteristically large and severe fire event following treatment, fire severity and large tree mortality within treated units would remain relatively low under most conditions, providing a

more diverse mix of age classes and vegetative conditions at the landscape scale and serving as important seed sources for regeneration and refugia for wildlife.

Flame length post treatment would also vary with activity fuel treatment option. In portions of units underburned or handpiled (including non-commercial units), flame lengths are expected to decrease following harvest compared to current conditions, toward the lowest end of the range. In units where fuels are left to abate naturally, flame lengths would increase for a period of time toward the top of the range. This is due to increased activity generated fuel loadings following harvest. Over the analysis period, the flame lengths would reduce with time to a point that they approximate those found for the same period under the No Action alternative. Using FVS modelling, Figure 16 demonstrates how activity generated fuels abate over time.

Table 18. Comparison of Fire Hazard Metrics by Alternative.

Prescription Category	Crowning Index			Torching Index			Flame Length		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Harvest/underburn:									
Existing	H	H	H	M	M	M	M	M	M
Post-Harvest	H	M	M	M	L	L	M	L	L
10 years	H	M	M	M	M	M	M	M	M
20 years	H	M	M	M	M	M	M	M	M
Harvest/hand pile and burn:									
Existing	H	H	H	M	M	M	M	M	M
Post-Harvest	H	M	M	M	L	L	M	L	L
10 years	H	M	M	M	M	M	M	M	M
20 years	H	M	M	M	M	M	M	M	M
Harvest/natural abatement:									
Existing	H	H	H	M	M	M	M	M	M
Post-Harvest	H	M	M	M	H	H	H	H	H
10 years	H	M	M	M	M	M	M	M	M
20 years	H	M	M	M	M	M	M	M	M

FVS was used to model the highest and lowest anticipated conditions for each category. These conditions represent the high and low terminus of the range of potential effects. Each category in this table represents the approximate relative position on this range of effects; near the high end of the range (H), near the middle of the range (M), and at the low end of the range (L). For CI and TI, higher values represent lower hazard. Therefore higher values are at the lower end of the range.

Because more activity fuel is left following helicopter harvest techniques, TI and Flame Length will be at higher hazard level than in Skyline or Ground based harvest units, but still within the range shown in Figure 15 and still within the category listed above.

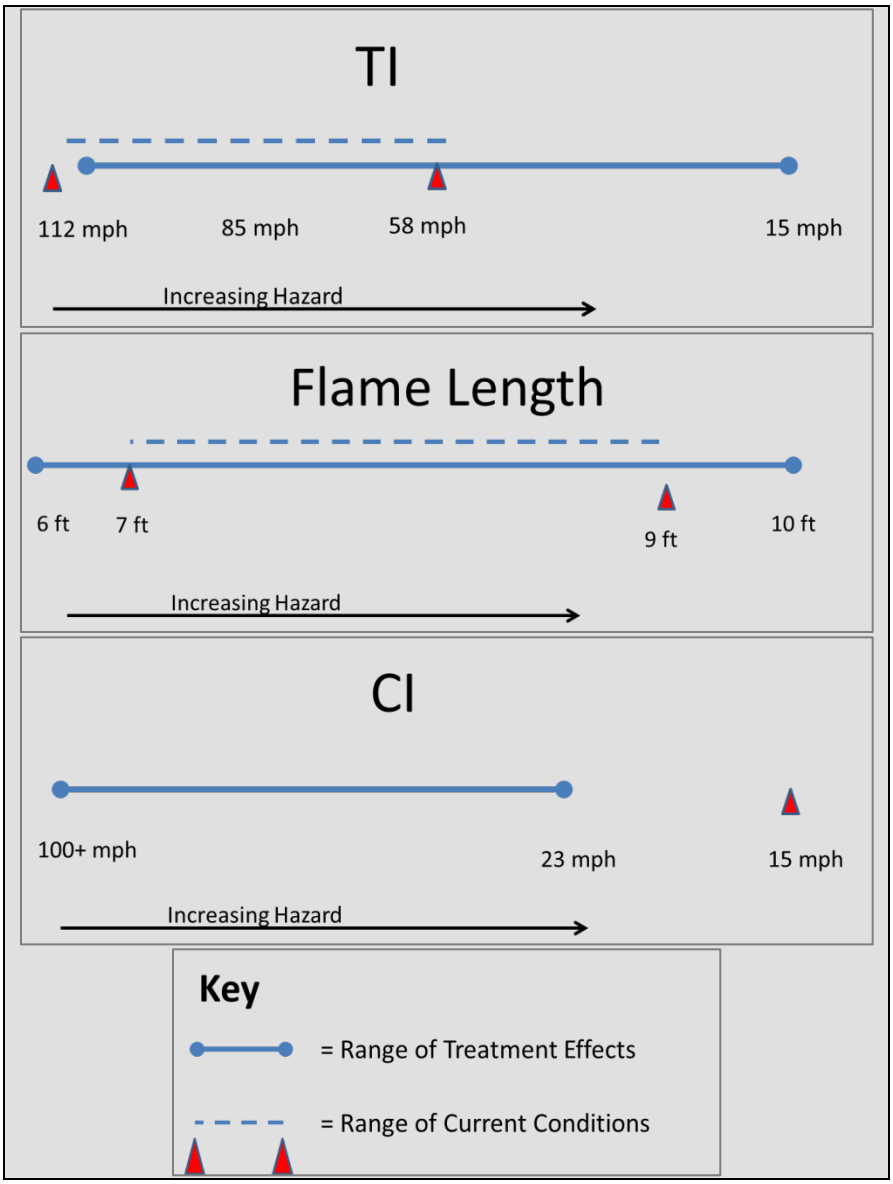

Figure 15. Ranges of current and post treatment conditions for 3 key indicators.

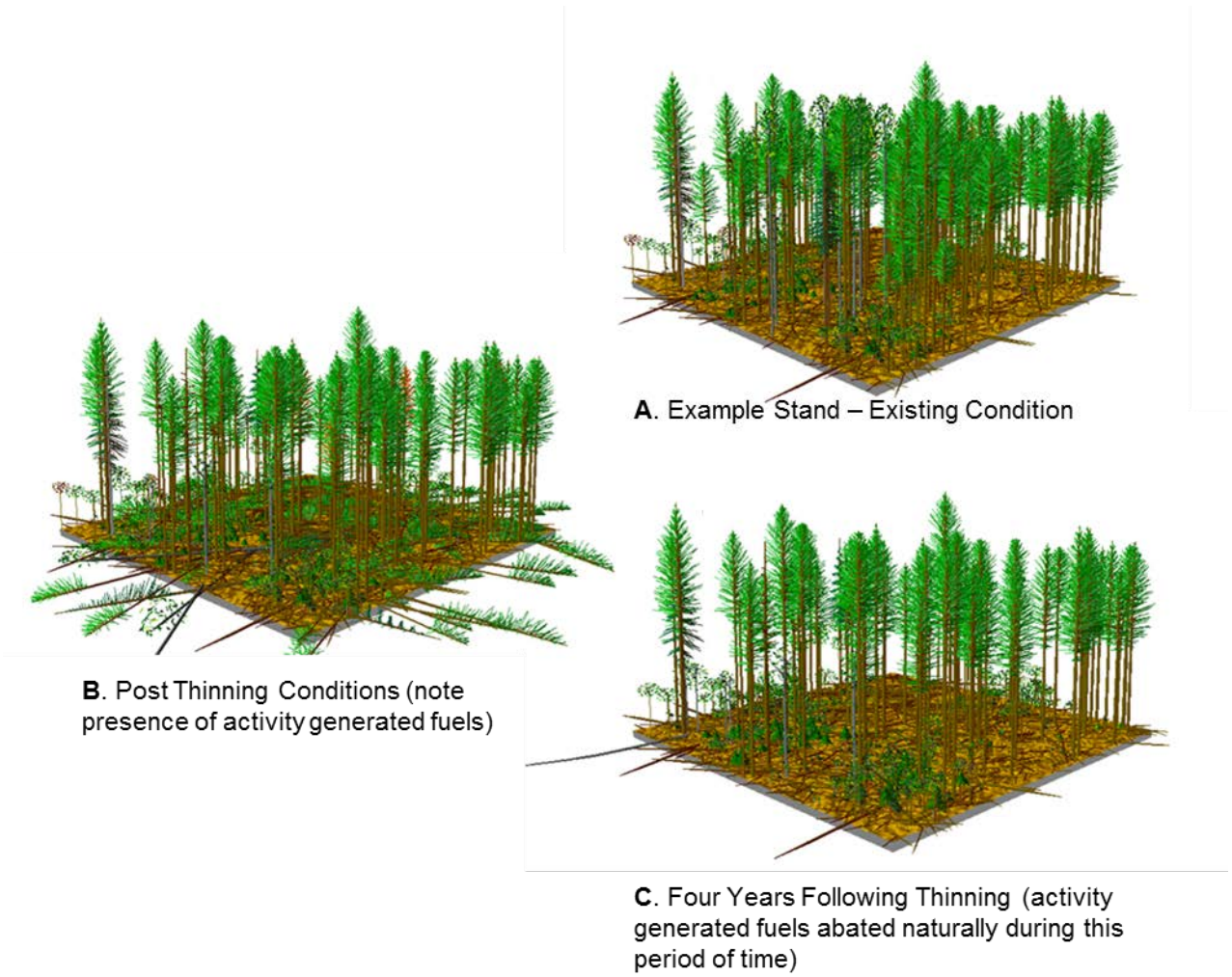

Figure 16. Example of Activity Generated Fuel Loading Over Time

Table 19. Summary of Fuels Treatment Acres and Effects

Treatment	Change to Fire/Fuel Conditions	Primary Effect (Beneficial/Adverse)	Time (yrs.)	Treatment Acres by Alternative		
				1	2	3
Commercial Harvest	CI increases (hazard reduced) TI increases or decreases (depending on activity fuel treatment) Flame Length would temporarily increase due to	Beneficial: Reduce crown fire hazard. Increase stand resiliency to wildfire and other disturbance. Increase likelihood of survival of large dominant trees. Adverse: Increased slash load in some portions of some units. More open canopy can increase midflame windspeed.	1-20	0	1026	850

Treatment	Change to Fire/Fuel Conditions	Primary Effect (Beneficial/Adverse)	Time (yrs.)	Treatment Acres by Alternative		
				1	2	3
	accumulations of activity generated fuels. See descriptions for fuel treatments below for more detail.					
Burning Activity Fuels (underburn)	CI no effect (see prescription impacts) TI increases (hazard reduced) Flame Length decreases lower than pretreatment condition	Beneficial: Nearly eliminate activity generated fuels and associated hazard. Reduce some natural fuels. Return role of fire to ecosystem. Adverse: Smoke emissions may have the potential to impact sensitive airsheds for a short duration. High cost. Fireline associated impacts surrounding treatment areas.	1-20	0	330	322
Hand or Machine Pile and Burn (landings and grapple pile)	CI no effect (see prescription impacts) TI increases (hazard reduced) Flame Length comparable to pretreatment condition	Beneficial: Reduce most activity created fuels. Easier to control fire behavior/ lower chance of escape. Can use in units with operational limitations that preclude underburning. Adverse: Long duration of heat may impact soil in isolated areas.	1-20	0	192	174
Natural abatement of activity generated fuels through decomposition	CI no effect (see prescription impacts) TI decreases (hazard increased) Flame Length increases temporarily higher than pre-treatment condition	Beneficial: Nutrients would be retained on the site. Soil quality would benefit in some areas from additional incorporation of woody material. Adverse: A temporary increase in surface fuels would lead to a temporary increase in flame length until fuels abated naturally through decay.	1-20	0	504	354
Non-Commercial thinning fuel breaks	CI no effect (unless in very young stand) TI increases (hazard reduced) Flame Length comparable to pretreatment	Beneficial: Reduce fire behavior associated with small diameter trees. Create a network of fuel breaks. Adverse: None.	1-20	0	374	334

Treatment	Change to Fire/Fuel Conditions	Primary Effect (Beneficial/Adverse)	Time (yrs.)	Treatment Acres by Alternative		
				1	2	3
	condition					
Handline Construction	None.	Beneficial: handline enables prescribed burning by restricting fire to within the planned unit perimeters. Adverse: handline exposes mineral soil for approximately an 18-inch width around, and sometimes through, the unit(s).	5-10	0	0.26	0.26

CUMULATIVE EFFECTS

Since the 1950s, commercial harvesting has occurred on approximately 21,000 acres in the watershed with the objective of reducing stand densities primarily to improve growth, enhance forest health, and other resource objectives. Commercial treatments generally involved follow up underburning of activity, and by extension many natural, fuel loadings.

These past practices have reduced fuel loadings, reduced the risk of stand loss to potential wildfires, and changed the baseline surface fuel conditions of the managed stands. These previous, ongoing, or future activities will ultimately enhance the effectiveness of activities proposed under action alternatives.

All past activities, whether described here or unknown to the planning team, impacted vegetation and fuel conditions to some degree. The impact these changes had to our current conditions are quantitatively or qualitatively captured in the existing conditions section.

In the future, additional prescribed burning and vegetation management can be expected that will influence vegetation and fuels conditions. These actions will result in more acres of altered surface fuel loading, reduced small tree density, and reduced crown fire hazard.

Past thinning and burning in combination with a given action alternative, would have the beneficial incremental cumulative effect of further reducing crown fire potential by reducing fire hazard and lowering the probability of stand replacement fire. The magnitude of this effect would not differ by alternative. Alternative 1 would not contribute to this beneficial cumulative effect of reducing fuels and associated fire hazard across the landscape, as no treatment would occur.

COARSE WOODY DEBRIS

SUMMARY OF EFFECTS

Alternative 1 would likely result in high levels of coarse wood over time, but with increased risk of high severity fire. Alternatives 2 and 3 will reduce the recruitment of coarse woody debris over time and generally less coarse wood within treated stands. However, these Alternatives would not contribute to a landscape deficiency of coarse wood because habitat will be provided across a spectrum of tolerance levels and distributions which are not unlike what would be expected under natural conditions. All Alternatives meet established LRMP Standard and Guidelines.

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 (USDA/USDI 1994, p. 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 (USDA/USDI 1994, p. B-6) well distributed throughout the landscape (USDA/USDI 1994, p. 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 (USDA/USDI 1994, p. 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 (USDA/USDI 1994, p. C-41). Future refinement of standards and guidelines was expected as new information became available (USDA/USDI 1994, p. C- 42 and p. E-12). More current information (Mellen-McLean et al. 2012, Rose et al. 2001) indicates that the biological population potential models (dating back to the 1970s and 80s) that most standards and guidelines were based on, may now be out of date (See the Primary Cavity Excavators subsection of the Management Indicator Species section for more details on the biological population potential standards in the Umpqua NF LRMP [USDA 1990]).

To supplement the Forest Plan standards and guidelines with more site-specific data, Pat Hochhalter (SW Area Ecologist on the Rogue River-Siskiyou National Forest) and Jody Thomas (DRM GIS analyst) completed a mapping exercise for the Umpqua separating out the Forest into DecAID wildlife habitat types and structural conditions by 5th and 6th field watershed, and joined that data with 2010 Gradient Nearest Neighbor (GNN) habitat data for snags and downed wood. The GNN method uses multivariate direct gradient analysis to link field plot data, satellite imagery, and maps of environmental variables in a raster GIS database. Individual pixels are associated with forest inventory plots that have the most similar spectral and environmental characteristics. A suite of detailed plot variables is then imputed to each pixel, allowing simultaneous and consistent predicting of a wide range of vegetation attributes.

The Northwest Forest Plan requires site-specific analysis and the application of models for computing down wood information (USDA/USDI 1994, p. C-40) and snag recruitment (USDA/USDI 1994, p. 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 Westside Variant of the Forest Vegetation Simulator (USDA 2014) model 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 version 2.20 (Mellen-McLean et al. 2012) 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-McLean et al. 2012).

The results of this synthesis 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 (USDA/USDI 1994, p. C-41). A comparison of GNN data and FVS outputs (as described above) to unharvested reference plots from DecAID provides the basis for setting objectives for snags and down wood for the watershed and considering what may be an appropriate CWD tolerance levels during project implementation.

DECAID Data References

The following analysis utilizes information from many locations within DecAID. Vegetation inventory data for snags came from figures WLCH_OCA_O.inv-14, WLCH_OCA_S.inv-14, and WLCH_OCA_L.inv-14. Inventory data for down wood came from figures WLCH_OCA_S.inv-16 and WLCH_OCA_L.inv-16. Wildlife tolerance levels were derived from the narratives provided for the western lowland conifer-hardwood forest, Oregon West Cascades habitat type, and from data presented in tables WLCH_S.sp-22 and WLCH_L.sp-22 for snags, and tables WLCH_S.sp-24 and WLCH_L.sp-24 for down wood (Mellen-McLean et al. 2012).

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-McLean et al. 2012), 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 (Ohmann and Waddell 2002, White et al. 2002). Management prescriptions should allow for these extremes because they are ecologically important (Mellen-McLean et al. 2012, White et al. 2002). Common natural disturbances that produce areas with high levels of dead wood include wildfire, insects and disease, and wind (blow down) events. These events are expected to be the source of patches of high snag densities in the future.

The GNN raster dataset was used for comparing current landscape distributions of snags and down wood with DecAID summaries of unharvested plot data. This entails a direct comparison of current conditions to "natural" or "unmanaged" habitat conditions of the same habitat types applied to the structural distributions currently present in the Sharps Creek watershed. In order to develop a realistic picture of the current conditions of the coarse woody debris within the watershed, the GNN data was analyzed at both the full watershed scale (about 42,533 acres), and at the scale of the portion of the Sharps Creek watershed falling within the District boundary (about 18,625 acres). For analysis, snags data were placed into two categories based on diameter at breast height (dbh): snags 10 inches and larger, and snags 20 inches and larger (which is a subset of the ≥10” size class), and then assessed according to snag density. Downed wood greater than 12.5cm (4.9 in) was analyzed as a single category and assessed

according to percent cover. Analysis was conducted for snag and down wood distribution and associated wildlife tolerance levels.

WATERSHED LEVEL ANALYSIS:

Snag Distribution (10 inch and greater size class)

A comparison of ≥10 inch dbh size class data from the GNN raster dataset and vegetation inventory data from unharvested plots in DecAID (Mellen-McLean et al. 2012), weighted for current structure class distribution across the landscape, are shown in Figure 17. The weighted GNN data indicate that about 77% of the local landscape is devoid of snags or has low snag densities (0 to 6 snags per acre), about 18% of the landscape has moderate snag densities (6 to 24 snags per acre), and about 4% of the area within the Sharps Creek watershed supports high densities of snags (24 or more snags per acre). This snag density distribution deviates from what would be expected under unharvested conditions according to the information presented by Mellen-McLean et al. (2012) in DecAID; under unharvested conditions (weighted by current structural class distributions) snag density distributions that would be expected would be with about 42% of the watershed being devoid of snags or having snags occur in low densities, about 43% of the landscape supporting snags at moderate densities, and about 14% of the watershed supporting high densities of snags. From this comparison in the ≥10" size class, it is likely that there is generally an excess of land within the watershed with no snags or with snags at low densities, and a deficiency of land with snags at moderate or high densities when compared to the average snag density distributions observed in stands under unharvested conditions by Mellen-McLean et al. (2012) in the same habitat type.

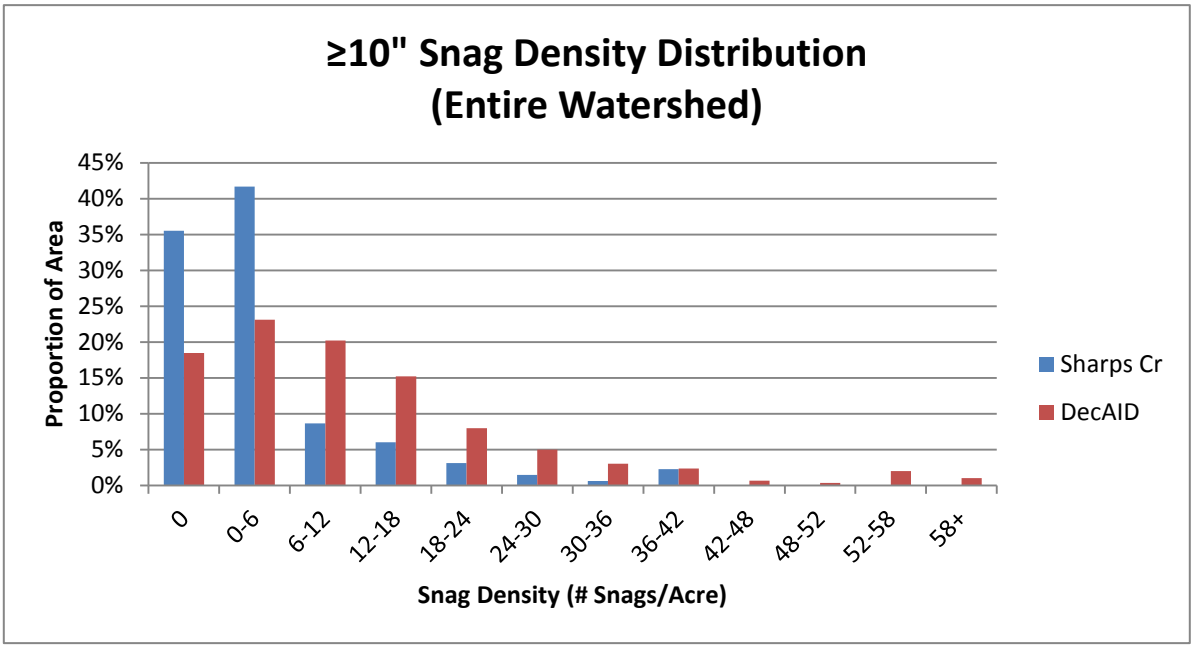

Figure 17. Distribution of >10 inch Diameter Snags in Sharps Creek Watershed

Snag Distribution (20 inch and greater size class)

A comparison of ≥20 inch dbh size class data from the GNN raster dataset and vegetation inventory data from unharvested plots in DecAID (Mellen-McLean et al. 2012), weighted for current structure class distribution across the landscape, are shown in Figure 18. The weighted GNN data indicate that about 61% of the local landscape is devoid of snags or have low snag densities (0 to 2 snags per acre), about 32% of the landscape has moderate snag densities (2 to 10 snags per acre), and about 7% of the area within the Sharps Creek watershed support high densities of snags (10 or more snags per acre). Similar to the ≥10" size class, this snag density distribution deviates from what would be expected under unharvested conditions according to the information presented by Mellen-McLean et al. (2012) in DecAID, though the deviation is less severe; under unharvested conditions (weighted by current structural class distributions) snag density distributions that would be expected would be with about 46% of the watershed being devoid of snags or having snags occur in low densities, about 40% of the landscape supporting snags at moderate densities, and about 14% of the watershed supporting high densities of snags. From this comparison in the ≥20" size class, it is likely that there is generally an excess of land within the watershed with no snags or snags at low densities, and a deficiency of land with snags at moderate or high densities when compared to the average snag density distributions observed in stands under unharvested conditions by Mellen-McLean et al. (2012) in the same habitat type.

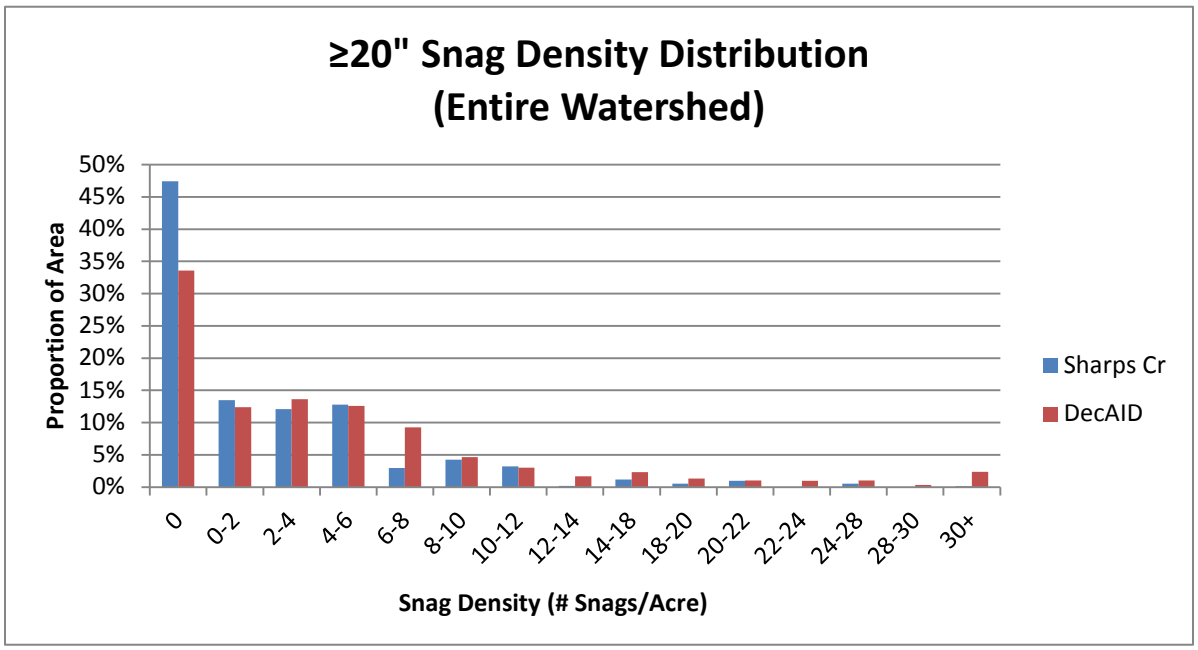

Figure 18. Distribution of >20 inch Diameter Snags in Sharps Creek Watershed

Down Wood Distribution

A comparison of ≥4.9" down wood data from the GNN raster dataset and vegetation inventory data from unharvested plots in DecAID (Mellen-McLean et al. 2012), weighted for current structure class distribution across the landscape, are shown in Figure 19. The weighted GNN data indicate that about 30% of the local landscape is devoid of large down wood or has low levels of down wood (0 to 2% ground cover), about 66% of the landscape has moderate levels of down wood (2 to 10% ground cover), and about 5% of the area within the Sharps Creek

watershed supports high levels of down wood (10% or more ground cover). These down wood cover distributions are very similar to what would be expected under unharvested conditions according to the information presented by Mellen-McLean et al. (2012) in DecAID; under unharvested conditions (weighted by current structural class distributions) down wood cover distributions that would be expected would be with about 27% of the watershed being devoid of large down wood or have low levels of down wood, about 63% of the landscape supporting snags at moderate levels of down wood, and about 9% of the watershed supporting high levels of down wood. From this comparison between current and natural conditions, it is likely that the distribution of down wood within the watershed is generally similar to the unharvested or "natural" conditions by Mellen-McLean et al. (2012) in the same habitat type. There are, however, slight differences with our data trending slightly more toward the lower end of the down wood distribution curve.

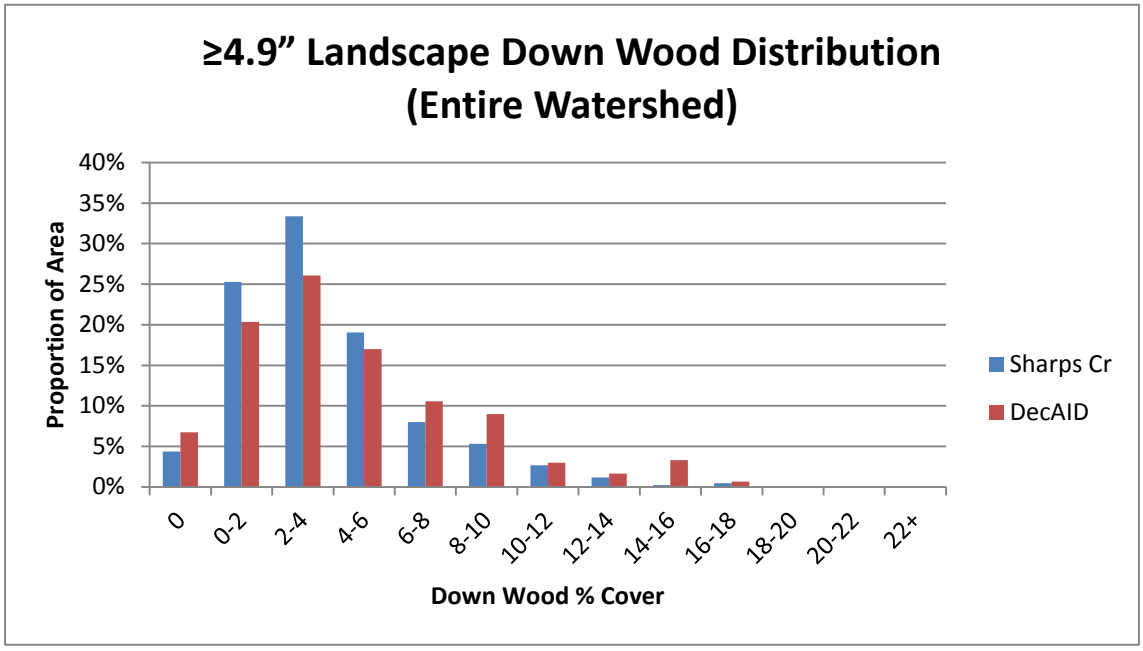

Figure 19. Distribution of ≥4.9 in. Diameter Down Wood by Percent Cover in Watershed.

Wildlife Tolerance Level Analysis

DecAID version 2.20 *Advice on Decayed Wood in the Westside Lowland Conifer-Hardwood Forest OR W Cascades, Small/medium and Large trees Vegetation Condition* provides analysis of wildlife data on snag habitat under natural conditions based on the most recent research available (Mellen-McLean et al. 2012). GNN data were analyzed according to wildlife tolerance levels based on the information synthesized from wildlife survey data provided in DecAID (Table 20). The ranges of wildlife data (cavity nesting birds through pileated woodpeckers, though the pileated woodpecker data which represents the upper end of the ≥ 20" dbh snags came from studies on the Olympic Peninsula and coast ranges, not the West Cascades) were chosen to provide for the greatest number of species based on DecAID narrative, Synthesis and Management Implications section, and tables WLCH_S and L.sp-5, WLCH_S and L.sp.7 (Mellen-McLean et al. 2012).

Tolerance levels indicate a level of assurance for providing habitat that meets the needs of the species. The higher the tolerance level is for the species, the more individuals in the population

that are likely being provided habitat. For more detailed information on tolerance levels, refer to Mellen-McLean et al. (2012).

Table 20. Tolerance Levels for Snags ≥ 10" dbh/acre and Snags/acre ≥ 20" dbh.

Percent Tolerance Levels	Snags/acre ≥ 10 dbh	Snags/acre ≥ 20 dbh
80	36	20
50	18	12
30	6	6

The tolerance levels in Table 21 are derived from the DecAID narrative for both small/medium and large structure classes when the objectives are to manage for wildlife, ecosystem functions, and natural conditions when based on the best available data to maintain down wood (≥4.9" diameter) specific to these vegetation conditions (Mellen-McLean et al. 2012). The open structure class was excluded from the formulation of tolerance values for this analysis because of a lack of wildlife data concerning down wood in that structure type.

Table 21. Tolerance Levels for Percent Cover for Down Wood ≥ 4.9" Diameter at Small End.

Percent Tolerance Levels	Percent Ground Cover
80	16
50	10
30	6

Wildlife tolerance levels, as described in DecAID, describe the likelihood that a given species will be utilizing an area based on the habitat characteristics that exist there. This can offer a level of assurance that wildlife species requiring those particular habitat characteristics will be provided for (Mellen-McLean 2012). Figure 20 displays a comparison of weighted distribution of tolerance levels as a proportion of the total habitat within the Sharps Creek watershed and what would be expected under approximated "natural" conditions (according to the data presented in DecAID by Mellen-McLean et al.[2012]) weighted for the distribution of structure classes that currently exist within the watershed. These distributions were calculated using the tolerance values displayed in Table 20. A comparison between the current distribution and the conditions which would be expected under unharvested conditions demonstrates that far more habitat currently falls below the 30% tolerance level for ≥10" snags than would be expected under unharvested conditions (77% vs. 42%). For the 30% tolerance level and above, current conditions in the Sharps Creek Watershed offer less assurance than would be expected under unharvested conditions with current structure class distributions for ≥10" snags (22% vs. 57%).

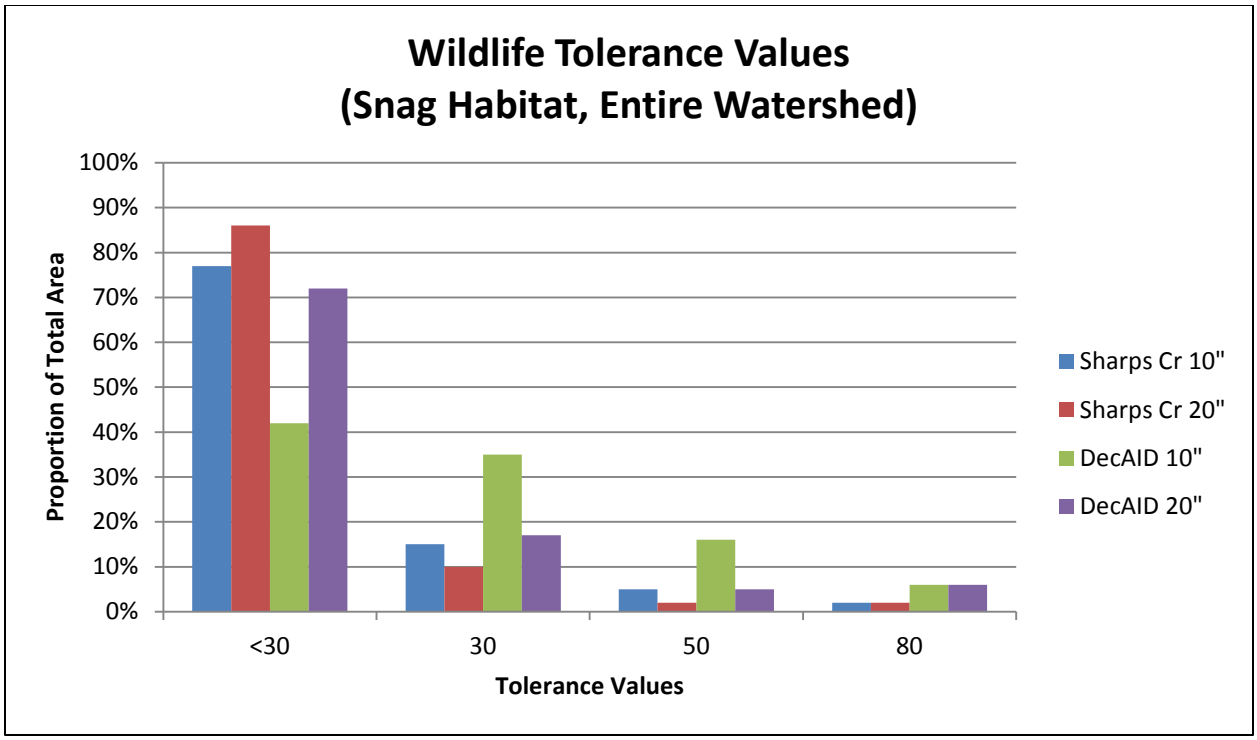

Figure 20. Distribution of Tolerance Levels for Wildlife Snag Habitat in Watershed

A similar trend also occurs in the ≥20" size class: more habitat falls below the 30% tolerance level than would be expected under unharvested conditions (86% vs. 72%), and less habitat currently supports assurance above the 30% tolerance level than would be expected under unharvested conditions (14% vs. 28%), though the disparity observed between data sets is less severe within this size class.

Figure 21 displays a comparison of weighted distribution of tolerance levels as a proportion of the total habitat within the Sharps Creek watershed and what would be expected under approximated "natural" conditions (according to the data presented in DecAID by Mellen-McLean et al.[2012]) weighted for the distribution of structure classes that currently exist within the watershed. These distributions were calculated using the tolerance values displayed in Table 21. A comparison between the current tolerance level distribution and the tolerance level distribution which would be expected under unharvested conditions demonstrates some disparities between values. More habitat currently falls short of providing assurances at or above the 30% tolerance level compared to what would be expected under unharvested conditions (82% vs. 70%). For the 30% tolerance level and above, current conditions offer less assurance than would be expected under unharvested conditions with current structure class distributions for down wood percent cover (17% vs. 29%).

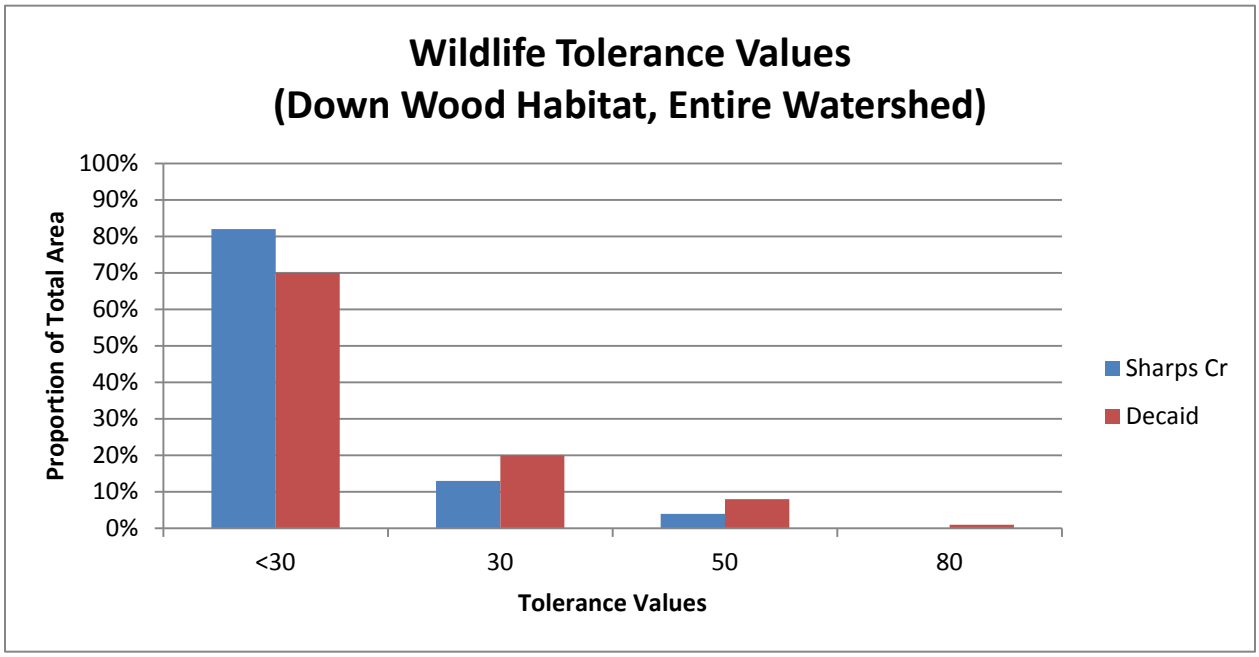

Figure 21. Wildlife Tolerance Level Distribution of ≥4.9" Diameter Down Wood by Percent Cover in Sharps Creek Watershed.

UMPQUA NATIONAL FOREST PORTION OF ANALYSIS AREA

Snag Distribution (10 inch and greater size class)

A comparison of ≥10 inch dbh size class data from the GNN raster dataset and vegetation inventory data from unharvested plots in DecAID (Mellen-McLean et al. 2012), weighted for current structure class distribution across the landscape, are shown in Figure 22. The weighted GNN data indicate that about 42% of the local landscape is devoid of snags or has low snag densities (0 to 6 snags per acre), about 48% of the landscape has moderate snag densities (6 to 24 snags per acre), and about 11% of the area within the Sharps Creek watershed supports high densities of snags (24 or more snags per acre). This snag density distribution is very similar to what would be expected under unharvested conditions according to the information presented by Mellen-McLean et al. (2012) in DecAID; under unharvested conditions (weighted by current structural class distributions) snag density distributions that would be expected would be with about 31% of the watershed being devoid of snags or having snags occur in low densities, about 52% of the landscape supporting snags at moderate densities, and about 15% of the watershed supporting high densities of snags. From this comparison in the ≥10" size class, it is possible that there may be a small excess of land within the watershed with no snags or with snags at low densities, and a very slight deficiency of land with snags at moderate or high densities when compared to the average snag density distributions observed in stands under unharvested conditions by Mellen-McLean et al. (2012) in the same habitat type. However, the data presented by Mellen-McLean et al. (2012) is only an average of natural snag distributions, and so it is possible that this current distribution may be within or close to a natural range of values based on the similarity of the two datasets.

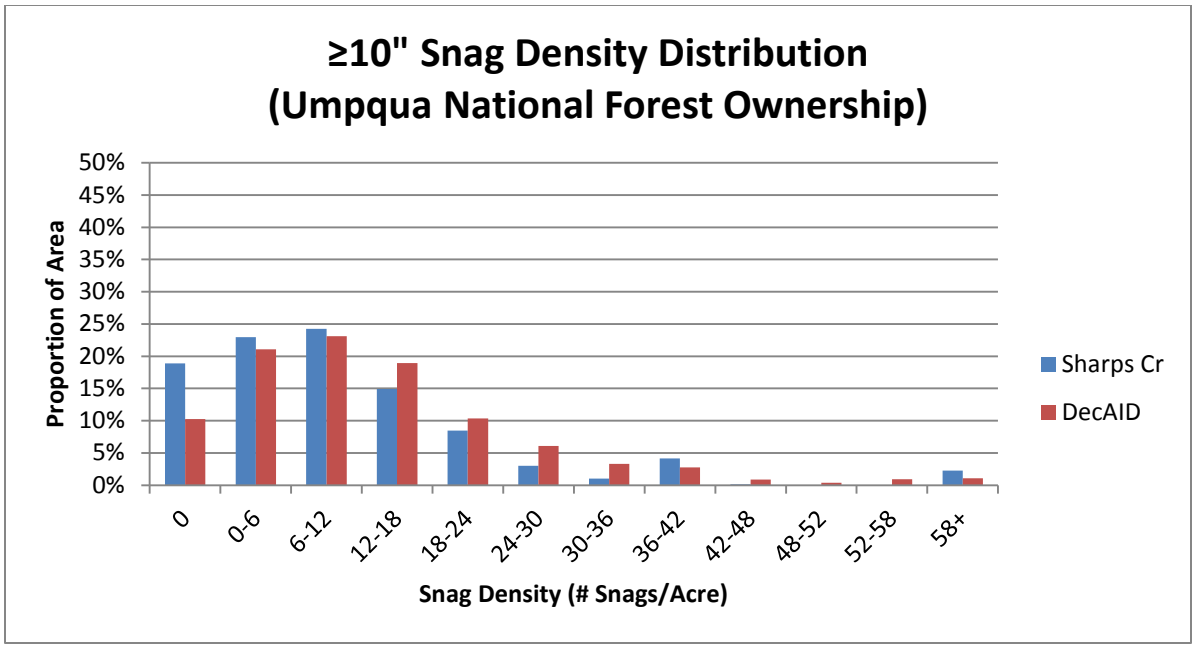

Figure 22. Distribution of >10 inch Diameter Snags in the Umpqua National Forest Ownership of the Sharps Creek Watershed.

Snag Distribution (20 inch and greater size class)

A comparison of ≥20 inch dbh size class data from the GNN raster dataset and vegetation inventory data from unharvested plots in DecAID (Mellen-McLean et al. 2012), weighted for current structure class distribution across the landscape, are shown in Figure 23. The weighted GNN data indicate that about 42% of the local landscape is devoid of snags or have low snag densities (0 to 2 snags per acre), about 46% of the landscape has moderate snag densities (2 to 10 snags per acre), and about 12% of the area within the Sharps Creek watershed support high densities of snags (10 or more snags per acre). Similar to the ≥10" size class, this snag density distribution may deviate very slightly from what would be expected under unharvested conditions according to the information presented by Mellen-McLean et al. (2012) in DecAID; under unharvested conditions (weighted by current structural class distributions) snag density distributions that would be expected would be with about 33% of the watershed being devoid of snags or having snags occur in low densities, about 51% of the landscape supporting snags at moderate densities, and about 16% of the watershed supporting high densities of snags. From this comparison in the ≥20" size class, it is possible that there may be a slight excess of land within the watershed with no snags or with snags at low densities, and a slight deficiency of land with snags at moderate or high densities when compared to the average snag density distributions observed in stands under unharvested conditions by Mellen-McLean et al. (2012) in the same habitat type. However, the data presented by Mellen-McLean et al. (2012) is only an average of natural snag distributions, and so it is possible that this current distribution may be within or close to a natural range of values based on the similarity of the two datasets.

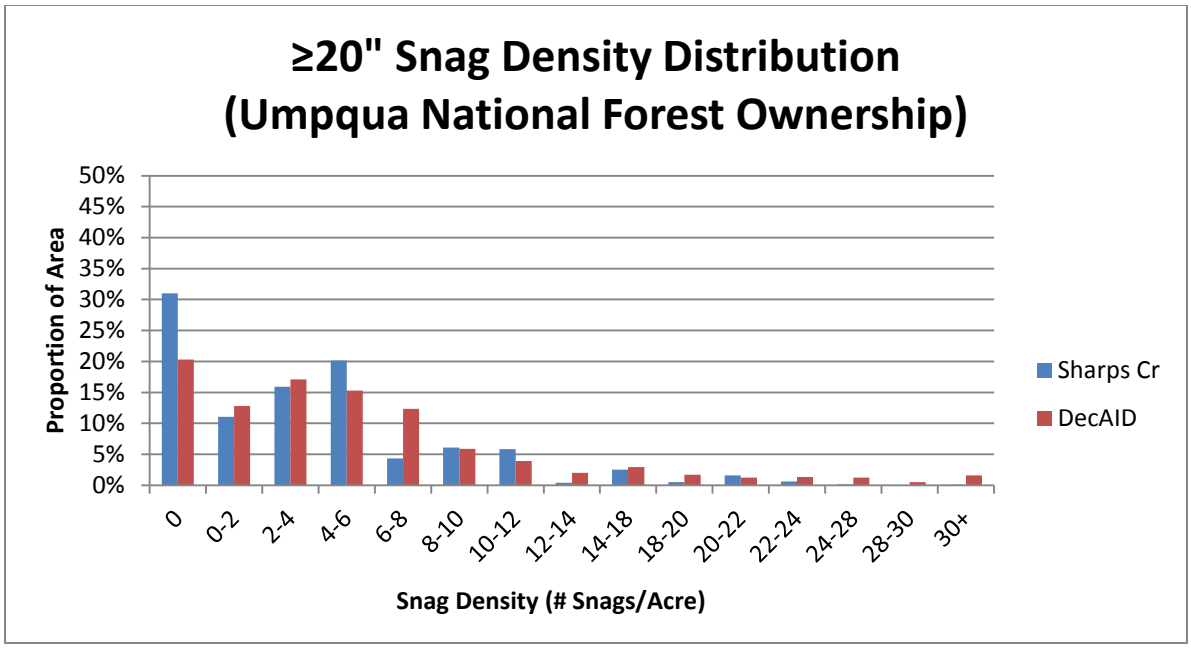

Figure 23. Distribution of ≥20 inch Diameter Snags in the Umpqua National Forest Ownership of the Sharps Creek Watershed.

Down Wood Distribution

A comparison of ≥4.9" down wood data from the GNN raster dataset and vegetation inventory data from unharvested plots in DecAID (Mellen-McLean et al. 2012), weighted for structure class distribution across the landscape, is shown in Figure 24. The weighted GNN data indicate that about 28% of the local landscape is devoid of large down wood or has low levels of down wood (0 to 2% ground cover), about 67% of the landscape has moderate levels of down wood (2 to 10% ground cover), and about 5% of the area within the Sharps Creek watershed supports high levels of down wood (10% or more ground cover). These down wood cover distributions are very similar to what would be expected under unharvested conditions according to the information presented by Mellen-McLean et al. (2012) in DecAID; under unharvested conditions (weighted by current structural class distributions) down wood cover distributions that would be expected would be with about 24% of the watershed being devoid of large down wood or have low levels of down wood, about 64% of the landscape supporting snags at moderate levels of down wood, and about 10% of the watershed supporting high levels of down wood. From this comparison between current and natural conditions, it is likely that the distribution of down wood within the watershed is generally similar to the unharvested or "natural" conditions by Mellen-McLean et al. (2012) in the same habitat type. There are, however, small differences with the current distribution trending slightly more toward lower levels of percent cover of down wood.

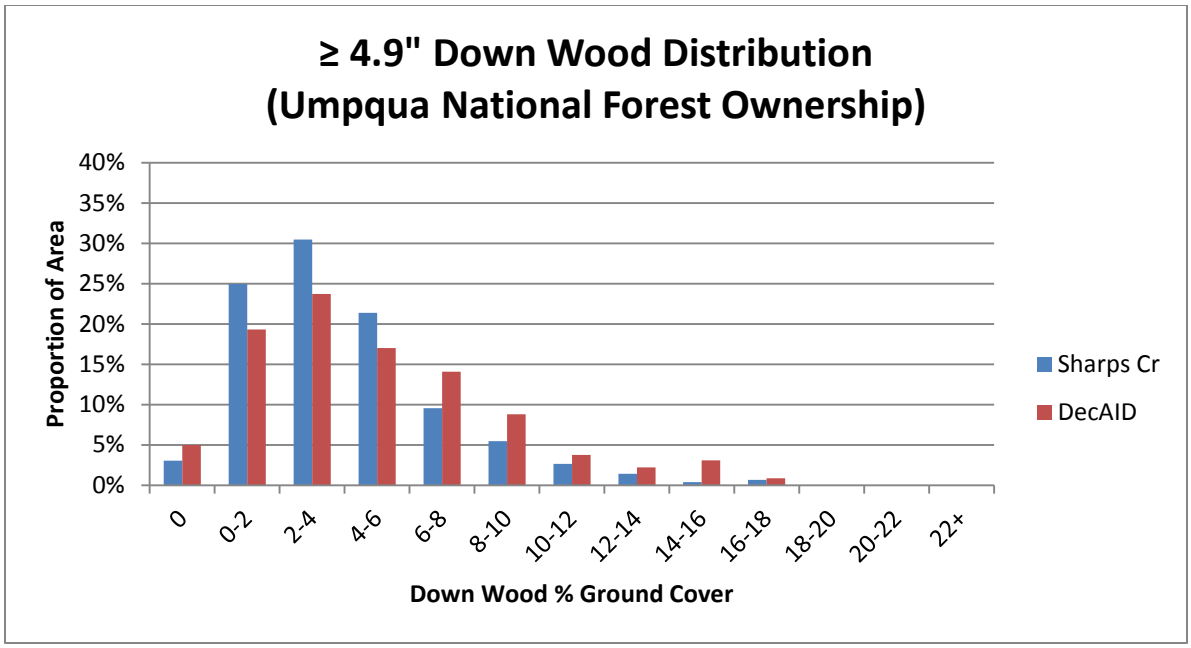

Figure 24. Distribution of ≥4.9in Diameter Down Wood by Percent Cover in Umpqua National Forest Ownership of the Sharps Creek Watershed.

Wildlife Tolerance Level Analysis

Tolerance levels for the Umpqua National Forest ownership were calculated using the same methodology and values as in the full watershed analysis above. Refer to Table 20 and Table 21 for the tolerance level values used.

Figure 25 displays the comparisons of weighted distribution of tolerance levels as a proportion of the total habitat within the Sharps Creek watershed and what would be expected under approximated "natural" conditions (according to the data presented in DecAID by Mellen-McLean et al.[2012]) weighted for the distribution of structure classes that currently exist within the watershed. These distributions were calculated using the tolerance values displayed in Table 20. A comparison between the current distribution and the conditions which would be expected under unharvested conditions demonstrates that more habitat currently falls below the 30% tolerance level for ≥10" snags than would be expected under unharvested conditions (42% vs. 31%). For the 30% tolerance level and above, current conditions offer less assurance than would be expected under unharvested conditions with current structure class distributions for ≥10" snags (51% vs. 68%).

A similar trend also occurs in the ≥20" size class: more habitat falls below the 30% tolerance level than would be expected under unharvested conditions (78% vs. 65%), and less habitat currently supports assurance above the 30% tolerance level than would be expected under unharvested conditions (21% vs. 35%), though the disparity observed between data sets is somewhat less severe within this size class.

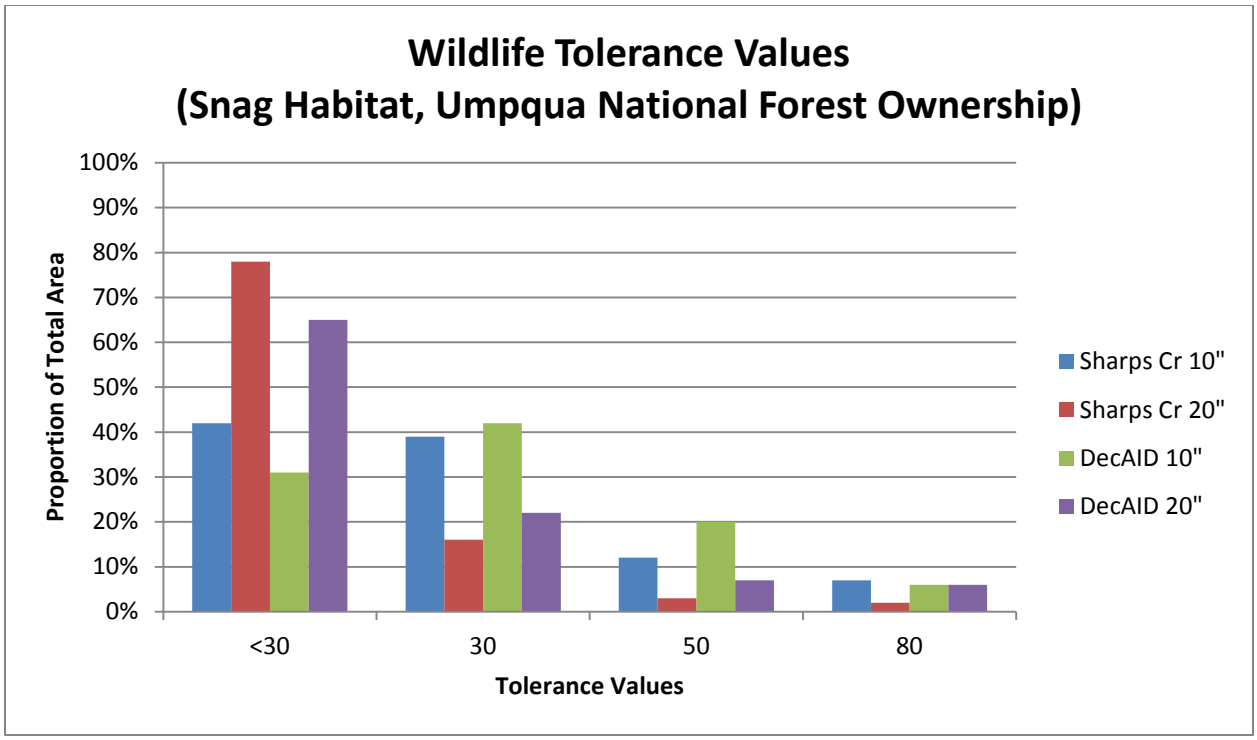

Figure 25. Distribution of Tolerance Levels for Wildlife Snag Habitat in the Umpqua National Forest Ownership of the Sharps Creek Watershed.

Figure 26 displays the comparisons of weighted distribution of tolerance levels as a proportion of the total habitat within the Sharps Creek watershed and what would be expected under approximated "natural" conditions (according to the data presented in DecAID by Mellen-McLean et al.[2012]) weighted for the distribution of structure classes that currently exist within the watershed. These distributions were calculated using the tolerance values displayed in Table 21. A comparison between the current tolerance level distribution and the tolerance level distribution which would be expected under unharvested conditions demonstrates some disparities between values. More habitat currently falls short of providing assurances at or above the 30% tolerance level compared to what would be expected under unharvested conditions (80% vs. 65%). For the 30% tolerance level and above, current conditions offer less assurance than would be expected under unharvested conditions with current structure class distributions for down wood percent cover (20% vs. 33%).

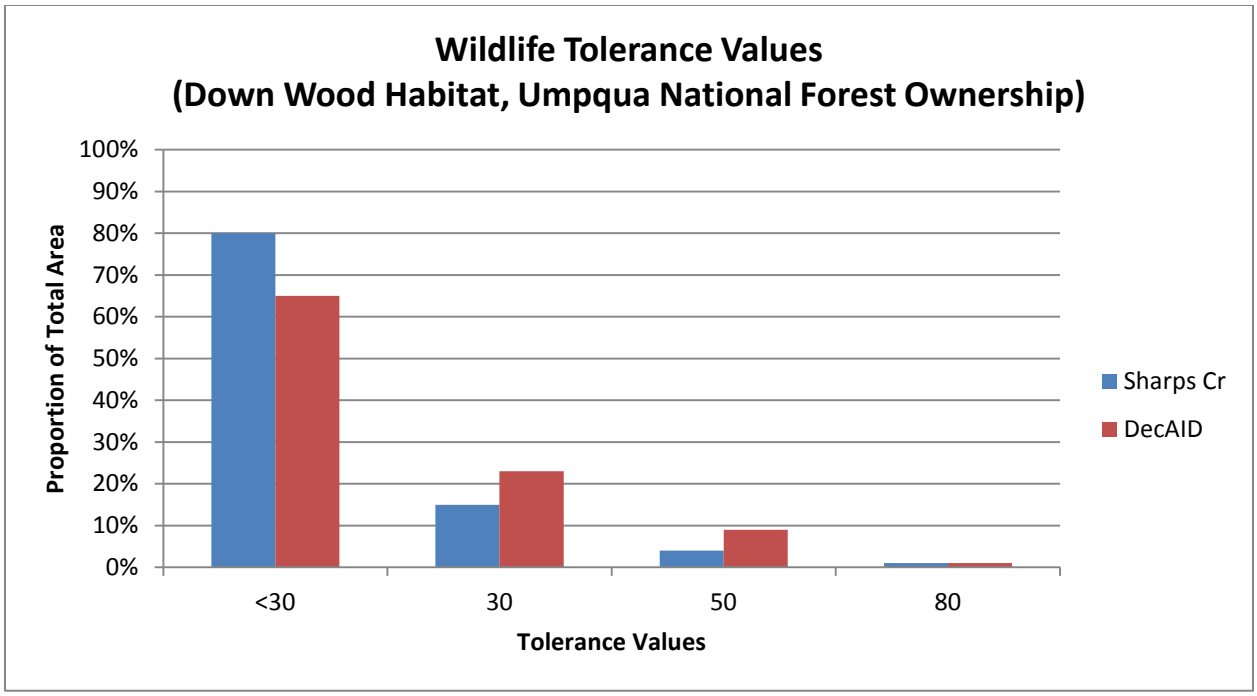

Figure 26. Wildlife Tolerance Level Distribution of ≥4.9" Diameter Down Wood in the Umpqua National Forest Ownership of the Sharps Creek Watershed.

Summary of Current Condition Analysis

According to the analysis, the distribution of down wood and snags within the District more closely resembles what would likely occur under "natural" conditions than the distribution which occurs outside of the district. It is important to note that this does not mean that current conditions represent what would occur naturally. Because of activities like timber harvest and fire suppression, the distribution of habitat types across the landscape are not likely what would occur under natural conditions, and are not what existed historically. Instead, by being similar to expected natural conditions, the current landscape within the district boundary closely represents what is present (on average) in inventory plots on unharvested landscapes, but within the distribution of habitat types currently present on the landscape.

There is, however, a general trend which emerges in the distribution analyses and the tolerance level analyses which suggests that there is a general excess of land, both within the watershed as a whole and within the District's portion of the watershed, which is devoid of snags or has snags in low density. Because of this excess, it is in the interest of snag associated wildlife to take action to ensure that placing more land into this category is avoided or minimized. The analysis also revealed a general shortage of land with high snag densities. With this finding in mind, it is generally desirable to retain areas of high snag density to the extent possible to avoid losing these high value habitats.

DIRECT AND INDIRECT EFFECTS

The direct and indirect effects to CWD are analyzed at two scales: 1) within the stands being harvested (stand-scale), and 2) within the landscape of the Sharps Creek watershed. 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 timber harvesting and post-harvest fuel reduction treatments.

Alternatives 2 and 3 cause a decrease in stand levels of snags and down wood because of incidental falling of snags for logging or safety reasons, and by consumption of down wood during the fuels reduction treatments. Harvest treatments would reduce the amount of suppression mortality within the treated portions of stands (1,026 acres for Alternative 2, 850 acres for Alternative 3), indirectly affecting future recruitment of CWD. Existing snags and logs would be protected to the extent practical and safe. However, it is probable that Alternatives 2 and 3 would lower levels of these structures (by approximately 3 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 mortality caused by fuels treatments and potentially damaged from harvest operations within the harvest units during and after treatment. All trees damaged during harvest operations, such as intermediate support trees or line damaged trees, would be retained to moderate the decreased rate of snags caused by thinning activities.

The stand level modeling was conducted in FVS (USDA 2014) and used stand exam data from representative stands selected from the proposed thinning units. Units from both managed and fire-regenerated stands were modeled for effects analysis. The figures below depicting effects to snags and down wood over time show the range between the 30% to 80% wildlife tolerance levels for wildlife as grey shading, and the 50% tolerance level as a grey horizontal line. Refer to Table 20 and Table 21 for wildlife tolerance level values.

Managed Stands

The baseline snags per acre (snags ≥10” DBH) averages 10 in the proposed managed units. With roughly three snags per acre being lost to mechanical disturbance, and roughly three snags per acre being created as a result of the fuels treatment and harvest activities and an additional three snags per acre created from girdling, the estimated post treatment snag density would be 13 snags per acre in managed stands. This would place the stand as a whole in between the 30% and 50% tolerance levels identified by Mellen-McLean et al. (2012). The changes to levels of snags and down wood at the stand-scale in managed stands are shown in Figure 27, Figure 28, and Figure 29. These charts show how the alternatives would change CWD trajectories over the next 100 years using the latest models, and include the creation of three snags per acre post-treatment.

Under Alternative 1, ≥10”dbh snag densities would continue to increase for the next 50-60 years as trees within the stand compete with each other for resources, and then begin to decline as suppression mortality would decrease and as standing snags would decay out of the system (Figure 27). Under Alternatives 2 and 3, levels of snags ≥10 inches are not predicted to drop below the 30% tolerance level as advised in DecAID for the next 100 years, eventually reaching the 50% tolerance level.

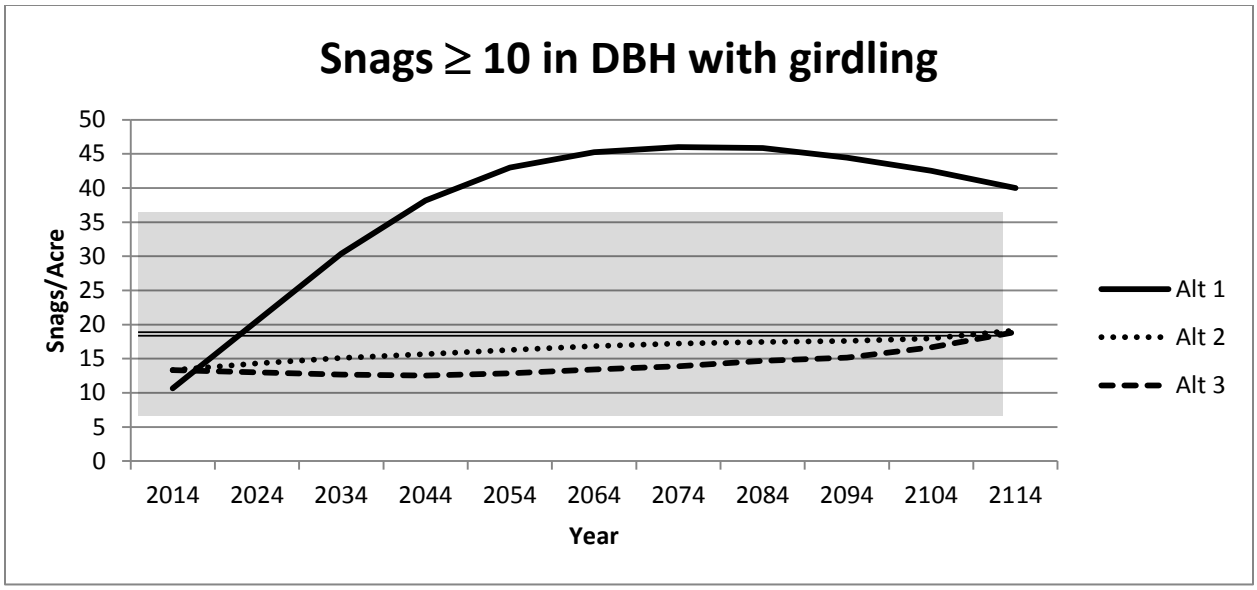

Figure 27. Changes Over Time to > 10" dbh Snags in Managed Stands[10]

Because of the young age of the managed stands, large snag (≥20" dbh) densities are currently very low; around 0.7 snags per acre. This is well below the 6 snags per acre needed to provide habitat at the 30% tolerance level. Under all alternatives large snags would continue to accumulate, eventually reaching the 30% tolerance level in 60-70 years (Figure 28). Snag densities under Alternative 1 would likely approach the 50% tolerance level after 100 years, while Alternatives 2 and 3 would provide slightly lower snag densities and would likely end up providing habitat somewhere between the 30% and 50% tolerance levels.

[10] In Figures 28-33, the range of the 30% to 80% wildlife tolerance levels for wildlife are shown as grey shading, and the 50% tolerance level is shown as a double-horizontal line. Figures for ≥10 inch dbh snag sizes include snag creation; starting snag densities of Alternatives 2 and 3 are higher than Alternative 1 because created snags increase snag densities.

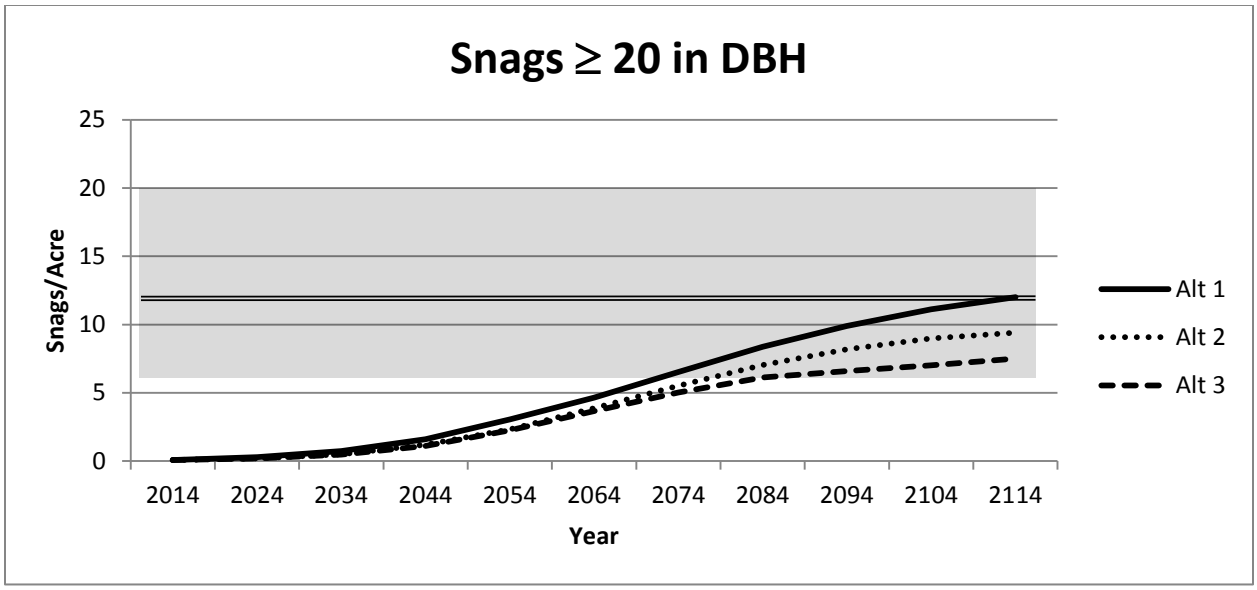

Figure 28. Changes Over Time to > 20" dbh Snags in Managed Stands

Downed wood cover is expected to decline initially in managed stands for all Alternatives before assuming an upward trajectory sometime in the next 25-50 years (Figure 29). Alternative 1 would maintain stand-level coverage of down wood over the 30% tolerance level, and would eventually reach the 50% tolerance level. Alternatives 2 and 3 would result in lower levels of down wood over time eventually reaching the 30% tolerance level after 100 years.

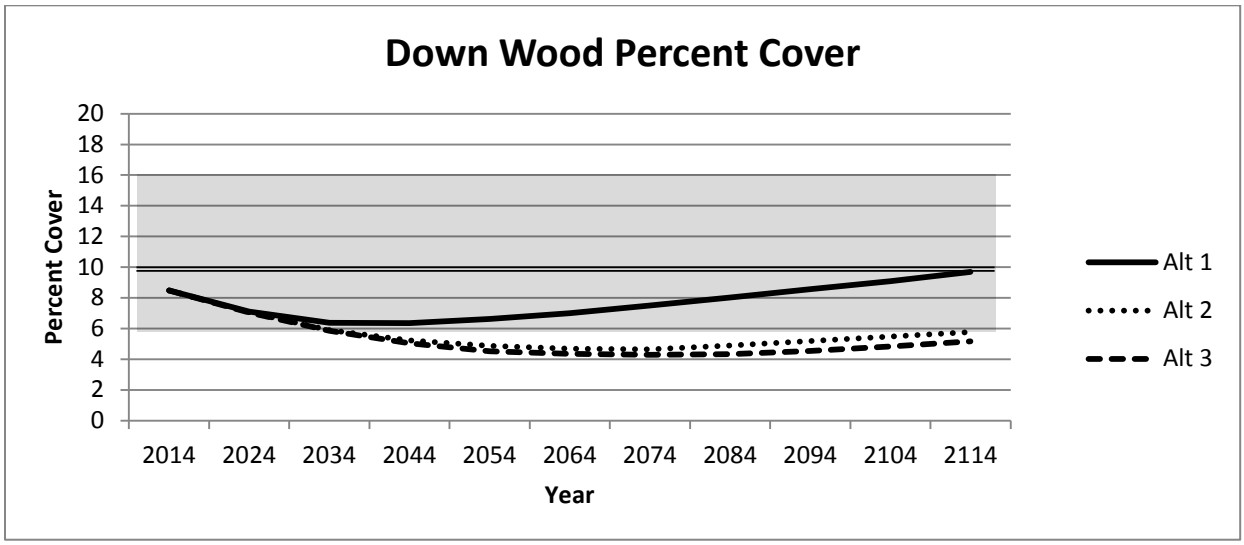

Figure 29. Changes Over Time to > 6" Diameter Down Wood in Managed Stands

Fire Regenerated Stands

The baseline snags per acre (snags ≥10" DBH) averages 15 in the proposed fire regenerated units. With roughly three snags per acre being lost to mechanical disturbance, and roughly three snags per acre being created as a result of the fuels treatment and harvest activities and an additional three snags per acre created from girdling, the estimated post treatment snag

density would be 18 snags per acre in fire regenerated stands[11]. This would place the stands on average, at or near the 50% tolerance level identified by Mellen-McLean et al. (2012). The changes to densities of snags and down wood at the stand-scale in fire regenerated stands are shown in Figure 30, Figure 31, and Figure 32. These charts show how the alternatives would change CWD trajectories over the next 100 years using the latest models, and include the creation of three snags per acre post-treatment.

Note that the baseline figure of 15 snags per acre does not match with the average snag density below in Figure 30, which is around 5 snags per acre. This is because there is a high degree of variation in the snag densities present in fire regenerated stands (ranging from 1 snag per acre to 66 snags per acre based on stand exam data). The figures below depict data from representative stands which were chosen because they represented the average conditions of size and densities of live trees, rather than standing dead trees, present in fire regenerated stands. These stands are still considered representative for coarse woody debris dynamics over time because these trajectories are based on expected suppression mortality, which is a function of competition caused by tree density.

Under Alternative 1 snag densities would continue to increase for the next 50-60 years as trees within the stand compete with each other for resources, and then begin to decline as suppression mortality would decrease and as existing snags would decay out of the system. Under Alternatives 2 and 3, average densities of snags ≥10 inches are not predicted to drop below the 30% tolerance level as advised in DecAID for the next 100 years (Figure 30). Over the next 100 years, the snag densities would begin to increase in the larger diameter class with a reduction in smaller diameter snags. Under Alternatives 2 and 3 average densities of snags ≥10” would likely begin to approach the 50% tolerance level within 60-70 years.

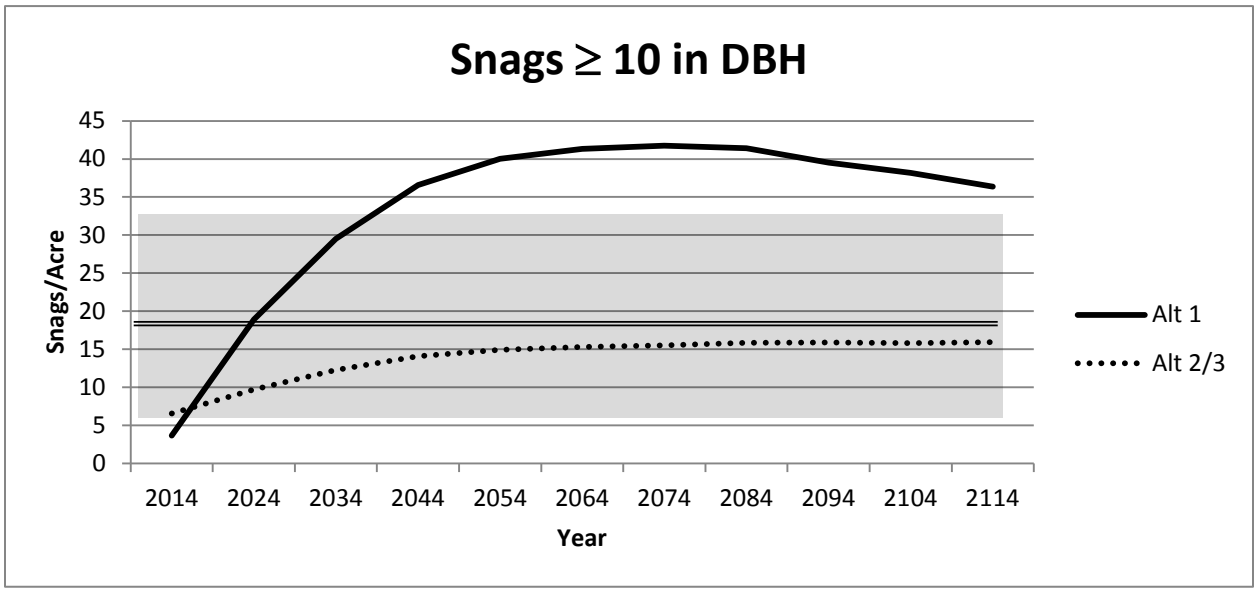

Figure 30. Changes Over Time to > 10" dbh Snags in Fire Regenerated Stands.

The current average large snag (≥20” dbh) density in modeled fire regenerated stands is around 3 snags per acre, likely due to the disturbance regime experienced in the region. This is well

[11] Figures below show fewer than 18 snags per acre. This is because modeling was conducted with representative stand data, while 18 snags per acre is the projected overall average density across all fire regenerated stands proposed for thinning.

below the 6 snags per acre needed to provide habitat at the 30% tolerance level. Under all alternatives large snags would continue to accumulate, eventually reaching the 30% tolerance level in 10-20 years (Figure 31). Snag densities under Alternative 1 would likely approach the 50% tolerance level after 30 years, while Alternatives 2 and 3 would provide slightly lower snag densities over all, but would still provide habitat above the 50% tolerance level after approximately 50 years.

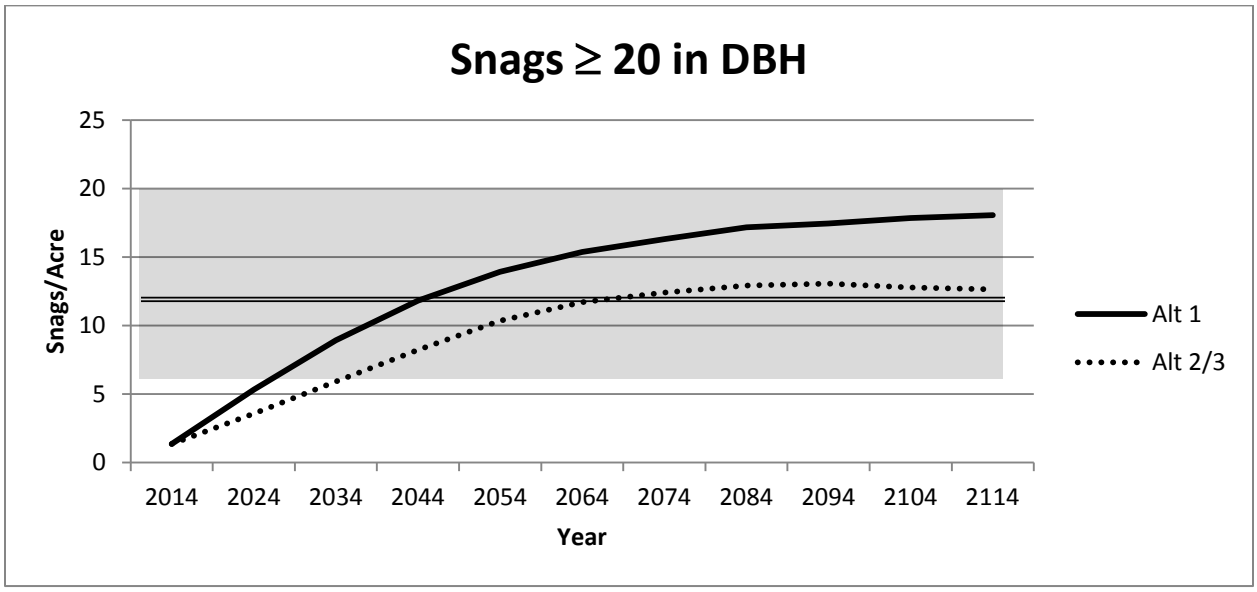

Figure 31. Changes Over Time to > 20" dbh Snags in Fire Regenerated Stands

Downed wood cover is expected to decline initially in fire regenerated stands for all Alternatives before assuming an upward trajectory sometime in the next 20-50 years (Figure 32). Alternative 1 would eventually offer stand-level coverage of down wood over the 50% tolerance level. Alternatives 2 and 3 would result in lower levels of down wood over time, ending up between the 30% and 50% tolerance levels.

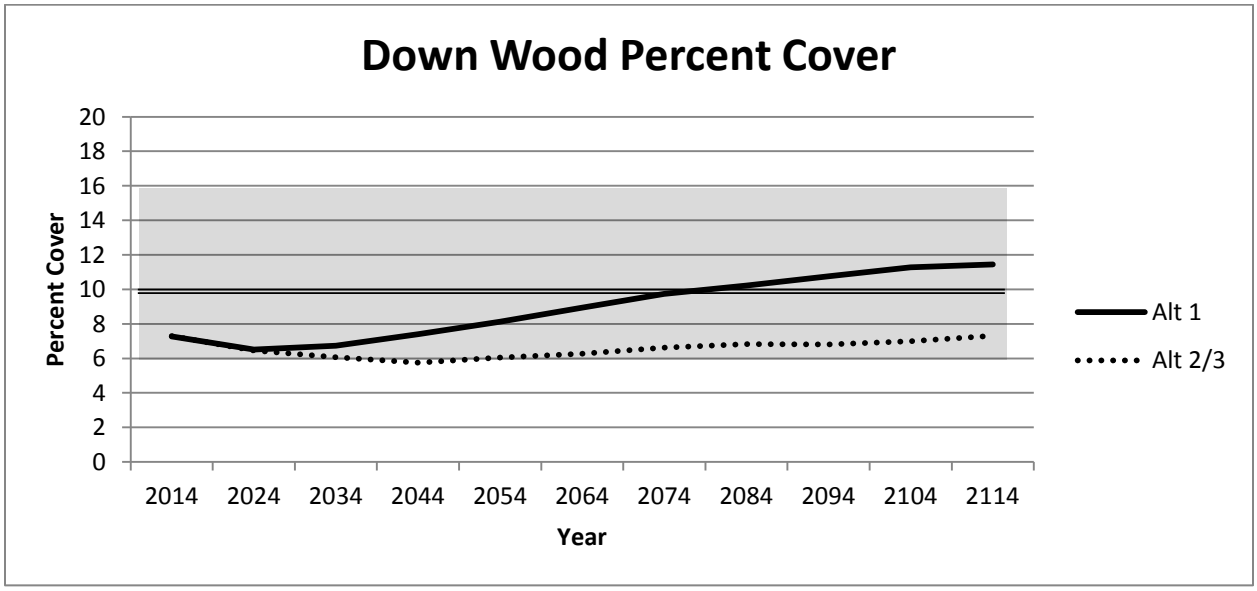

Figure 32. Changes Over Time to > 6" Diameter Down Wood in Fire Regenerated Stands

Strategic Roadside Fuel Treatments

The non-commercial roadside fuel treatments include brushing, pruning, and felling of some small trees (less than 10" dbh) to create fuel breaks along ridge-top roads in strategic locations throughout the project area; a total of 374 acres. Snags within close proximity to the road (within 66 feet) may be removed to maintain fuel break continuity/effectiveness and to provide for firefighter safety. Overall these activities may reduce the recruitment of large snags and down wood within these treatment areas over time, though to a much lesser extent than is expected in the commercial stands because prescribed treatment is less intense.

CUMULATIVE EFFECTS

Substantial adverse effects to levels of CWD at both the stand and landscape-scale have resulted from past clear cut timber harvesting, road building, roadside salvage and fire exclusion. At the landscape scale the available data show an overabundance of land area with no snags or insufficient down wood, and a deficit of land area with high snag densities and down wood. It would take several decades to restore snags to within the ranges advised for in DecAID for these two conditions throughout the watershed. Alternative 1 would cause the potential commercial thin units to continue on the current trajectory of coarse wood accumulation. Alternatives 2 and 3 do not add to this cumulative deficiency in snag and down wood habitat because the post treatment coarse wood trajectories offer habitat which is spread throughout the 30% to 80% tolerance value range. Reasonably foreseeable actions include the Calapooya Divide Project, which is projected to be similar to the Quartz project in scope and in the types of habitat affected (approximately 1,200 acres in similar stand conditions). It is likely that the impacts to coarse wood resulting from the Calapooya Divide Project will be similar to the impacts described for the Quartz project. Another reasonably foreseeable action is clear cut timber harvesting which is likely to occur on private lands within the watershed. It is likely that these private timber harvests will affect 150 acres per year on average, depending on market prices. These private harvests would likely maintain the low coarse wood levels currently present in their portion of the watershed. At the landscape-scale, including past, current and future projects Alternatives 2 and 3 do not add to the cumulative loss of snags or down wood because, overall, the commercial thinning activities are expected to remove land area from the CWD density categories identified above as being in overabundance toward conditions which have been identified as being in deficit.

CONCLUSION

After considering the direct, indirect, and cumulative effects on the existing coarse wood conditions, it is likely that some negative effects will result from all alternatives. Alternatives 2 and 3 would result in lower amounts of coarse wood than would be expected to occur under Alternative 1. However, the high density of coarse wood that would be expected under Alternative 1 would result in conditions which would continue to contribute to the high risk of large fire which is present in the project area, so a reduction in the amount of coarse wood is not an altogether undesirable effect. When considering the scale of the proposed treatments, the potential effects are minimal with respect to the watershed (2% of the land area) or even to the portion of the watershed within the District's boundary (5-6% of the land area, depending on the Alternative). In terms of providing adequate habitat, Alternatives 2 and 3 are likely to provide coarse wood habitat at various tolerance levels within treated stands, with stands maintaining moderate tolerance levels overall. The exception is down wood in managed stands, which would take some time to reach the 30% tolerance level and would be providing low quality down wood habitat in the interim. These negative effects at the stand level are balanced against the improved diversity and structural conditions which would occur as a result of Alternatives 2 and

3 which would eventually begin to contribute to down wood accumulation as suppression mortality resumes. To assist in providing habitat in the interim, up to 7 trees per acre would be felled in managed stands if funds and other resources allow, to function as down wood habitat. This would have a potentially small effect (increasing the down wood cover by about one percent) but would offer some moderate sized down wood structure to persist in the system as old down wood decays out. In terms of meeting standards and guidelines, all Alternatives more than meet the biological population potential minimums of 0.04 to 1.15 snags per acre required in the Umpqua NF LRMP (Table 27).

AQUATIC CONSERVATION STRATEGY

The use of DecAID to assess relation to the watershed existing condition and reference ranges for CWD is consistent with the Aquatic Conservation Strategy of restoring structural and plant and wildlife species diversity. The Quartz project would manage approximately 6-7% (Alternatives 3 and 2 respectively) of the Riparian Reserves in the project area within managed stands to move ACS toward restoration at the landscape scale. The harvest in outer portions of Riparian Reserves would occur for the purpose of restoration of stand complexity and species diversity as well as large tree and snag development to achieve the intent of the ACS objectives #1, #8 and #9 of Aquatic Conservation Strategy (USDA/USDI 1994, p. B-11); therefore, proposed activities under both Alternatives 2 and 3 are consistent with Aquatic Conservation Strategy.

FOREST WILDLIFE

MIGRATORY BIRD TREATY ACT AND LANDBIRD ANALYSIS

SUMMARY OF EFFECTS

Alternative 1 would result in no effects to migratory birds. Alternatives 2 and 3 would potentially disturb some species of migratory birds in and around treated stands during the nesting season. This would not result in meaningful negative impacts to migratory birds because of the small scale, both spatially and temporally, of this project. Alternatives 2 and 3 are consistent with the Migratory Bird Treaty Act, Executive Order 13186, and the Forest Service and USFWS MOU to strengthen migratory bird conservation on Forest Service lands.

Federal land management agencies are required by treaty and executive order to consider the effects of their land management activities on a variety of bird species. The following describes the relevant legislation and policy, as well as the potential effects to landbirds.

The Migratory Bird Treaty Act of 1918 (MBTA)

Implements various treaties and conventions between the U.S., Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the act, it is unlawful to pursue, hunt, take, capture (or kill) a migratory bird except as permitted by regulation (16 U.S.C. 703-704). The regulations at 50 CFR 21.11 prohibit the take, possession, import, export, transport, sale, purchase, barter, or offering of these activities, or possessing migratory birds, including nests and eggs, except under a valid permit or as permitted in the implementing regulations

(Director's Order No. 131). A migratory bird is any species or family of birds that live, reproduce or migrate within or across international borders at some point during their annual life cycle.

The U.S. Fish and Wildlife Service (FWS) is the lead federal agency for managing and conserving migratory birds in the United States; however, under Executive Order (EO) 13186 all other federal agencies are charged with the conservation and protection of migratory birds and the habitats on which they depend. In response to this order, the Forest Service has implemented management guidelines that direct migratory birds to be addressed in the NEPA process when actions have the potential to negatively or positively affect migratory bird species of concern.

Executive Order 13186 (66 Fed. Reg. 3853, January 17, 2001)

"Responsibilities of Federal Agencies to Protect Migratory Birds"

Presidential Executive Order (EO) 13186 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 landbird conservation plans into forest planning. The species listed in Table 23 are the focal species described in the USFS Landbird Strategic Plan that are suspected to occur within the Sharps Creek watershed. Their preferred habitat attributes and forest condition are shown.

Forest Service & FWS Memorandum of Understanding (MOU)

The purpose of this MOU is, "to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds through enhanced collaboration between the Parties, in coordination with State, Tribal, and local governments." Under the MOU the Forest Service shall*:*

Address the conservation of migratory bird habitat and populations when developing, amending, or revising management plans for national forests and grasslands, consistent with NFMA, ESA, and other authorities listed above. When developing the list of species to be considered in the planning process, consult the current (updated every 5 years) FWS Birds of Conservation Concern, 2008 (BCC), State lists, and comprehensive planning efforts for migratory birds. Within the NEPA process, evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors. To the extent practicable:

a. Evaluate and balance long-term benefits of projects against any short- or long-term adverse effects when analyzing, disclosing, and mitigating the effects of actions.

b. Pursue opportunities to restore or enhance the composition, structure, and juxtaposition of migratory bird habitats in the project area.

c. Consider approaches, to the extent practicable, for identifying and minimizing take that is incidental to otherwise lawful activities, including such approaches as:

1. Altering the season of activities to minimize disturbances during the breeding season;

2. Retaining snags for nesting structures where snags are underrepresented;

3. Retaining the integrity of breeding sites, especially those with long histories of use and;

4. Giving due consideration to key wintering areas, migration routes, and stop-over habitats.

5. Minimizing or preventing the pollution or detrimental alteration of the environments utilized by migratory birds whenever practical by assessing information on environmental contaminants and other stressors relevant to migratory bird conservation.

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. This Executive Order directs federal agencies to avoid or minimize the negative impact of their actions on migratory birds, and to take active steps to protect birds and their habitat. This Executive Order also requires federal agencies to develop Memorandum of Understandings (MOU) with the FWS to conserve birds including taking steps to restore and enhance habitat, prevent or abate pollution affecting birds, and incorporating migratory bird conservation into agency planning processes whenever possible. The Forest Service has completed, and are currently implementing, their MOU's with the USFWS. The Current MOU remains valid until December 8th 2015.

Partners in Flight (PIF) Bird Conservation Regions (BCR'S)

Bird Conservation Regions (BCRs) are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. BCR's are a hierarchical framework of nested ecological units delineated by the Commission for Environmental Cooperation (CEC). The CEC framework comprises a hierarchy of 4 levels of eco-regions. At each spatial level, spatial resolution increases and eco-regions encompass areas that are progressively more similar in their biotic (e.g., plant and wildlife) and abiotic (e.g., soils, drainage patterns, temperature, and annual precipitation) characteristics. The Umpqua falls within BCR 5 (Northern Pacific Forest) and the BCR 5 species which occur on the Umpqua, along with their habitats, are displayed in Table 22. Most of the species of conservation concern utilize habitat which is not present within the areas which may be affected by Alternatives 2 and 3. Species which prefer habitat which may be impacted are also identified in Table 22.

Table 22. Birds of Conservation Concern in the BCR 5, Northern Pacific Rain Forest.

Bird Species	Preferred Habitat	Preferred Habitat Potentially Effected?
Black Swift[1]	Nests on ledges or shallow caves in steep rock faces and canyons, usually near or behind waterfalls and sea caves. Forage over forests and open areas in montane habitats.	No
Rufous Hummingbird[1]	Found in a variety of habitats, most likely in brushy areas with flowers and forests with a well-developed understory.	Yes
Allen's Hummingbird	Found in narrow, moist coastal fog zones in open areas of coastal scrub. Nest in nearby wooded areas.	No
Olive-sided Flycatcher[1]	Open conifer forests (< 40 % canopy cover) and edge habitats where standing snags and scattered tall trees remain after a disturbance.	No
Willow Flycatcher (non listed subspecies)	Associated with riparian shrub dominated habitats, especially brushy/willow thickets. In SE WA also found in xeric brushy uplands.	Yes

Bird Species	Preferred Habitat	Preferred Habitat Potentially Effected?
Horned Lark (*Strigata* ssp.) (ESA candidate)	Open fields with short herb dominated ground cover < 31 cm tall and patches of bare ground.	No
Oregon Vesper Sparrow (*Affinis* ssp.)	Lightly grazed pastures with scattered shrubs and grass height < 30-60 cm) high	No
Western Grebe (nb)	Marshes with open water and on lakes and reservoirs supporting emergent vegetation.	No
Bald Eagle (delisted species)	Associated with large bodies of water, forested areas near the ocean, along rivers, and at estuaries, lakes and reservoirs.	No
Northern Goshawk	A habitat generalist that prefers to nest in mature forests with large trees on moderate slopes with open understories.	No
Peregrine Falcon (delisted species)	Wide range of habitats, nests on cliff ledges, bridges, quarries.	No
Lesser Yellowlegs (nb)	Migrates through east of the Cascade crest. A wader of shallow pools often found near mudflats on seasonally flooded fields and small isolated ponds.	No

nb= non breeding within this BCR, [1]species are also focal species identified in Altman and Alexander 2012.

The Habitat Conservation for Landbirds in the Coniferous Forests of Western Oregon and Washington list of focal species (Altman and Alexander 2012) and BCC species list for the project area was reviewed. Those species and habitats that are within the project area are incorporated and effects disclosed in this analysis. Table 23 displays a list of focal landbird species identified in the 2012 PIF habitat conservation plan on the Umpqua National Forest that are known or likely to be present in the Planning Area and could be affected by the proposed actions.

Table 23. Landbirds Identified as Focal Species by the Partners in Flight[1]

Forest Stage	Habitat Attribute	Focal Species
Old-Growth/Mature Forest (Multi-Layered/Late-Successional)	Large snags	Pileated Woodpecker
	Large trees	Brown Creeper
	Deciduous canopy/sub-canopy trees	Pacific-slope Flycatcher
	Mid-story tree layers	Varied Thrush
Mature/Young Forest (Multi-Layered/Understory Reinitiating)	Closed canopy	Hermit Warbler
	Open mid-story	Hammond's Flycatcher
	Deciduous understory	Wilson's Warbler
	Forest floor complexity	Winter Wren (Pacific Wren)

Forest Stage	Habitat Attribute	Focal Species
Young/Pole Forest (Understory Reinitiating/Stem Exclusion)	Deciduous canopy trees	Black-throated Gray Warbler
Sapling/Seedling Forest (Stand Initiation/Early Successional)	Residual canopy trees	Olive-sided Flycatcher
	Snags	Northern Flicker
	Deciduous shrub layer	Orange-crowned Warbler
Unique Forest Habitats or Conditions	Mineral springs	Band-tailed Pigeon
	Wet meadows	Lincoln's Sparrow
	Alpine grasslands	American Pipit
	Waterfalls	Black Swift
	Nectar-producing plants	Rufous Hummingbird
	Large hollow snags	Vaux's Swift
	Landscape mosaic forest	Blue (Sooty) Grouse
Klamath Mountains Mixed Conifer/Mixed Conifer-Hardwood Forests	Pine-oak canopy/subcanopy trees	Purple Finch
	Dense shrub understory	Nashville Warbler
	Shrub-herb interspersion understory	Hermit Thrush
	Forest canopy edges	Western Tanager
	Montane brush fields	Fox Sparrow
	Post-wildfire	Lazuli Bunting

[1](Altman and Alexander 2012)

EXISTING CONDITIONS

The scope for analyzing effects to landbirds is at the Sharps Creek watershed scale. There are two North American 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 20 miles north of the Sharps Creek watershed and has been monitored since 1968. The Warner Mountain BBS Route (69219), which is located about 15 miles to the east, has been monitored annually since 1992.

The 2012 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 and Mature Forest - closed canopy".

The conservation strategy identifies one focal bird species for the young/pole forest type: the black-throated gray warbler. The hermit warbler, Hammond's flycatcher, Wilson's warbler, and winter wren (Local populations were reclassified to Pacific wren in 2010) are focal species for the mature/younger forest, closed-canopy habitat type (Table 23). Data from the BBS are available from Sauer et al. (2014). Monitoring data from the local BBS routes, as well as long-term (1966-2011) and short-term (2001-2011) population trends for the region (BCR5) are displayed in Table 24. The data displayed at the route level is only to show general local trends;

the percent changes displayed for all species (except for the black-throated gray warbler on the Winberry Route) are not statistically different from 0 at the route level. Regional level (BCR 5) data displayed are more reliable, categorized as a reliability level of “Blue” (moderate reliability) by Sauer et al. (2014).

Table 24. Population Trend Data for Focal Species[1]

Population Trend (Percent Change) in Focal Bird Species				
	Winberry	Warner Mt.	Regional	
Species	1968-2011	1992-2011	1966-2011	2001-2011
Black-throated gray warbler	5.3	4.3	-1.4	0
Hammond's flycatcher	0.38	4.07	3.7	3.7
Hermit warbler	5.92	-0.77	-0.1	-0.7
Wilson's warbler	2.48	-2.53	-2	-1.9
Winter wren (Pacific wren)	0.52	-2.2	-1.2	-6.6

[1](Altman and Alexander 2012)

DIRECT AND INDIRECT EFFECTS

The direct (short-term) and indirect (long-term) effects to land birds were analyzed at the Sharps Creek watershed scale. Alternative 1 would have no direct effects to land birds because no thinning or fuels treatments, or other habitat modifying activities would occur. Timber harvest, fuels treatments and temporary road construction associated with Alternatives 2 and 3 would change landbird habitat within and adjacent to proposed harvest units. Alternative 2 would thin 1026 acres of young/pole forest and mature/young forest (as described in Altman and Alexander 2012). 1/10 acre gaps would be created around sugar pines in stands which they occur. Alternative 3 would thin 850 acres and would include the same sugar pine gaps, and would include ¼ gaps in previously managed units.

There are potential beneficial indirect effects for a variety of landbirds associated with Alternatives 2 and 3. Thinning and gap creation would open up the forest canopy and result in an increase in the deciduous tree and shrub component, as well as ground vegetation. Insects that comprise a large component of the landbird prey base would respond favorably to these conditions. Recent studies are leading research scientists to conclude that commercial thinning in dense, young Douglas-fir stands can increase diversity of breeding songbirds (Hagar et al. 2004, Hayes et al. 2003). Pileated woodpeckers, Wilson’s warblers and Hammond’s flycatchers can benefit from the increased habitat heterogeneity that would result from thinning. A variety of thinning intensities and patterns, ranging from no thinning to widely spaced residual trees, is recommended to maximize bird diversity at the landscape scale and structural diversity both within and among stands (Hagar et al. 2004). Reducing crown density and creating small openings in dense stands may maintain suitable habitat for the dusky flycatcher (Marshall et al. 2003). The proposed ¼ acre openings in Alternative 3 (totaling 28 acres) would provide temporary early seral habitat for species such as orange-crowned warbler, mountain quail and Rufous hummingbirds at the small scale**.** Other species like brown creepers and Pacific wrens

would likely respond negatively due to increased habitat fragmentation and forest floor disturbance (Vanderwel et al. 2007). Riparian buffers and the protection of unique habitats would limit effects to Pacific-slope flycatchers and varied thrush. Other recommended actions that would benefit landbirds:

- 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.
- All trees damaged during harvest operation, such as intermediate support trees or line damaged trees, would be retained to mitigate the decreased rate of snag recruitment caused by thinning and harvest activities.
- To reduce effects to nesting landbirds, burning of hand piles and machine piles would occur in the fall/winter months.
- Apply 60 foot no-cut buffers to all perennial streams, except for 180 foot buffers in fire regenerated stands.
- 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.
- Retain existing hardwood trees to the extent practical.

For the focal species associated with stem exclusion forest types (black-throated gray warblers), proposed activities would reduce habitat quality in the short-term within treated stands. Hayes et al. (2003) and Hagar et al. (2004) found that thinning young Douglas-fir in western Oregon caused localized declines in black-throated gray warblers and Hutton's vireo over 5 years, but did not cause extirpations.

The stands proposed for treatment are even-aged Douglas-fir trees, generally single-layered and closed-canopy with little 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.). This species can be highly associated with this forest condition if there are deciduous canopy trees and deciduous subcanopy/understory shrubs present. It is most abundant in young (40-80 years) stands with broadleaf trees (Gilbert and Allwine 1991) and in Douglas-fir/oak dominated forests at the interface of the Willamette Valley and Oregon Coast Range, with areas of relatively high oak cover (Morrison 1982).

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 cover by maintaining some areas with high canopy cover (e.g., riparian no-cut buffers).

Hagar et al. (2004) have recorded declines (but not extirpations) in black-throated gray warblers after commercial thinning. Therefore, it is assumed that Alternatives 2 and 3 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 cover 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 lessen the short-term impact, deciduous hardwood trees would be retained where feasible. Given that between approximately 24% and 28% (depending on the alternative) of the acreage within proposed harvest units would remain

untreated under Alternatives 2 and 3, and that the habitat type likely to impacted is common across the watershed, potential short-term effects to habitat for the black-throated gray warblers are considered to be minor and inconsequential to the species.

Direct Effects from Disturbance

For Alternatives 2 and 3 timber harvest, temporary road construction or reconstruction, and fuels treatments that would occur in the spring represent a potential direct impact to nesting landbirds from disturbance and potential for loss of nest structures and young that have not fledged. Direct effects from logging activity on nesting birds may cause some localized disruption of nesting on 1,026 acres (Alternative 2) or 850 acres (Alternative 3) for one or more breeding seasons. Additionally, fuels treatment such as understory jack-pot burning (burning concentration of harvest slash material) would occur in late spring and may cause disruption of nesting on approximately 522 acres within harvest units and 374 acres within non-commercial roadside treatments. Other short term (one or two days at a site) disturbance activities associated with Alternatives 2 and 3 that would temporarily displace individuals or their prey include creating slash piles, road maintenance and road reconstruction, rock pit use, and the similar and connected actions listed in Chapter Two for Alternatives 2 and 3.

These direct effects would be reduced through a variety of project design features. Burning of slash piles would be prioritized for the fall and winter rather than during the spring breeding season, limiting potential direct effects to landbirds. Due to the limited magnitude, spatial and temporal distribution of the effects and the abundance of non-impacted habitats (1,109 acres or 97%) in the watershed area, potential effects are not considered consequential to these species. Alternative 2 would thin 176 more acres than Alternative 3, but this is considered inconsequential at the watershed scale, so the differences between the two alternatives are not considered to be meaningful. The number of individuals or species potentially affected by proposed activities is unknown and is considered unquantifiable without reliable survey data and a known or 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. In the privately-owned portion of the watershed there has been a large amount of clearcut harvesting, which has led to large amounts of early successional forest types in the lower portions of the watershed. This forest management on private industry lands would continue to clearcut an estimated 150 acres per year, which would function to provide habitat for younger forest associated species and grass/forbs/shrub associated species. There is one foreseeable future timber sale project in the Sharps Creek watershed (the Calapooya Divide Project) that would affect landbird habitat on federal land similar to this project in scale and effect. Alternatives 2 and 3 would cumulatively add to those potential acres and expected effects. The direct and indirect effects of Alternatives 2 and 3 are consistent with landbird conservation management strategies and would potentially improve habitat conditions on previously managed stands. Thus, when considered in the context of past, present, and foreseeable actions, it is determined that there are no consequential cumulative effects associated with Alternatives 2 and 3. Alternative 1 would cause no direct or indirect effects to landbirds and thus, no cumulative effects.

MANAGEMENT INDICATOR SPECIES

The Umpqua National Forest Land and Resource Management Plan (LRMP) (USDA 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 (Table 25). 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. Roosevelt elk and the black-tailed deer represent big game winter range. The bald eagle and peregrine falcon are sensitive species that require special management. However, they do not nest within the planning area and this project does not affect their habitat; therefore, they are not discussed further. The planning area is located in the lower elevations of Douglas-fir and western hemlock forest. Pine marten occur in the higher elevations with true-fir, mountain hemlock, and lodgepole pine forest types; therefore, because their habitat is not affected by this project, the pine marten are not discussed further.

Table 25. Management Indicator Species (MIS)

Species	Habitat Indicator	Unit Of Measure	Species/Habitat Present in Panning Area
Northern Spotted Owl	Mature/Old Growth Habitat	Acres Occupied	Yes
Black-tail Deer and Roosevelt Elk	Big Game Winter Range	Numbers	Yes
Bald Eagle	None/Special Management	Sightings	No
Peregrine Falcon	None/Special Management	Active Nest	No
Pileated Woodpecker	Mature/Old Growth Habitat	Acres	Yes
Pine Marten	Mountain Hemlock and Lodgepole Pine Habitat	Acres	No
Primary Cavity Excavators	Snag Habitat	Acres and Percent of Snags	Yes

Throughout further analysis of Management Indicator Species, historical and current Forest-wide baseline values are obtained from the Management Indicator Species on the Umpqua National Forest habitat assessment 2012 (MIS Habitat Assessment) document (Chapman 2012) prepared by the forest wildlife biologist. This document is incorporated into this analysis by reference.

NORTHERN SPOTTED OWL

SUMMARY OF EFFECTS

Alternative 1 would result in no effects. Alternatives 2 and 3 would result in both negative and positive effects to the NSO. Negative effects include some habitat reduction and disturbance, but not to an extent which contribute to a negative trend of viability of the species on the Forest. All Alternatives are consistent with Umpqua NF LRMP Standards and Guidelines.

Refer to the Quartz Project Biological Assessment for a detailed account of the legal status, life history, threats, conservation needs, range wide environmental baseline, and status of the critical habitat for the northern spotted owl (NSO).

RELEVANT STANDARDS AND GUIDELINES

Several Forest Plan standards and guidelines apply to northern spotted owls and their habitat:

1. Any management activity that will negatively affect plant or animal species listed on the Regional Forester's Sensitive Species list (USDA 2011b), or their habitat will be modified to either avoid (preferable) or minimize the impact. Activities will not be permitted if they will result in the loss of a colony or subpopulation that is important in the natural distribution of the species.
2. Active raptor nest sites identified in project planning or during project work should be protected from human disturbance until fledging or nesting is complete (see prescriptions and other standards for threatened, endangered or sensitive raptors).
3. If additional sites occupied by a species classified as threatened or endangered under the Endangered Species Act of 1974 are discovered, these sites will be managed as directed by the appropriate recovery plan or draft recovery plan. Any activity that may impact the species will be coordinated with the USDI Fish and Wildlife Service as required by consultation procedures.

EXISTING CONDITIONS

Northern spotted owls (NSO) are residents of mature and old growth forests. In addition to being selected as indicators for mature forests in the Forest Plan, they also are listed as a Threatened species under the Endangered Species Act and a Region 6 Sensitive species. Additional information on the spotted owl in relation to its designation as a Threatened species can be found in the Biological Assessment prepared for this project as part of required consultation procedures. Information in relation to its designation as a sensitive species can be found in the wildlife Biological Evaluation prepared for the project. As a Forest Plan Management Indicator Species, the analysis for this species will focus on the mature forest indicator habitat for which it was selected.

Table 26 contains a Forest-wide breakdown of NSO habitat. The Umpqua NF is comprised of 986,135 acres of primarily mixed conifer forest. The majority of the Umpqua NF is capable habitat with the exception of the small amount of non-forested land (meadows, lakes, rivers, rocky outcrops, etc) and upper elevation sub- alpine fir and lodgepole pine forests which are not widely utilized by spotted owls (USDI 2008). However, about 518,813 acres (approximately 50%) of the Umpqua NF currently serves as suitable habitat. About 59% of this suitable habitat is within protected land allication such as Adminitstratively Withdrawn Areas and Late-successional and Riparian

Reserves. Past timber harvest activity is the primary reason for capable land not currently supporting suitable habitat. Wildfires have also reduced suitable habitat over time to a lesser extent.

Table 26. Breakdown of Forest-wide NSO Habitat

Umpqua National Forest – Northwest Forest Plan	Acres	NRF Habitat Acres (% Total)	Capable Habitat Acres (% Total)	Protected Acres[1] (% Total)	Unprotected Acres (% Total)
Ownership					
All Ownerships	1,036,490	518,813 (50%)	892,526 (86%)		
Private	50,348	15,540 (31%)	45,372 (90%)		
Federal	986,135	503,273 (51%)	890,302 (90%)	579,581 (59%)	406,579 (41%)
Land Allocations- Federal (hierarchal, no acres double-counted)					
Congressionally Reserved Areas (Wilderness, OCRA)	108,772	35,681 (33%)	64,176 (59%)		
Late-Successional Reserves (mapped, without IRA's)	279,553	152,747 (57%)	278,115 (99.5%)		
100-Acre Spotted Owl Core Areas in the Matrix	19,590	15,948 (81%)	19,492 (99.5%)		
Areas Withdrawn from the timber base (Wild and Scenic River Corridor, Inventoried Roadless Areas(IRA's), Administratively withdrawn)	128,026	78,135 (61%)	110,102 (86%)		
Riparian Reserves (Matrix and AMA acres only)	98,640	51,174 (52%)	96,667 (98%)		
Matrix/Adaptive Management Areas (IRA's removed)	351,554	169,588 (48%)	323,429 (92%)		
2012 Final Critical Habitat- (Portion Within Umpqua National Forest)					
Critical Habitat	596,633			297,455 (50%)	313,631 (50%)
Critical Habitat, NRF Habitat	354,304			184,238 (52%)	170,065 (48%)
Critical Habitat, Dispersal Only Habitat	174,937			80,471 (46%)	94,466 (54%)
Critical Habitat, Capable Habitat	535,738			270,977 (51%)	264,782 (49%)

[1] Protected = land allocation with no programmed timber harvest which includes Congressionally Reserved land, LSR's, Owl Cores and Wild and Scenic River Corridors.

Only two active northern spotted owl sites were identified within the survey boundary while conducting surveys in 2013 and 2014 (NSO territories 640 and 655). Average home ranges in our area are considered to be within a 1.2 mile radius of nest or activity center locations. Both of the active sites contain the necessary amounts of suitable habitat needed maintain spotted owl life history functions (Table 33; See the Biological Evaluation section for a description of quantity of habitat required for life history functions).

DIRECT AND INDIRECT EFFECTS

The viability of the northern spotted owls was analyzed with the implementation of the 1994 Northwest Forest Plan (NWFP). The Record of Decision (ROD) for the NWFP including the Standards and Guidelines for Management of Habitat for Late-successional and Old-Growth Forest Related Species was signed in 1994. The ROD amended the 1990 LRMP of the Umpqua National Forest. The U.S. Fish and Wildlife Service issued a Biological Opinion on the 1994 NWFP. The Biological Opinion determined that implementing the NWFP would not jeopardize listed species (USDA/USDI 1994).

Alternative 1 would have no direct effect because no northern spotted owl habitat would be impacted. Alternative 2 would reduce habitat quality of approximately 392 acres of NRF habitat to dispersal habitat because of reduced canopy closure. Alternative 3 would affect fewer acres of habitat because of fewer acres of treatment; approximately 323 acres reduced from NRF to dispersal habitat. This reduction of habitat quality due to canopy closure reduction would likely be short term as the remaining trees continue to grow, and canopies close.

Spotted owl territies 640 and 655 would both experience small temporary losses of NRF habitat (1%-5% loss depending on territory and alternative;Table 33). Both of the active sites contain the necessary amounts of suitable habitat needed maintain spotted owl life history functions (NSO territories 640 and 655; see the Biological Evaluation section for a description of quantity of habitat required for life history functions).

CUMULATIVE EFFECTS

The cumulative effects to spotted owls are analyzed at the Sharps Creek watershed scale. Past clear-cutting of habitat (approximately 21,000 acres of Forest Service, BLM and private land) has had the largest cumulative impact to this species by removing NRF habitat. Future clear-cut harvesting on private land (est. 150 acres per year) would not impact NRF habitat because this harvest would be occurring in second-growth plantations. Alternatives 2 and 3 would modify /downgrade approximately 392 and 323 acres of low quality NRF habitat, respectively. This impact to NRF represents approximately 2.1% (Alternative 2) or 1.7% (Alternative 3) of the available habitat within the watershed depending on Alternative. The current trend for NRF habitat within the watershed is stable to increasing.

The reasonably foreseeable Calapooya Divide project, which may occur adjacently to the Quartz Project, would be of similar nature and scope and would have similar effects as those described above. This and future commercial thinning would reduce the risk of future loss of habitat to wildfire by making the stands more fire resilient, potentially reducing the risk of wide-spread habitat loss.

Because this project modifies or downgrades relatively few acres of NRF within the watershed in the short-term, and because reasonably foreseeable actions are likely to be similarly minor in scale of impact, cumulative effects of the Quartz project are considered to be minor and would not affect the viability of this species within the watershed.

EFFECTS DETERMINATION

Proposed management actions would modify stand conditions within 392 acres (Alternative 2) or 323 acres (Alternative 3) throughout the Quartz project area which contains two active NSO sites (Figure 37) and thus may have negative impacts to NSOs through habitat modification. However, the habitat which may be potentially affected by Alternatives 2 and 3 comprise approximately .0006% to .0008% (Alternatives 3 and 2 respectively) of the 518,813 acres of the

suitable habitat on the Umpqua National Forest. Because the amount of suitable habitat affected is so small in relation to the habitat available on the Forest, the Quartz Integrated Project would not contribute to a negative trend of viability of the species on the Forest. Furthermore, after harvest there would be an expected one to two percent gain in canopy cover per year after thinning (Chan et al. 2006). Therefore, those negative effects which may occur in currently suitable habitat due to reduction in canopy closure will be short term in nature (0-20 years, depending on the stand).

PRIMARY CAVITY EXCAVATORS (INCLUDING PILEATED WOODPECKERS)

SUMMARY OF EFFECTS

Alternative 1 would result in no effects. Alternatives 2 and 3 would result in a reduction of snag habitat over time, and localized disturbance, but not to an extent which contribute to a negative trend of viability of the species on the Forest. Post treatment snag densities would remain above Umpqua NF Standards and Guidelines. All Alternatives are consistent with Umpqua NF LRMP Standards and Guidelines.

Primary cavity excavators are defined as bird species that actually construct, forage, or create nesting cavities in dead and live trees. As a group, “cavity nesters” were identified as a Forest Plan MIS to standing dead trees for snag dependent wildlife species.

RELEVANT STANDARDS AND GUIDELINES

Several Forest Plan standards and guidelines apply to primary cavity excavators and snag habitat. Most of the relevant standards and guidelines 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 1990).

EXISTING CONDITIONS

Habitat for primary cavity excavators such as woodpeckers and sapsuckers consists of dead or defective trees 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% of the potential habitat is retained and well distributed across the Forest (USDA 1990). The Oregon Department of Fish and Wildlife criterion for forest planning suggested a 60% level for snag habitat. The Umpqua Forest Plan prescribes managing for 60% of potential populations of snag dependent species, using Thomas et al. (1979) information on snag requirements (the highest snag density requirement is for the hairy woodpecker, with a snag density of 1.15 snags per acre, Table 27). Information that is more recent suggests higher levels are needed (Mellen-McLean et al. 2012). The primary cavity excavators found in the planning area and surrounding forest are listed in Table 27 along with monitoring trends from local and regional breeding bird surveys (Sauer et al. 2014) and number of snags/acre required to meet Umpqua NF LRMP standard and guidelines.

Table 27. Primary Cavity Excavators and Population Trend Data

Primary Cavity Excavators	PPC[1] S&G (Snags/Acre)	Population Trends (1966-2011)			
		Winberry[2]	Warner Mtn[3]	BCR 5	Reliability Rating (BCR5)
Red-breasted Sapsucker	0.27	Decreasing	Stable[5]	Stable[5]	Blue
Hairy Woodpecker	1.15	Increasing	Decreasing[5]	Stable[5]	Blue
Northern Flicker (Trend Data 1966-2009)	0.29	Increasing	Stable	Stable[5]	Blue
Pileated Woodpecker	0.04	Increasing	Decreasing	Stable[5]	Yellow[6]

[1] The PPC column is for reference purposes, and shows the number of snags/acre required to meet Umpqua LRMP standard and guidelines.
[2]This 26 mile breeding bird survey route is located about 20 miles north of the planning area.
[3]This 24 mile breeding bird survey route is located about 15 miles east of the planning area.
[4]Statistically significant ($p<0.05$).
[5]Stable is considered a <2% change per year.
[6] Yellow reliability ratings trends represent a data deficiency in the BBS data due to either low abundance or small sample size detected

DIRECT AND INDIRECT EFFECTS

The direct and indirect effects to primary cavity nesters were analyzed at the scale of the Forest ownership of the Sharps Creek watershed and at the Forest-wide scale. The actions that have the largest direct effect on primary excavators are timber harvest and prescribed fire. There is no expected negative effect to potential nesting habitat from other proposed connected actions because these other actions do not occur in habitat likely to support nesting. The indirect effects are the long-term changes in future snag recruitment caused by thinning 1,026 acres (Alternative 2) or 850 acres (Alternative 3).

Alternative 1 would maintain snags of both size classes (≥10” dbh and ≥20” dbh) at higher densities than would occur under Alternatives 2 and 3 (Figure 27, Figure 28, Figure 30, and Figure 31). Larger diameter snags (≥20” dbh) would develop more slowly, and would require from 15 to 60 years to reach densities needed to meet the 30% tolerance level for pileated woodpecker, depending on the habitat type and alternative (Figure 28 and Figure 31; See Coarse Woody Debris section for a discussion on tolerance levels). Alternatives 2 and 3 would cause a decrease in smaller diameter snags through timber harvesting effects. Timber harvesting and fuels treatments would also damage some remaining trees, creating some new snags (estimated at three snags per acre), and three snags per acre will be created post treatment under Alternatives 2 and 3. FVS models estimate that snag densities in the ≥10” size class would remain above the 30% tolerance level for pileated woodpecker. Large snags would accumulate over time, but would not reach the 30% tolerance level for some time (10-70 years depending on habitat type and selected Alternative)

These changes in snag levels would have few negative effects on primary cavity excavators because they maintain adequate densities of snags (greater than 30% tolerance levels on average) or allow adequate densities of snags to develop over time in the short and long term as indicated by Figure 27, Figure 28, Figure 30, and Figure 31.

LRMP standards and guidelines for snag habitat require 60% PPC. Alternatives 2 and 3 would retain approximately 10 snags per acre in managed stands and 15 snags per acre in fire regenerated stands, exceeding current LRMP standards and guidelines by approximately 8.85 and 13.85 snags per acre respectively (Table 20). Alternatives 2 and 3 would have no effect to population trends or population viability for cavity nesters on the Umpqua National Forest as a result of this project.

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 inhabiting >18” dbh hard snags, with populations on the decline 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. Bull (1987) noted that foraging occurred on down wood, standing snags and live trees in relatively equal amounts. While feeding on downed wood, a preference for material between 10 and 20 inches was observed. While foraging on standing trees, a preference for trees over 20 inches was also observed. Shroeder (1982) study indicate average diameter of nest trees to be 30 or 31 inches, with a minimum size considered to be 20 inches dbh.

In the MIS Habitat Assessment, suitable pileated woodpecker habitat was identified as the same mature/old growth habitat identified for spotted owls as well as the inclusion of large scale snag patches created by wildfires and mapped insect/disease outbreaks. When combined, these create approximately 624,689 acres of mapped pileated woodpecker nesting habitat on the Umpqua Forest.

Alternative 1 would not alter any habitat components within the analysis area and would have no direct or indirect effects. Alternative 2 proposes commercial thinning on 472 acres of mapped pileated habitat. Stand exam data indicates large snags over 20 inches in diameter average 2 per acre within treated units or a potential impact to approximately 944 large snags. Alternative 3 proposes to thin 375 acres potentially impacting 750 large snags. However, the impacts expected to be less with management recommendations to protect existing snag habitat. Proposed treatments would result in some reduction in canopy cover and stocking rates, but these units would still retain the largest, oldest trees and large snags.

The 374 acres of roadside fuels treatments proposed in Alternatives 2 and 3 would result in fewer snags within these roadside treatment areas, as some snags would need to be felled for safety reasons, but would not result in reduced canopy cover because

treatment is limited to understory trees and ladder fuels. These treatments may continue to reduce snag densities through time because of reduced suppression mortality caused by having fewer trees in the understory. These impacts would only be experienced within thin roadside strips along ridge-tops, and is therefore not expected to meaningfully depreciate snag habitat at the watershed or Forest scale.

The Forest is responsible for maintaining viable populations of MIS species on the Forest. However, assessment at a smaller scale is useful in determining the effects of the proposed actions, and how that might affect the larger picture at the Forest scale. To this end habitat was assessed at the scale of the Forest ownership of the Sharps Creek watershed, which offers approximately 13,482 acres of suitable habitat. The actions proposed in Alternatives 2 and 3 would affect 472 acres and 375 acres of suitable habitat respectively, which comprises approximately 3.5% (Alternative 2) or 2.7% (Alternative 3) of the suitable habitat within this analysis area. Various studies of pileated woodpeckers have found home ranges to be from 500-1,200 acres (Bull and Holthausen 1993, Mellen et al. 1992). With these large home ranges it is likely that any nesting habitat lost to timber harvest would only make up portions of the range of woodpeckers in the analysis area. Considering the small amount of affected suitable habitat (2.7-3.5%) and the large home ranges associated with the species, Alternatives 2 and 3 will not affect population viability at the scale of the upper watershed or contribute to viability concerns at the watershed scale.

At the Forest scale, Alternatives 2 and 3 would affect 0.06% to 0.08% of suitable habitat available. Because of this very small proportion of habitat potentially affected, there would be no effect to population trends or population viability for pileated woodpeckers on the Umpqua National Forest as a result of this project. The pileated woodpecker would indirectly be affected from the proposed 539 acres of plantation thinning in Alternatives 2 and 3, because these actions would achieve desired late-successional forest structure more quickly than the No Action alternative (see 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 commercial harvests in Alternatives 2 and 3 are expected to be short term (one or two days at a site) and localized. Disturbance associated with understory burning would affect approximately 330 acres and would be brief in duration and spread over time as burning prescription allows. Disturbance would only occur if there were suitable nesting habitat (cavities) in close proximity to activities associated with Alternatives 2 and 3 (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. Because the activities proposed in Alternatives 2 and 3 would be small in terms of the project or Forest scale, the potential 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 (Brown 1985, USDA/USDI 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 located nearby the Winberry and Warner Mountain Breeding Bird Surveys (BBS) routes; decreasing trends in one area is offset by increasing trends in the other, suggesting overall stable populations in this area. The only "statistically significant" documented trends (Sauer et al. 2014) are local increases for red-breasted sapsuckers and regional increases for pileated woodpeckers (Table 27; Sauer et al. 2014).

The trend in clear-cut harvesting on federal forest lands that caused the concerns for decreasing populations of primary cavity excavators and pileated woodpeckers has largely been halted (or at least dramatically decreased) by the NWFP. About 54% of the federal forests in this area are currently in reserved land allocations. The primary type of timber harvesting occurring on the Umpqua National Forest and surrounding federal lands is commercial thinning in young (40 to 80 years of age) forest with project design features for snag recruitment. Alternatives 2 and 3 would help to offset the past effects of timber harvesting and fire exclusion in this area by accelerating forest succession and making stands more fire resilient. Activities proposed by this project include measures that maintain and protect habitat components important to the group of cavity excavators listed as MIS. Implementation of project activities, when combined with future timber harvests, would result in no additional cumulative effects 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 and pileated woodpeckers are expected to stabilize and increase in the foreseeable future.

DETERMINATIONS

Because Alternatives 2 and 3 would potentially affect approximately 0.001% of capable snag habitat (776,970 acres) on the Umpqua National Forest, and 472 acres of mature forest habitat would be affected the overall direct, indirect, and cumulative effects would result in a very small reduction in snag habitat at the Forest scale which is increasing as an overall trend across the Forest. In addition, an increase in disturbance to snag habitat as a result of logging operations for cavity nesters and the pileated woodpecker can be expected. The loss of habitat and increase in disturbance would be negligible when considered at the watershed and Forest scale. The Quartz Integrated Project is consistent with the 1990 LRMP and NWFP (USDA 1990; USDA/USDI 1994), and thus continued viability of cavity nesters and pileated woodpeckers is expected on the Umpqua National Forest as the 60% PPC (0.4-1.15 snags per acre) snag levels would be exceeded as displayed in Figure 27 and Figure 30.

ELK AND DEER - BIG GAME WINTER RANGE

SUMMARY OF EFFECTS

Alternative 1 would result in no effects. Alternatives 2 and 3 would result in small-scale, localized beneficial effects to elk and deer habitat forage and predicted use as a result of proposed treatments. None of the Alternatives would contribute to a negative trend of viability of the species on the Forest. All Alternatives are consistent with the Umpqua NF LRMP standards and guidelines.

Certain areas of the forest were identified as big game winter range under the Umpqua LRMP (USDA 1990). Designated as Management Area 11, these areas were designed to provide for big game winter range habitat and timber production consistent with other resource objectives. They emphasize winter range management achieved through forage and cover production on land used or suitable for occupancy by deer and elk. Timber harvest is encouraged to provide stable production of forage and cover. A habitat ratio of 60% forage to 40% cover was once considered optimum for winter range (Brown 1994,Thomas et al. 1979), but more recent studies suggest smaller ratios may be suitable as long as the interspersion of forage and cover is good (Larkin et al. 2004). However, forage is ultimately the most limiting factor. The primary forage areas tend to be in more open canopy early seral forest or open meadows with shrubs and higher nutritional herbaceous species. None of the actions proposed in Alternative 2 or 3 occur in the big game winter range areas, though some of the commercial and non-commercial actions proposed would occur adjacent to or within the vicinity of these areas.

RELEVANT STANDARDS AND GUIDELINES

The 1990 LRMP has several standards and guidelines that apply to elk and deer (big game) winter range. The relevant ones that apply to this project include the use of a habitat effectiveness model ("A Model to Evaluate Elk Habitat in Western Oregon" or similar model) to compare the impact of various alternatives on big game habitat (USDA 1990, p. IV-38) and direction for management of deer and elk winter range areas described in Forest Plan Prescription C4-I.[12]

EXISTING CONDITIONS

The planning area makes up about 0.7% of the 1.2 million-acre Indigo Wildlife Management Unit (WMU). There are 481 acres of big game winter range within the planning area, which accounts for about 6% of its total area.

Recent stem exclusion conditions in old harvest plantations, reduction and change in recent timber harvest to primarily thinning, and the absence of fire activity has resulted in forage concerns for this species across the District. Regeneration harvest on both private and federal land in the 1980's and 1990's has been reforested to fairly dense stocking levels. Most of these stands have already reached, or are near the stem exclusion stage of development when closed canopies greatly reduce forage opportunity for elk.

Evidence of deer was noticeable throughout the planning area. The same benefits derived from past management for elk also benefited black-tail deer. Deer tend to be more solitary, prefer heavier cover, and forage on shrub species, whereas elk prefer more open habitat composed of grass and forbs.

[12] Habitat effectiveness model (HEI) is an index of elk habitat quality ranging from 0-1 where 0= non-viable habitat and 1= optimal habitat (Wisdom et al. 1986).

Habitat for both species is greatly enhanced by either natural events or management activities that provide cover and forage in close proximity. The Umpqua 1990 LRMP states that ODFW will be in charge of population monitoring for this species (USDA 1990, p. V-18). Monitoring data for deer and elk within the Indigo Wildlife Management Unit is presented in Figure 33 and Figure 34.

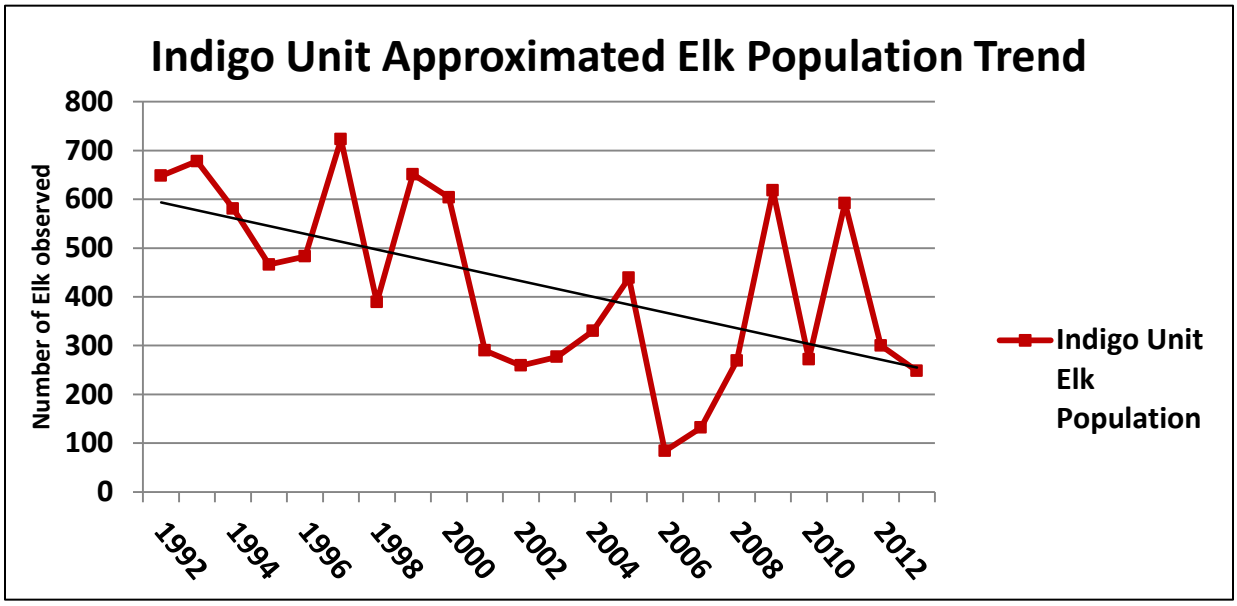

Figure 33. Indigo Wildlife Management Unit Elk Population Trend

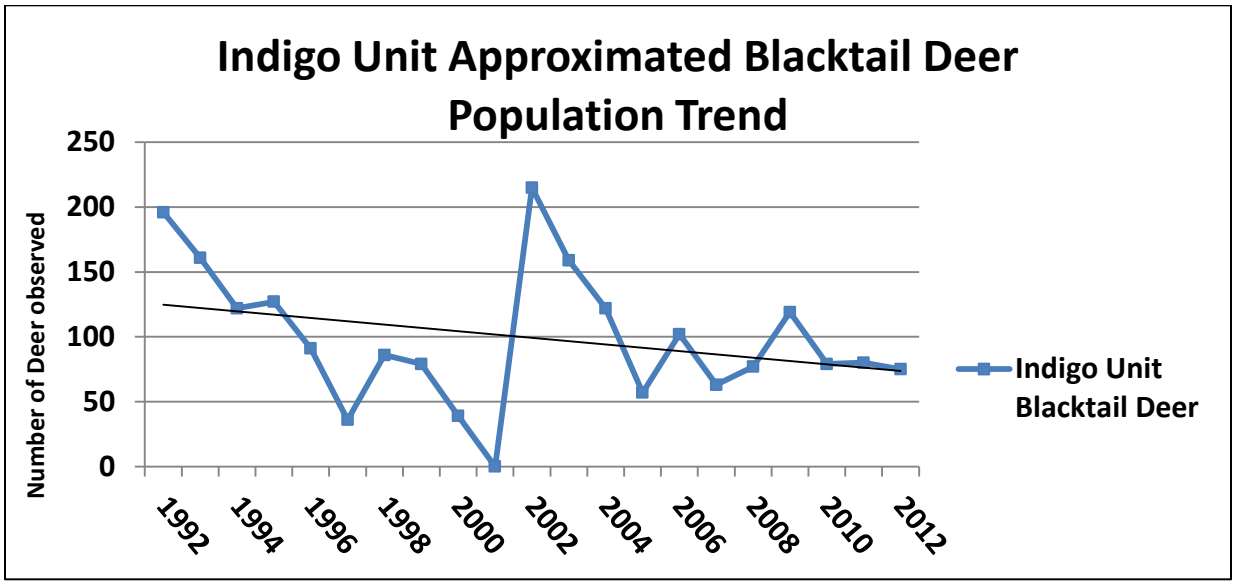

Figure 34. Indigo Unit Blacktail Deer Population Trend

DIRECT AND INDIRECT EFFECTS

The direct and indirect effects to big game were analyzed at the planning area and watershed scale.

The no action alternative would maintain the current forage-to-cover ratio and the declining trend in forage habitat.

The thinning treatments associated with Alternatives 2 and 3 would increase the amount of sunlight to reach the shrub/forb/grass component of the harvested units. This would result in an increased production of elk and deer forage over the next 10-20 years, which would then begin to decline as the gaps and stands begin to develop larger trees, and tree crowns begin to expand and close in again. Alternative 3, with its heavier thinning prescription in managed stands and the inclusion of small gaps, would allow more sunlight than Alternative 2 and so would likely increase available forage even further.

Commercial thinning would result in an overall increase of forage on about 1026 and 850 acres, with the implementation of Alternatives 2 and 3 respectively or 0.04% of the planning area. This would in turn provide a beneficial indirect effect on the health of deer and elk herds within the planning area.

This project has the potential to improve forage habitat at a local scale based on the diversity of native forage currently present. However, beneficial effects to big game forage from proposed thinning should not be overrated. The actions proposed in Alternatives 2 and 3 do not directly benefit winter range management areas, and any benefits from forage enhancement would only be experienced by local individuals. The effects should not be used to suggest the potential for any noticeable population response unless applied to the landscape at a scale greater than proposed by this project. This project would have no effect on the population trend or population viability of elk and deer on the Umpqua National Forest.

The presence of roads, along with other habitat characteristics, affects how elk and deer use their range (Wisdom et al. 1986, Wisdom et al. 2005). Alternatives 2 and 3 would build no new system roads. The proposed road decommissioning that would occur under Alternatives 2 and 3 would have a slight beneficial effect for elk in this regard, however at the watershed scale this benefit is likely to be small and localized.

Direct and indirect disturbance effects are largely limited to potential temporary displacement of individuals occurring in habitat during implementation of proposed harvest activities and associated connected actions. Alternatives 2 and 3 would spread disturbance out over several years and throughout the landscape of the planning area (approximately 8,331 acres). Consequently, no measurable adverse effects to big game would be expected.

Existing elk habitat models used in land management planning in western Oregon and Washington have been updated to reflect research conducted in the last two decades. For example, declines in elk populations in the 1990s led researchers to pay more attention to factors such as summer nutrition, which was previously not considered a limiting factor for elk populations. An interagency team of researchers (Rowland et al. 2013) has been compiling data, conducting analyses, and developing new regional elk habitat models that incorporate new knowledge about elk habitat requirements, especially nutritional conditions.

The elk nutrition model predicts biomass (kg/ha) and dietary digestible energy (kcal/g). These have been demonstrated to relate to specific measures of elk productivity (Cook et al. 2004). The outputs are mean DDE (dietary digestible energy) expressed as kcal/gram across the watershed. The higher the DDE the better off the population is likely to be. Due to the relatively small scope and intensity of treatments (1,026 acres in Alternative 1, and 850 acres in

Alternative 2) compared to the watershed (42,533 acres) there is a very marginal amount of increase in nutrition as a result of the treatments. Nutritional model outputs for all 3 Alternatives are displayed in Table 28. Most of the watershed falls into the low-marginal classification for elk forage, with relatively few areas providing areas of high quality forage opportunities. The only detectable expected change between alternatives is a 1% change from poor quality to low-marginal quality when moving from Alternative 1 to Alternatives 2 and 3.

Table 28. Elk Nutrition Availability for the Sharps Creek Watershed.[13]

Class	Description	DDE Values	Alternative 1	Alternative 2	Alternative 3
1	Poor	≤2.40	17%	16%	16%
2	Low-Marginal	2.40-2.575	78%	79%	79%
3	High-Marginal	2.575-2.75	5%	5%	5%
4	Low-Good	2.75-2.825	0%	0%	0%
5	High-Good	2.825-2.9	0%	0%	0%
6	Excellent	≥2.9	0%	0%	0%

An elk habitat use model was also produced to predict the expected use of an area. After developing and evaluating several versions, the team (Rowland et al. 2013) found that the model that performed best in validation tests was based on four habitat covariates:

- distance to open public road
- dietary digestible energy (DDE)
- distance to cover-forage edge
- slope

The resulting RSF (resource selection function) value is a relationship between the open roads in the watershed, the distance to forage, cover ratio, mean DDE, and mean slope. The RSF values were then split into categories which would offer an even distribution of classes across the landscape (20% of the total land in each category according to RSF value) in order to track changes between alternatives. Table 29 summarizes the outputs of the habitat use model for all of the Alternatives, and Figure 35 displays the spatial distribution of these outputs across the Sharps Creek Watershed. The model outputs suggest that some small beneficial effect for elk habitat use would occur as a result of Alternatives 2 and 3. This effect is most apparent in the southern region of the project area (circled in red in Figure 35). This impact would be small in scale, with only a small increase in expected use when moving from Alternative 1 to Alternatives 2 and 3.

Table 29. Expected Elk Habitat Use in the Sharps Creek Watershed by Alternative.

Class	Expected Use Class	RSF Value Range	Alternative 1	Alternative 2	Alternative 3
1	Low	<52	20%	19%	18%
2	Medium-Low	52-95	20%	20%	20%
3	Medium	95-170	20%	21%	22%
4	Medium-High	170-323	20%	20%	20%
5	High	>323	20%	20%	20%

[13] DDE value classes are adapted from Cook et al. 2004. Values shown for each alternative represent the proportion of the watershed providing the associated DDE value class.

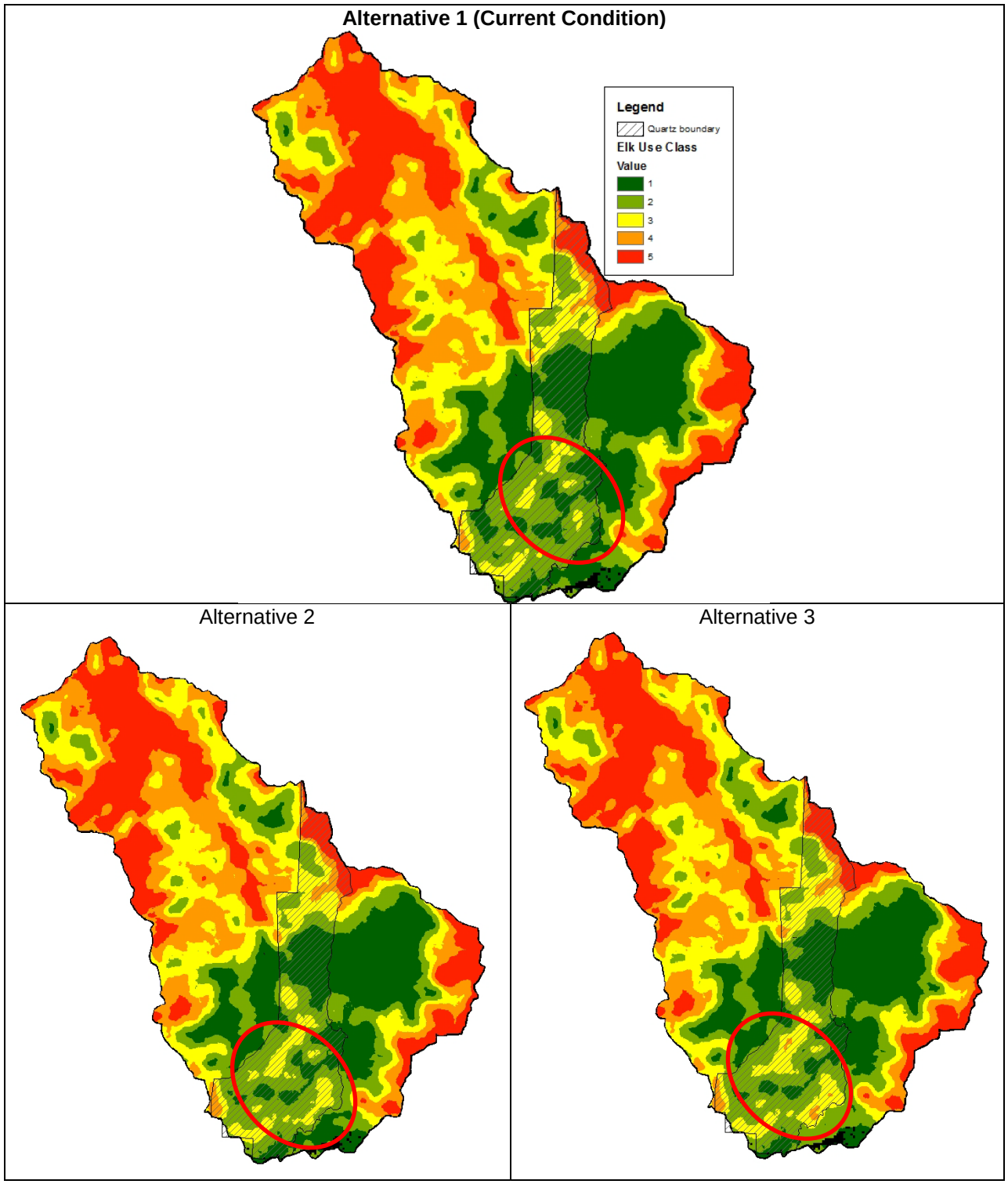

Figure 35. Spatial Distribution of Habitat Use Classifications for the Sharps Cr. Watershed[14]

[14] The red circle denotes the area which is expected to experience the most noticeable effect as a result of Alternatives 2 and 2

CUMULATIVE EFFECTS

The cumulative effects of this project are analyzed at the wildlife management unit (WMU) scale, for that portion that is National Forest land.[15] This is the spatial scale at which elk populations are monitored by Oregon Department of Fish and Wildlife. At this scale, about 52% of the Federal Forest Land is in a reserved land allocation (e.g. late-successional reserve land allocation), and clear-cut harvesting within this allocation is not expected to occur in the near future. This suggests a continued decline in the amount of forage habitat within this WMU over the next one to two decades. Most of the larger patches of forage habitat would occur on private forestland and be concentrated in the southeastern third of the WMU, although there are two 7,000-10,000-acre private forest in-holdings in the eastern portions of the WMU.

The reasonably foreseeable actions on federal forest lands (Matrix and LSR) within the watershed include the Calapooya Divide Project which is projected to affect an estimated 1,200 acres. This future project would provide small, incremental additions of forage in the form of small gaps, and an improvement of understory forage vegetation similar in scale to this project, and would likewise probably result in slightly improved conditions for deer and elk. On private lands it is likely that clearcutting would continue to occur at a rate of roughly 150 acres per year. Given the past, present, and foreseeable actions (See the beginning of this chapter) the direct and indirect effects of the Alternatives 2 and 3 (when cumulatively added on to reasonably foreseeable future actions) would not be enough to stop the declining trend in forage habitat and forage-to-cover ratios within the WMU.

DETERMINATIONS

Alternatives 2 and 3 would improve habitat conditions for Roosevelt elk and black-tailed deer in the Quartz project area (Table 28, Table 29). Therefore, the Quartz Integrated Project would not contribute to a negative trend in viability on the Umpqua National Forest for either Roosevelt elk or black-tailed deer. All Forest Plan standards and guidelines for these species would be met through the implementation of the Quartz Integrated Project.

SURVEY AND MANAGE WILDLIFE SPECIES

The 1994 NWFP required protection of certain wildlife species that were referred to as “Survey and Manage/Protect and Buffer Species”. These species were identified because of viability concerns when implementing the Forest Plan. Survey and Manage species standard and guidelines provide additional benefits to amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropod. These standard and guidelines contain four components, and priorities differ among them. Components 1 and 2 are pertinent to ground disturbing projects. They require surveys prior to ground-disturbing activities and to manage known sites.

A component of the NWFP is to integrate adaptive management throughout the life of the Plan. Adaptive management is incorporated when new information becomes available, it should be used in the design or modification of activities and standard and guidelines. In the spirit of adaptive management the 1994 Forest Plan Environmental Impact Statement was amended. On January 15, 2001 the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer and other Mitigation Measures Standards and Guidelines (USDA/USDI 2001) was published. This document provided new information regarding management of Survey and Manage/Protect and Buffer Species.

15 This WMU contains about 700,000 acres of National Forest Land and 135,000 acres of BLM-managed forest and is located in the western Cascades east of Interstate 5, south of State Highway 58 and north of State Highway 138.

The FSEIS considered alternatives with an objective of continuing to provide the same level of protection intended by the 1994 Record of Decision. The amended 2001 Plan was to:

a) clarify required management;
b) remove unnecessary and duplicative or conflicting requirements;
c) add a process for changing species between categories;
d) add a process for adding or removing species from Survey and Manage, based on new information

Species would be removed when they fail to meet the three basic criteria for Survey and Manage:

a) Does the species have suitable habitat in the Northwest Forest Plan area?
b) Is the species associated with late-successional or old-growth forest?
c) Does the reserve system and other standards and guidelines provide for a reasonable assurance of species persistence?

On December 26, 2001, the Douglas Timber Operators, Inc., and American Forest Resource Council filed a complaint against the Secretary of Agriculture and the Secretary of Interior in the United States District Court for the District of Oregon (Douglas Timber Operators, et al. v. Secretary of Agriculture, et al., Civil No. 01-6378-AA (D. Oregon)). The complaint alleged that the January 2001 amendment to the Survey and Manage Standards and Guidelines "transferred more than 81,000 acres of timber-producing NWFP forest land into permanent reserves, resulting in a 7% reduction on the regional timber volume permitted under the 1994 Northwest Forest Plan, a loss of 51 million board feet (MMBF) of timber sales per year in perpetuity" and "added uncertainty." The complaint also alleged that the 2001 Survey and Manage amendment is "in violation of substantive and procedural requirements of the Oregon and California and Coos Bay Wagon Road Grant Lands Act (O&C Act), 43 U.S.C. § 1181a, the National Forest Management Act (NFMA), 16 U.S.C. §§ 1600, et seq., the Multiple-Use Sustained-Yield (MUSY) Act of 1960, 16 U.S.C § 528-531, and the Federal Land Policy and Management Act (FLPMA), 43 U.S.C. §§ 1701, et seq." On September 30, 2002, "to avoid further costly litigation, and without admission of any liability or wrongdoing by either party" the parties signed a Settlement Agreement. The agreement required the BLM and Forest Service to consider an alternative that replaces the Survey and Manage mitigation requirements with existing Forest Service and BLM special status or sensitive species programs (SSSS program).

Complying with the terms of the Settlement Agreement, an alternative was considered and selected. The Forest Service and BLM issued a new decision, The Record of Decision dated March 22, 2004 (2004 ROD), entitled "To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl" (USDA/USDI 2004). This decision eliminated the Survey and Manage requirement and move warranted species to the Regional Forester's Sensitive Species List which is now known as the SSSS program. Established protocols and management recommendation for Survey and Management species were continued for those species that were moved to the sensitive species list.

On January 10, 2006 the court ordered in favor of the plaintiff, Northwest Ecosystem Alliance the following: The Record of Decision dated March 22, 2004, entitled "To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl" (the 2004 ROD) is hereby set aside and enjoined all ground-disturbing activities under the 2004 ROD unless they comply with the 2001 ROD.

The Quartz Integrated Project applies a 2006 Exemption, from a stipulation entered by the court in litigation regarding Survey and Manage species and the 2004 Record of Decision related to Survey and Manage Mitigation Measure in Northwest Ecosystem Alliance v. Rey, No. 04-844-MJP (W.D. Wash., Oct. 10, 2006). Previously, in 2006, the District Court (Judge Pechman) invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain categories of activities from the Survey and Manage standards and guidelines, including both pre-disturbance surveys and known site management. Also known as the Pechman Exemptions, the Court's Order from October 11, 2006 directs:

"Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

> A) Thinning projects in stands younger than 80 years old:
> B) Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
> C) Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions;
> D) The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old

To correct deficiencies identified by the U.S. District Court in Northwest Ecosystem Alliance v. Rey, (*NEA v. Rey*) No. 04-844-MJP (W.D. Wash., Oct. 10, 2006) the agencies prepared the 2007 Final Supplement to the 2004 To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (2007 ROD; USDA/USDI 2007).

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in Conservation Northwest, et al. v. Sherman, et al., No. 08-1067-JCC (W.D. Wash.), granting Plaintiffs' motion for partial summary judgment and finding NEPA violations in the Final Supplement to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines. Plaintiffs and Defendants entered into settlement negotiations that resulted in the 2011 Survey and Manage Consent Decree, adopted by the District Court on July 6, 2011.

The Defendant-Intervenor subsequently appealed the 2011 Consent Decree to the Ninth Circuit Court of Appeals. The April 25, 2013 ruling in favor of Defendant-Intervener remanded the case back to the District Court. On February 18, 2014, the District Court vacated the 2007 ROD. Vacatur of the 2007 RODs has the result of returning the Forest Service to the 2001 ROD, but with the Pechman Exemptions in place. In order to allow projects to proceed, a grace period is allowed in the court remedy ruling which allows field units to choose between the 2001 and 2003 species list in coordination with the 2001 ROD. The Quartz Project utilized the 2001 species list.

Portions of the Quartz Project meet Exemption A in managed stands, B for culvert replacements and removals, and C for roadside fuels treatments.

Therefore, based on the preceding information regarding the status of surveys and site management for Survey & Manage wildlife species, it is my determination that commercial thinning in stands younger than 80 years, (434 acres of plantation thinning for Alternative 2, 316 acres for Alternative 3) within the Quartz Integrated Project and connected actions complies with the provisions of the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (2001 ROD), in coordination with the 2006 exemptions.

The species listed below were considered and surveyed for where proposed activities did not meet previously mentioned exemptions and where potential habitat existed which would be affected by Alternatives 2 and 3: Vertebrates (great grey owl and red tree vole) and Mollusks (*Megomphix hemphilli and Pristiloma arcticum crateris*).

Consult the project file for a unit by unit disclosure of survey and manage surveys conducted, as well as units exempted from survey and manage.

RELEVANT STANDARDS AND GUIDELINES

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 (USDA 1990).

SPECIES

The great gray owl and red tree vole are Survey and Manage 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 (Quintana-Coyer et al. 2004) and Survey Protocol for the Red Tree Vole v3.0, *Arborimus longicaudus* (Huff et al. 2012). These species are not included on the Regional Forester's Sensitive Species list for the Umpqua National Forest (updated December 2011) or discussed elsewhere in this document. They are discussed below for purposes of full discovery.

GREAT GRAY OWL

(Strix nebulosa)

SUMMARY OF EFFECTS

No negative effects to the Great Gray Owl are expected because treatment is not proposed in suitable habitat. All Alternatives are consistent with the 2001 Survey and Manage ROD requirements for the Great Gray Owl.

The great gray owl is a Survey and Manage 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 (Quintana-Coyer et al. 2004). This species is not included on the Regional Forester's Sensitive Species list for the Umpqua National Forest (updated January 2011) or discussed elsewhere in this document. It is discussed briefly below for purposes of full discovery.

Nesting habitat for great gray owls is characterized as mature stands of timber with more than 60 percent canopy cover (Bull and Henjum 1990). Nesting suitable habitat includes large diameter nest trees of 38-42 inches dbh (within the West Cascades Physiographic Province),

forest for roosting cover, and proximity [within 200 m] to openings that could be used as foraging areas (Quintana-Coyer et al. 2004).

Great gray owls were initially thought (in 1993) to be restricted to elevations above 4,000 feet. They have since been 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 seven miles north of the planning area near the summit of Mount June (4,600 ft. elevation).

DIRECT AND INDIRECT EFFECTS

Alternative 1 would have no effect on the species, as no ground disturbing activities would occur.

The proposed plantation thinning units are stands that are less than 80 years old and have no suitable large remnant trees/snags that would provide suitable nesting habitat structure and are exempt from Survey and Manage. The fire regenerated stands proposed for harvest are composed of trees which are relatively small for mature stands (in terms of great gray owl habitat requirements), and most stands do not contain trees and snags of sufficient size to provide nesting structures for great gray owls according to stand exam data. Stand exam data do show that there are some trees and snags of sufficient size within proposed units 3, 6, and 7. These proposed units are within close proximity (200 meters) of the two meadows at the northern end of the project area. These meadow habitats are small in size (under 10 acres in size), are composed of very shallow rocky soils, and are dominated by sparse clumps of bunchgrasses and rocky outcrops which are covered in mosses and lichens. These habitat conditions are not suitable for prey species of great gray owls (namely pocket gophers (*Thomomys mazama*), Townsend's chipmunks (*Tamius townsendii*), and creeping vole (*Microtus oregoni*). The proposed commercial units in fire regenerated stands were specifically designed to exclude areas made up of large diameter trees which would be considered nesting habitat.

There are three criteria which trigger protocol surveys when they are met in unison:

-The proposed activity is within the range of the great gray owl.

-The proposed activity is within or contains suitable nesting habitat.

-The proposed activity will cause a significant negative effect on the species' habitat or persistence of the species at the sight.

Great grey owls require a combination of nesting structure and foraging habitat within close proximity for habitat to be considered suitable (Quintana-Coyer et al. 2004). The meadow habitats within the project area are small and rocky which would prohibit the construction of burrows by prey species, and does not provide sufficient cover for their survival. This lack of ability to support prey results in the meadows being considered as unsuitable for foraging habitat. While there may be individual structures within the nearby stands (stands within 200m) that are of suitable size for nesting in (38-42" dbh), these structures are rare within the proposed units. This lack of nesting structure, in combination with the lack of sui* foraging habitat and necessary prey resources, results in the commercial harvest units proposed in Alternatives 2 and 3 being unsuitable as nesting habitat. The areas proposed for roadside fuel treatments are also not considered suitable habitat because while some areas may contain suitable nesting and roosting structures, they are not within proximity to suitable foraging habitat. Additionally, Alternatives 2 and 3 would not affect the trees and snags of the size used by great gray owls. Therefore, no surveys were conducted for the great gray owls for this project because the proposed activities associated with the Alternatives 2 and 3 would not have negative impact on

the species' habitat, its life cycle, microclimate, or life support requirements, and because the natural openings within the project area are of less than 10 acres in size (Quintana-Coyer et al. 2004).

CUMULATIVE EFFECTS

Alternatives 1, 2, and 3 would have no direct or indirect effects and as such, no meaningful cumulative impact.

RED TREE VOLE

(Arborimus longicaudus)

SUMMARY OF EFFECTS

Alternative 1 would result in no effects. Alternatives 2 and 3 would not result in meaningful negative impacts because of relatively poor habitat quality in proposed thinning units and fuel treatment area, and negative survey results. All Alternatives are consistent with the 2001 Survey and Manage ROD requirements for the red tree vole.

The red tree vole (RTV) is a Survey and Manage wildlife species whose known or suspected range includes the Cottage Gove Ranger District, which is at the southern end the North Mesic Zone (Huff et. al 2012).

RTV 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 (Huff et. al 2012).

There 8 known historic RTV locations within the planning area in the Cedar Creek drainage, located during CVS surveys in 2002. None of these known sites exist within a proposed thinning unit.

The proposed harvest units that were previously clear-cut plantations (managed stands) do not meet the definition of mature/old growth forest, nor do they contain remnant older trees. Additionally these stands are under 80 years of age, and are therefore exempt from Survey and Manage under the 2006 "Pechman" exemptions.

The fire regenerated stands are all over 80 years of age, and quadratic mean diameters (QMD) above 16 inches at the stand scale, and as a result all commercial units and roadside fuel treatment areas associated with these stands were surveyed for RTV. Overall, 1,309 acres of potential habitat was surveyed for RTV activity using the Survey Protocol for the Red Tree Vole v3.0 (Huff et. al 2012). The area surveyed fully covers, and often extends beyond, the boundaries of the potential commercial thin and fuel treatment units in Alternatives 2 and 3. Throughout the survey effort 13 potential nests were identified and all 13 trees containing the potential nests were climbed for inspection. Only 1 of the potential nests was confirmed as an RTV nest, the remaining 12 nests were confirmed as non-RTV. The confirmed inactive RTV nest was found in unit 3, and was confirmed inactive by the condition of the nest materials and feces. As an inactive RTV nest, the site does not require protection. The proposed fire regenerated commercial units are located on ridge tops in habitat which would be considered low quality for RTV; stand exam data results demonstrate variables (average dbh, basal area, canopy cover and stand age) which correlate to low probability of occupancy based on habitat

selection modeling (Dunk and Hawley 2009). This relatively low habitat quality, along with the wide-scale past fire disturbance is the hypothesized reason for the lack of RTV activity in the area.

DIRECT AND INDIRECT EFFECTS

Alternative 1 would have no direct, indirect or cumulative impact on the red tree vole because no trees would be cut. The thinning proposed in managed stands in Alternatives 2 and 3 would fell small diameter trees in stands less than 80 years old. These managed thinning units do not meet the stand criteria for suitable habitat for the Northern Mesic Zone (i.e. mature/old-growth forests, with QMD $\geq$ 16" dbh) that would potentially contribute to a reasonable assurance of species persistence within the planning area, and as such proposed activities within these stands would not be expected to cause a consequential negative impact on the species habitat or the persistence of the species at the site (Huff et. al 2012).

The 616 acres (Alternative 2) or 521 acres (Alternative 3) acres proposed for thinning within the fire regenerated stands fall within the boundaries of the area surveyed for RTV activity. The negative result for the RTV survey indicates that the proposed units are not being used by RTV. Therefore, the proposed thinning in these stands would not be expected to cause a consequential negative impact on the species persistence at the site.

Fuel treatment activities will consist of approximately 896 acres (Alt 2) and 870 acres (Alt. 3) through a combination of underburning, and pile burning. These fuel activities are not likely to change the canopy composition of the stands in which they occur. These fuel treatment areas were included as part of the survey effort and the negative result indicates that RTV are not using the habitat within the units. As a result, this this activity is not expected to have a meaningful adverse effect on RTV or their habitat (large old growth trees and overstory canopy cover).

There are no direct or indirect effects associated with connected actions such as culvert replacement and temporary road construction because no mature/old growth or older trees are expected to be impacted

Based on the proposed logging systems, approximately 94 guyline trees of smaller co-dominant trees within potential suitable RTV habitat would need to be felled for safety reasons adjacent to skyline portions of proposed commercial harvest thinning units (Figure 37 shows proposed units and their adjacency to suitable habitat). The guyline trees would range in diameter from 16-24 inches dbh and would likely be used as foraging, not nest trees. Use of old-growth trees would be avoided if possible. Due to the relatively low amount of affected habitat the potential impacts are considered negligible to the species.

The proposed action would have an indirect effect of accelerating the development of larger trees and reduce the risk of future loss of habitat to wildfire by making the stands more fire resilient.

CUMULATIVE EFFECTS

The cumulative impacts to red tree voles are analyzed at the Sharps Creek watershed scale. Past clear-cutting of habitat (approximately 21,000 acres of Forest Service, BLM and private land) has had the largest cumulative impact to this species by removing late-seral habitat. Future clear-cut harvesting on private land (estimated at 150 acres per year) would not impact late-seral habitat because this harvest would be occurring in second-growth plantations. Alternative would have no cumulative effects because no additional habitat would be negatively impacted. Alternatives 2 and 3 would not remove but may respectively degrade 616 or 521

acres of suitable RTV habitat at the site scale. Where habitat conditions exist prior to proposed activities, it is expected that they would remain following project implementation; project sites would retain dominant overstory trees as habitat structures. Thus, the negative cumulative effects caused by the minor and temporary modification of 616 acres (Alternative 2) or 521 acres (Alternative 3) of potentially suitable habitat associated with these activities on the approximately 17,930 acres of remaining habitat would be immeasurable/undetectable. The reasonably foreseeable Calapooya Divide Project would affect the landscape at a similar scale, and the potential effects would be likewise minor and temporary. With these past, present, and reasonably foreseeable events in mind, the cumulative effects of the Quartz Project are minor and would not result meaningfully reduce the ability of the RTV to persist on the landscape.

CONCLUSION

The Quartz Integrated Project is not expected to negatively affect persistence at the site or landscape level because of the small scale of the project, the relatively low habitat quality present in the proposed thinning units, and the negative survey results within thinning units which lead to an overall lack of meaningful direct, indirect, and cumulative effects.

MOLLUSKS – OREGON MEGOMPHIX AND CRATER LAKE TIGHTCOIL

(*Megomphix hemphilli* and *Pristiloma arcticum crateris*)

SUMMARY OF EFFECTS

Alternative 1 would result in no effects. Alternatives 2 and 3 may result in disturbance or death to individuals, and short-term modification to potential habitat within treated stands. All Alternatives are consistent with the 2001 Survey and Manage ROD requirements for mollusk species.

There are two mollusk species that need to be considered in the 2001 Survey and Manage ROD. Local populations of slugs or snails are often termed colonies. Densities of colonies vary from species to species and potentially stable colonies can occupy areas ranging in size from ten to hundreds of square feet. Most of the land mollusks are poor dispersers and do not move far from their natal sites. Mollusks have restricted home ranges and limited dispersal capabilities.

One of these species, *Pristiloma arcticum crateris* is considered as “rare”. Categories 1A states “manage all known sites and complete Strategic Surveys” the 2001 ROD provided for additional mitigations that require pre-disturbance survey for category A species and equivalent effort surveys for category B species. Equivalent effort surveys are to be completed prior to ground disturbing projects. Equivalent effort surveys differ from practical pre-disturbance surveys in that for many of these species their characteristic make detection during such surveys less likely and, therefore, do not qualify as practical. Equivalent effort surveys are only designed to locate the species if it occurs in an identifiable condition during a reasonable survey time period (no more than two field seasons). Equivalent effort surveys are not expected to meet the description of “likely to determine the presence” of the species because the characteristics of these species make finding sites less certain. The Survey Protocol for Survey and Manage Terrestrial Mollusk Species v3.0 (Duncan et. al 2003) states that pre-disturbance surveys should only be conducted within 10 meters of perennially wet areas within forests and riparian areas (p.20). Alternatives 2 and 3 include buffers around all such areas which would cover or

exceed the areas which would require pre-disturbance surveys, (those areas not already exempted from surveys), therefore no pre-disturbance surveys were conducted for this species.

The 2001 ROD has placed Megomphix (*Megomphix hemphilli*) in “Category 1F”, which means that the species is considered “uncommon” and not “rare”, and that pre-disturbance surveys and protection is only required for sites that were found on or before September 30, 1999. New information on this species may result in its removal from Survey & Manage or assignment to another category. Until that time, loss of some sites is not likely to change the level of rarity (USDA/USDI 2001, p. 60).

The Oregon Megomphix is a terrestrial snail species that occurs in moist conifer and hardwood forests at low to moderate elevations. Megomphix snails are most often found within the mat of decaying vegetation under sword ferns and big-leaf maple trees and near rotten logs or stumps. Most occupied sites are on well-shaded slopes and terraces, and many are near streams.

There are no known sites for Oregon megomphix within the Quartz planning area. The nearest known sites are roughly 2 miles to the North of the project area in the Brice Creek watershed on the Cottage Grove Ranger District.

DIRECT AND INDIRECT EFFECTS

Alternative 1 would have no direct or indirect effects as no actions would take place. Direct impacts to this species from Alternatives 2 and 3 include possible injury or crushing from ground disturbing actions such as skidding equipment, temporary road construction, culvert replacement or falling trees from the thinning operation. Activities such as fuels reduction through piling and burning or underburning could also impact individuals if these activities occur while Oregon megomphix are dispersing or foraging. Indirect effects include environmental changes to the stand from opening up the canopy. This allows more sunlight to reach the forest floor which can increase drying and reduce humidity on the forest floor, changing the microclimate of the understory. This results in a short-term negative impact to mollusks in general. Increased sunlight should initiate a long-term benefit to grass, forb and shrub layers, providing a more stable microclimate and increase in available hiding cover. Mitigation measures that protect coarse woody debris, leaf and needle litter and rock outcrops assure long-term viability within the project area and following management considerations outlined in the Conservation Assessment for this species (Applegarth 2013).

CUMULATIVE EFFECTS

Cumulative impacts are analyzed at the Sharps Creek watershed scale. Past timber harvest, road building and prescribed fire may have degraded the quality of potential habitat in the planning area and watershed. Alternatives 2 and 3 would add 1,026 and 850 acres of commercially thinned stands, respectively, to the landscape altered by past timber management. However, Alternatives 2 and 3 would result in movement of managed stands toward a condition more favorable to Oregon megomphix and reduce the risk of future loss of habitat to wildfire by making the stands more fire resilient. Fire regenerated stands would recover in short order and experience the same benefit to fire resiliency. Thus, when considered in the context of past, present, and foreseeable actions, it is determined that there would be no consequential negative cumulative impacts to the species associated with the action alternative. This is because of the small scale and duration of potential habitat-modifying activities, and the expected long-term benefits from projects implementation to habitat conditions for this species. The no action alternative would have no anticipated direct or indirect impacts on the species and thus, does not contribute to a cumulative impact.

CONCLUSION

The Quartz Integrated Project is not expected to negatively affect the persistence to survey and manage mollusk species because of the small scale of the project and associated potential negative impacts. Surveys were not conducted and protection is not required in exempted areas or outside of known sites (according to species as applicable), and riparian protection buffers adequately protect high quality habitat based on survey protocols.

BIOLOGICAL EVALUATION OF WILDLIFE SPECIES

SUMMARY OF EFFECTS

Alternative 1 would result in no effects to TES species. Alternatives 2 and 3 would result in the varied effect determinations for TES species; see Table 30 for summary of effects determinations. The Northern Spotted Owl (the only species listed under the Endangered Species Act) received a may effect, likely to adversely affect determination, and will require formal consultation with the USFWS.

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 (Forest Service Manual 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 Alternatives 2 and 3 and their associated connected actions (Chapter Two) 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 30 lists Region 6 sensitive wildlife species relevant to the Quartz planning area. The table summarizes the presence or absence of and the potential effects 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. Species with no suitable habitat within the planning area, and species with habitat fully contained within protection buffers, and therefore experiencing no impact, will not be discussed further in this section.

Table 30. Region 6 Sensitive Wildlife Species

Sensitive Species	Is species or habitat in or adjacent to actions associated with Alternatives 2 and 3?	Is there a conflict with implementation of the project to species or habitat?	Would the project impact individual or result in loss of viability or trend? (Effects Determinations)
Northern Spotted Owl *Strix occidentalis caurina*	Suitable nesting habitat adjacent and dispersal habitat within the project	Yes; see discussion	Impact to individuals and habitat; Likely to Adversely Affect[16] - Consultation with USFWS required
Pacific Fringe-tailed Bat *Myotis thysanodes vespertinu*	Suitable habitat within and adjacent to project	Yes; see discussion	Project may result in death or injury to individuals but would not result in viability concerns
California Shield-Backed Bug *Vanduuzeeina borealis californica*	Suitable habitat within high elevation meadows	Yes; see discussion	The project would result in no impact to species viability
Johnson's Hairstreak *Callophrys johnsoni*	Yes, adjacent habitat in older forest	Yes; see discussion	Project may result in death or injury to individuals but would not result in viability concerns
Cascade Axetail Slug *Carinacauda stormi*	Suitable habitat within and adjacent to project	Yes; see discussion	Project may result in death or injury to individuals but would not result in viability concerns
Mardon Skipper *Polites mardon*	Suitable meadow habitat within and adjacent to project	Yes; see discussion	Project may result in death or injury to individuals but would not result in viability concerns
Evening Fieldslug *Deroceras hesperium*	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 viability
Coronis Fritillary *Speyeria coronis coronis*	Suitable meadow habitat within and adjacent to project	Yes; see discussion	The project would result in no impact to species viability
Crater Lake Tightcoil *Pristiloma arcticum crateris*	Suitable habitat within and adjacent to project	Presence assumed; no conflict to species with protection buffers	The project would result in no impact to species viability

16 Likely to Adversely Affect

Sensitive Species	Is species or habitat in or adjacent to actions associated with Alternatives 2 and 3?	Is there a conflict with implementation of the project to species or habitat?	Would the project impact individual or result in loss of viability or trend? (Effects Determinations)
		adjacent to perennial wet areas	
Northern Bald Eagle *Haliaeetus leucocephalus*	No suitable habitat within or adjacent to potential actions	No	The project would result in no impact to species viability
Harlequin Duck *Histrionicus histrionicus*	No, Streams adjacent to units are too small and not suitable for nesting.	No	The project would result in no impact to species viability
Peregrine Falcon *Falcon peregrinus anatum*	No suitable habitat within or adjacent to project	No	The project would result in no impact to species viability
Black Swift *Cypseloides niger*	No suitable habitat within or adjacent to project	No	The project would result in no impact to species viability
Fisher *Martes pennanti*	Suitable dispersal habitat in mature stands	Short-term impact to foraging habitat; see discussion	The project would result in no impact to species viability
Foothill Yellow-legged Frog *Rana boylii*	Suitable habitat along Sharps Creek outside of project area	Project will have no impact to suitable stream habitat	The project would result in no impact to species viability
Northwestern Pond Turtle *Clemmys marmorata marmorata*	Suitable habitat within and along lower reaches of Martin Creek	Project will have no impact to suitable stream habitat. possible impact to overwintering habitat; see discussion	Project may result in death or injury to individuals but would not result in viability concerns
Gray Blue (butterfly) *Plebejus (Agriades) podarce*	No suitable habitat within or adjacent to project	No	The project would result in no impact to species viability

NORTHERN SPOTTED OWL (NSO)

The following incorporates by reference the Biological Assessment for the Quartz Integrated Project. Consult the Biological Assessment for more detailed information concerning the northern spotted owl and the analysis that was conducted concerning the impact of this project to the species.

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).

The analysis area is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (USC 2002a). For this consultation, because the NSO is the only listed or proposed species likely affected by the proposed action, the analysis area includes all federal, state, and privately owned lands within 1.2 miles (median NSO home range radius for the western Cascades) of proposed treatment areas and all home ranges of currently occupied or historic NSO activity centers that could be directly, indirectly or cumulatively impacted through the proposed actions.

The Quartz Integrated Project action area and NSO analysis area covers about 32,701 acres, of which 20,684 acres (63%) are currently suitable nesting, roosting, and foraging habitat (NRF) for the NSO (Table 31).[17] This analysis area encompasses 27,023 acres of designated critical habitat from two West Cascades South subunits (18,062 acres from subunit 5, and 8,961 acres from subunit 6), and 9,179 acres of Late Successional Reserve Unit 222. The Quartz project is situated in the southwest corner of the Cottage Grove Ranger District and as a result, the analysis area covers multiple federal and non-federal ownerships. The breakdown of the habitat by ownership, NWFP land allocation, and habitat quality is summarized in Table 31 and displayed in Figure 36.

Table 31. NSO Environmental Baseline: Action Area for Quartz

Umpqua National Forest Northwest Forest Plan	Acres	Suitable NSO NRF Habitat Acres (%Total)	Capable NSO NRF Habitat Acres (%Total)	Protected Acres[1] (% Total)	Unprotected Acres (%Total)
Ownership					
All Ownerships	32,701	20,686 (63%)	32,607 (99%)	18,012 (55%)	14,689 (57%)
Private, State, and other non-BLM Government	3,473	583 (17%)	3,466 (99%)	0	3,473 (100%)
Federal	29,004	20,003 (69%)	28,917 (99%)	18,012 (62%)	11,216 (34%)
Land Allocations- Federal (hierarchal, no acres double-counted)					
Administrative Withdrawn	None	None	None		
Late-Successional Reserves (mapped)	9,179	5,935 (65%)	9,155 (99%)		
100-Acre Spotted Owl Core Areas in the Matrix	1,399	1,189 (85%)	1,399 (100%)		

[17] For this analysis, NRF calculations were based on data from the 15 year monitoring report for the Northwest Forest Plan spotted owl habitat model (Davis et al. 2011).

Umpqua National Forest Northwest Forest Plan	Acres	Suitable NSO NRF Habitat Acres (%Total)	Capable NSO NRF Habitat Acres (%Total)	Protected Acres[1] (% Total)	Unprotected Acres (%Total)
Riparian Reserves (Matrix and AMA acres only)	7,433	5,230 (70%)	7,146 (99%)		
Matrix/Adaptive Management Areas	11,216	7,752 (69%)	11,169 (99%)		
[1]Protected = land allocation with no programmed timber harvest.					

Every currently active or historic spotted owl home range that had units within them was included in this analysis in order to maintain sites in accordance with Recovery Action 10 of the 2011 Revised Recovery Plan for the Northern Spotted Owl. Fifteen total sites fell within this analysis area (2 sites confirmed active in surveys which occurred in 2013 and 2014, and 13 historic sites with no known spotted owl activity; Table 33). One of these historic sites (NSO site 0137) currently lacks sufficient amounts of habitat within the core use are and home range needed to reliably support occupancy, survival and reproduction (see below for descriptions of these scales of habitat use; see the Effect to NSO Critical Habitat for a description of necessary quantities of suitable habitat). The remaining 14 spotted owl sites maintain at or above the minimum thresholds of suitable NRF habitat.

DIRECT AND INDIRECT EFFECTS TO HABITAT

NSOs remain on their home range throughout the year. As a result, NSOs have large home ranges that provide all the habitat components and prey necessary for the survival and successful reproduction of a territorial pair. In the western Cascades, a 1.2-mile radius circle around an owl activity center is used to represent the owl's home range (Thomas and Raphael 1993).

Home ranges contain three distinct use areas:

> 1) The nest patch, which research has shown to be an important attribute for site selection by NSOs and includes approximately 70 acres usually of contiguous forest (300-meter radius around a nest center) (Perkins 2000, Swindle et al.1997).
> 2) The core area, which is used most intensively by a nesting pair and varies considerably in size across the geographic range, but on average includes approximately 500 acres (800 meters radius around a nest center; Swindle et al. 1999, Irwin et al. 2000 and 2005) and generally a greater proportion of mature/old forest (Courtney et al. 2004).
> 3) The remainder of the home range, which is used for foraging and roosting and is essential to the year-round survival of the resident pair.

Refer to the Quartz Project Biological Assessment for an explanation of the rationale and scientific literature behind the selection of home range, core use areas, and nest patches.

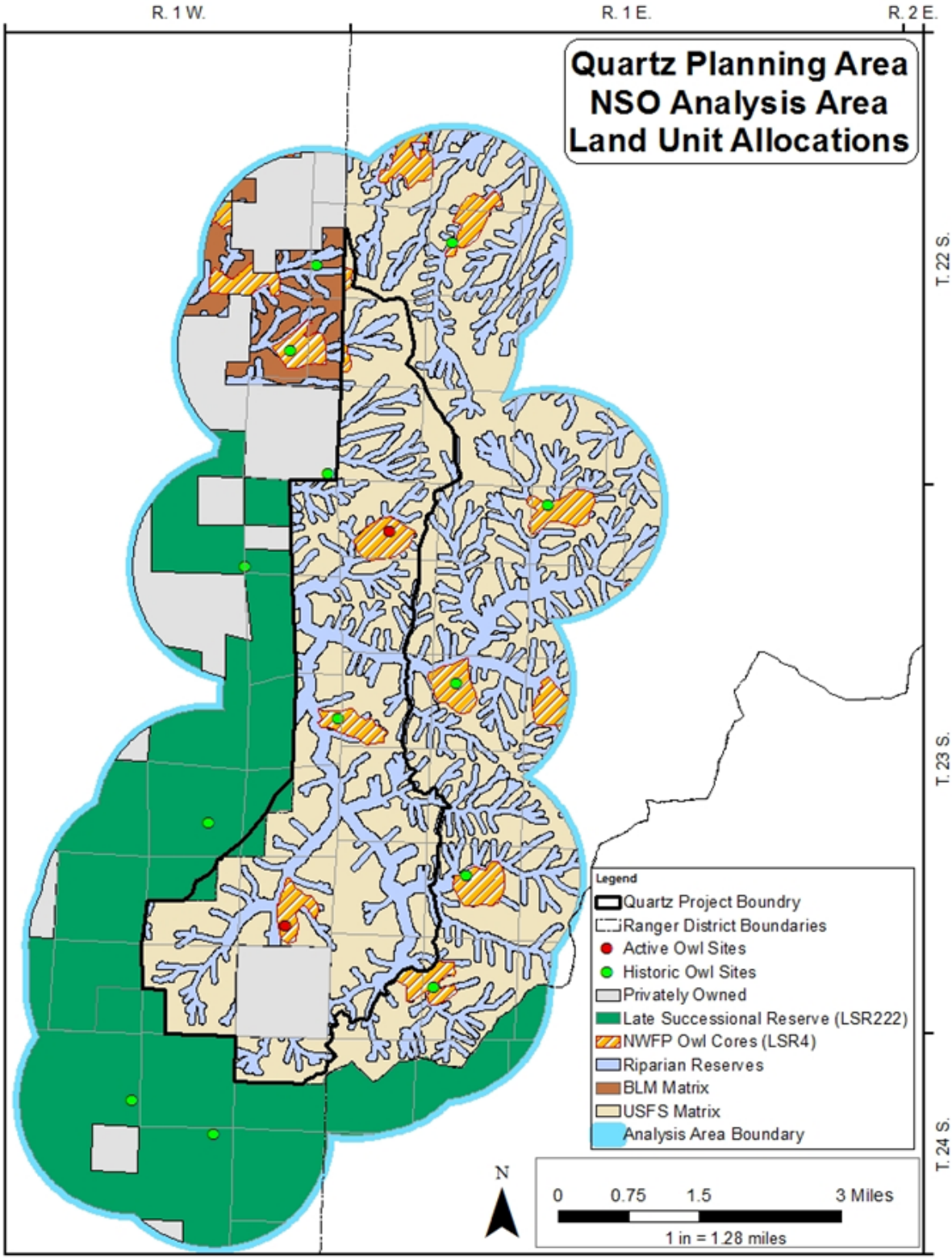

Figure 36. NSO Action Area Land Allocation

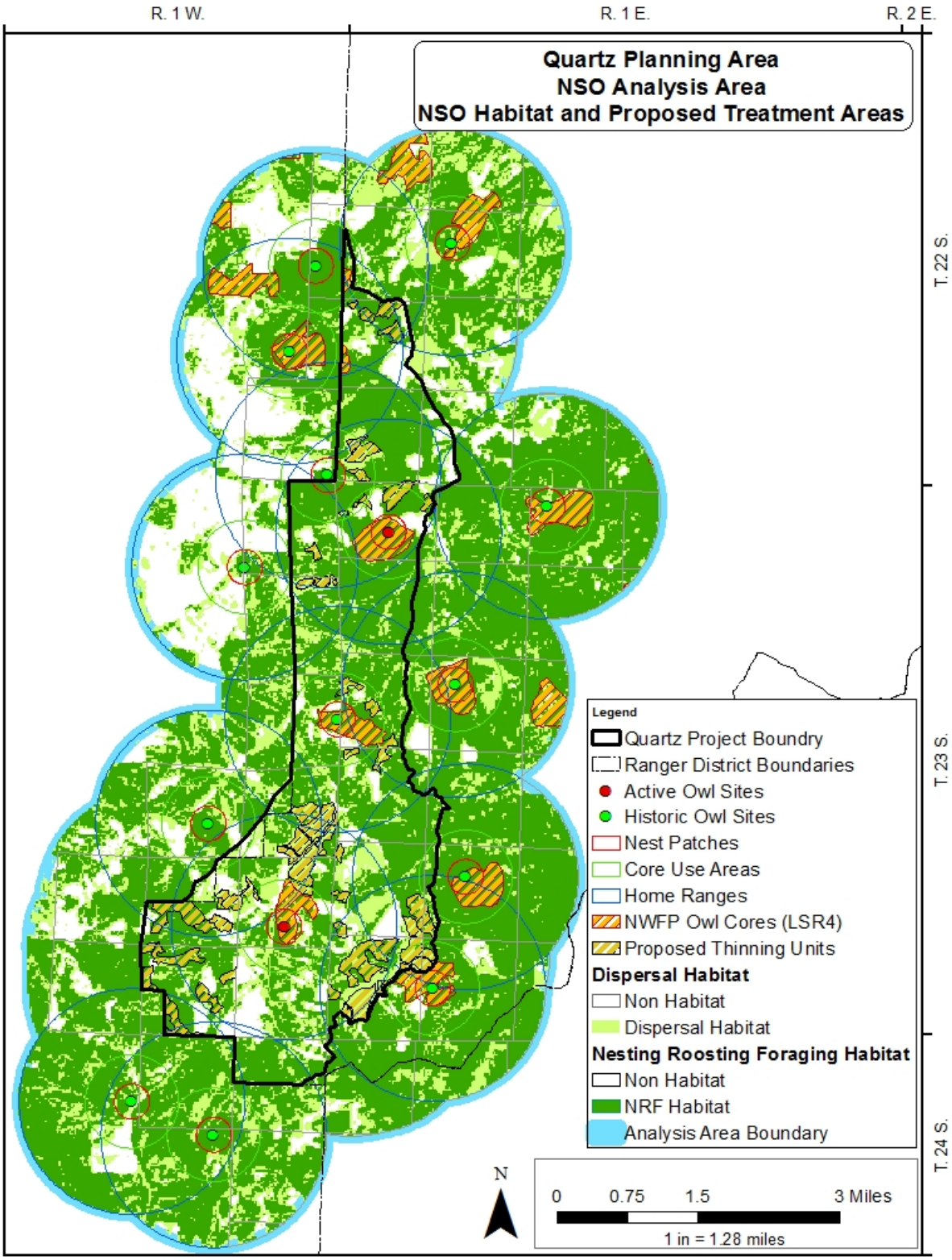

Figure 37. Suitable NRF Habitat, Activity Centers and Home Ranges

Proposed action and connected action activities that may result in impacts to NSO's or their habitat include:

- Harvest using helicopter, ground-based, and skyline logging systems.
- Nine landings for helicopter logging would be used up to one acre in size. Two of these landings will be created for the project: one which will be constructed entirely within plantation unit 31, and one in fire regenerated unit 5. The helicopter landing which will be constructed in unit 5 will be created in what is currently NRF habitat, which will remove 1 acre of NRF habitat. The remaining helicopter landings will be created using existing landings or wide road features which may require expansion of the existing opening to up to one acre in size.
- Approximately 1.7 miles of existing temporary roads would be used. Approximately 0.7 miles of existing road would be used, and another 1 mile of temporary roads would be created within and/or bordering on existing units. All temporary roads would be obliterated after use. Due to the narrow 15 foot road width, the temporary roads will still function as NRF and dispersal habitat.
- Road reconstruction and maintenance work on approximately 54 miles of existing roads including approximately 9 miles on BLM roads needed for project access.
- Road decommissioning on approximately 1.5 miles on the 2300-106 and 2300-808 roads near Quartz Creek. Activities include removing culverts and a failing wooden bridge, restoring stream channels at stream crossings, ripping and out sloping road surfaces, stabilizing fill slopes, and blocking entrances.
- Road inactivation on approximately 1.6 miles on the 2241-841 road. Activities include removing culverts, installing water bars and blocking entrances.
- Expansion of the existing Shane Saddle rock pit on the North Umpqua Ranger District as one of the rock sources for the road work. The expansion would include about 100 horizontal feet into the previously undisturbed rock outcrop area above the current top of the pit.
- Snag creation within plantation units (See the Coarse Woody Debris Section).
- Invasive weed management within harvest unit and along existing roads.
- Treating activity-created fuels would occur on approximately 522 of the harvested acres using a combination of underburning, machine piling, and hand piling and burning.
- Outside of the commercial thin areas, treat surface and ladder fuels over 334 acres within 200 feet of strategic ridgeline roads. Understory fuel treatments would include thinning trees (<10" dbh) and shrubs, pruning, piling and burning, or chipping.
- Meadow maintenance and restoration on 18 acres within dry meadows and the 30 acres of transitional zone surrounding the meadows. Activities would include meadow burning, cutting encroaching conifers, pulling non-native and invasive weeds, and underburning the area surrounding the meadows.

Within the analysis area, thinning treatments are proposed on 409 acres (Alternative 2) or 327 acres (Alternative 3) within plantation stands, and on 616 acres (Alternative 2) or 521 acres (Alternative 3) within fire regenerated stands. Together, these treatments lead to a total treatment of 1,026 acres (Alternative 2) or 850 acres (Alternative 3) of commercial thinning. Alternative 3 would include some ¼ acre gaps being created in some of the units totaling 9.5 acres. Both Alternatives would include 1/10 acres gaps for 5 needle pines which are not mapped or quantified at this time as they would be placed around pines as they occur across the landscape. A summary of expected post treatment conditions pertaining to NSO habitat conditions is included in Table 32, along with landscape level (for the analysis area) effects to NRF and dispersal habitat. Overall, canopy cover is expected to decrease in treated stands and will reduce some habitat from NRF to dispersal habitat. Overall, 392 acres (Alternative 2) or

324 acres (Alternative 3) of will be reduced from low quality NRF (suitable foraging habitat) to dispersal-only habitat as canopy cover is expected to drop below 60%. If Alternative 3 is selected, 327 acres of dispersal habitat would likely be modified to non-habitat as canopy cover is expected to drop just below 40% in all but one of the managed stands. Overall, however, dispersal habitat is expected to increase under both Alternative 2 and 3 as a result of the modification of NRF habitat to dispersal habitat.

Table 32. Summary of Post Treatment Conditions and Landscape Effects to NSO Habitat

	Managed Stands		**Fire Regenerated Stands**	
	Alternative 2	Alternative 3	Alternative 2	Alternative 3
Acres Proposed	409 Acres	327 Acres	616 Acres	521 Acres
Post Treatment Trees Per Acre	60-80	40-60	60-80	Same as Alt 2
Post Treatment Canopy cover	41-46%	37-42%	49-64%	Same as Alt 2
Entire Analysis Area (32,701 acres)				
	Alternative 2		Alternative 3	
NRF Habitat Post Treatment	20,294 Acres		20,363 Acres	
Change in NRF Habitat	392 Acre Decrease		324 Acre Decrease	
Dispersal Habitat Post Treatment	7,838 Acres		7,466 Acres	
Change in Dispersal Habitat	403 Acre Increase		31 Acre Increase	

Two spotted owl territories were found to be currently active during surveys which took place in 2013 and 2014 (Territories 640 and 655). Both of these currently active territories contain proposed thinning units within their home ranges and core use areas. Alternatives 2 and 3 would reduce canopy cover in proposed commercial stands as a result of proposed thinning. In most fire-regenerated stands this would result in existing NRF habitat being reduced to dispersal habitat.. Thinning would also impact other important biological features such as coarse wood debris. Pre-existing snags and downed wood will be retained to the greatest extent possible post treatment (see Chapter 2 for all associated project design features). Refer to Coarse Woody Debris Section for information on coarse wood management objectives and effects to snags and down wood. Other important biological features such legacy trees and large trees with broken tops and deformities would remain on site. Table 33 summarizes the existing condition (Alternative 1) of NRF habitat for these home ranges and expected post treatment conditions by NSO territory for each Alternative. Change in NRF acreage is highlighted in red, and territories identified as currently occupied are identified in bold text.

Table 33. NRF Habitat Within the Quartz Analysis Area by Alternative.

		Nest Patch (70 acres)				**Core (500 acres)**				**Range (2895 acres)**			
		NRF		**Dispersal**		**NRF**		**Dispersal**		**NRF**		**Dispersal**	
ID	**Alt**	**Per-cent**	**Acres**	**Per-cent**	**Acres**	**Per-cent**	**Acres**	**Per-cent**	**Acres**	**Per-cent**	**Acres**	**Per-cent**	**Acres**
020	1	64%	45	30%	21	68%	341	23%	114	75%	2208	19%	575
	2	64%	45	30%	21	68%	341	23%	114	74%	2172	21%	620

		Nest Patch (70 acres)				Core (500 acres)				Range (2895 acres)			
		NRF		Dispersal		NRF		Dispersal		NRF		Dispersal	
	3	64%	45	30%	21	68%	341	23%	114	74%	2172	20%	598
137	1	53%	37	32%	22	27%	133	25%	123	35%	1047	21%	619
	2	53%	37	32%	22	27%	133	25%	123	35%	1052	34%	1013
	3	53%	37	32%	22	27%	133	25%	123	35%	1052	31%	903
148	1	80%	56	17%	12	56%	279	29%	146	53%	1569	33%	982
	2	80%	56	17%	12	56%	279	29%	146	52%	1545	21%	612
	3	80%	56	17%	12	56%	279	29%	146	52%	1546	21%	612
211	1	95%	67	5%	3	80%	398	16%	80	53%	1567	19%	565
	2	95%	67	5%	3	80%	398	16%	80	51%	1521	21%	612
	3	95%	67	5%	3	80%	398	16%	80	51%	1521	21%	612
250	1	68%	48	19%	13	61%	307	24%	120	57%	1694	18%	536
	2	68%	48	19%	13	61%	303	25%	124	56%	1651	20%	579
	3	68%	48	19%	13	61%	303	25%	124	56%	1652	19%	559
356	1	88%	62	12%	8	70%	351	28%	142	67%	1970	24%	711
	2	88%	62	12%	8	70%	351	28%	142	66%	1957	25%	725
	3	88%	62	12%	8	70%	351	28%	142	66%	1957	25%	725
522	1	96%	68	2%	2	73%	365	9%	44	56%	1654	25%	726
	2	96%	68	2%	2	73%	365	9%	44	54%	1603	26%	777
	3	96%	68	2%	2	73%	365	9%	44	54%	1603	26%	777
639	1	82%	57	13%	9	66%	332	28%	138	71%	2086	24%	696
	2	82%	57	13%	9	65%	326	29%	145	67%	1974	27%	811
	3	82%	57	13%	9	65%	326	19%	94	68%	2001	22%	646

		Nest Patch (70 acres)				Core (500 acres)				Range (2895 acres)			
		NRF		Dispersal		NRF		Dispersal		NRF		Dispersal	
640	1	74%	52	24%	17	50%	249	37%	185	46%	1366	37%	1107
	2	74%	52	24%	17	50%	249	37%	187	41%	1214	43%	1268
	3	74%	52	24%	17	50%	249	35%	175	42%	1234	36%	1065
645	1	99%	69	1%	1	91%	453	9%	46	79%	2347	17%	495
	2	99%	69	1%	1	91%	453	9%	47	78%	2297	18%	546
	3	99%	69	1%	1	91%	453	9%	46	79%	2324	15%	447
649	1	75%	53	12%	9	66%	328	23%	116	69%	2028	26%	765
	2	75%	53	12%	9	62%	308	27%	137	67%	1980	28%	813
	3	75%	53	12%	9	62%	308	27%	137	67%	1980	27%	786
651	1	90%	63	10%	7	79%	396	20%	100	81%	2386	17%	489
	2	90%	63	10%	7	79%	396	20%	100	80%	2356	18%	519
	3	90%	63	10%	7	79%	396	20%	100	80%	2356	18%	519
655	1	85%	60	9%	6	74%	370	12%	62	74%	2194	18%	529
	2	85%	60	9%	6	68%	342	18%	91	73%	2152	19%	572
	3	85%	60	9%	6	68%	342	18%	91	73%	2152	19%	549
657	1	76%	53	23%	16	87%	435	12%	62	82%	2428	14%	412
	2	76%	53	23%	16	87%	435	12%	62	82%	2428	14%	412
	3	76%	53	23%	16	87%	435	12%	62	82%	2428	14%	412
670	1	78%	54	22%	16	58%	292	29%	143	59%	1746	32%	958
	2	78%	54	22%	16	58%	292	29%	143	58%	1705	34%	1000
	3	78%	54	22%	16	58%	292	29%	143	58%	1705	34%	1000

Thinning would occur within the home ranges of the two currently occupied NSO sites (640 and 655), and some of that thinning would occur at the core use area scale. No thinning activity is proposed within the nest patches. Table 34 contains a detailed breakdown of effects to NSO habitat for each Alternative broken down by proposed thinning unit, including estimated post treatment canopy cover.

Approximately 421 acres of commercial thinning is proposed within the home range of NSO territory 640 under Alternatives 2 and 3. 198 acres of this thinning would occur in managed stands (which does not currently support NRF habitat) and 223 acres of thinning would occur in fire-regenerated stands (which is comprised of mostly suitable, low-quality NRF habitat) and would reduce canopy cover to below 60% (the NRF threshold) in most stands, reducing these stands to dispersal habitat (Table 34). As a result of the thinning treatment and the associated reduction of canopy cover, NSO territory 640 is likely to experience a 4% to 5% reduction in NRF habitat (as a proportion of the total area) within the home range as a result of Alternatives 2 and 3 (Table 33).

Alternatives 2 and 3 propose 29 acres of commercial thinning in the core use area of NSO territory 640. These commercial thinning units are in previously managed former plantations, which do not currently support NRF habitat. As a result, there is no expected loss to NRF habitat within the core use area, and a slight gain (Alternative 2) or slight loss (Alternative 3) in dispersal habitat due to the difference in thinning prescription.

136 acres of commercial thinning is proposed within the home range of NSO territory 655 under Alternatives 2 and 3. 57 acres of this thinning would occur in managed stands (which does not currently support NRF habitat) and 78 acres of thinning would occur in fire-regenerated stands (which is comprised of mostly suitable, low-quality NRF habitat). Canopy cover is expected to remain above 60% in 23 of these 57 acres, which would allow those stands to continue to support NRF habitat (Table 34). In the remaining treated areas where canopy cover is expected to be below 60%, the habitat would function as dispersal habitat until canopy cover increases as the stand grows. As a result of the proposed thinning treatment and the associated reduction of canopy cover, NSO territory 655 is likely to experience a 1% reduction in NRF habitat (as a proportion of the total area) within the home range as a result of Alternatives 2 and 3 (Table 33).

Alternatives 2 and 3 propose 49 acres of commercial thinning in the core use area of NSO territory 655. These commercial thinning units are in fire regenerated stands which are currently comprised of mostly NRF habitat. 47 out of the 49 acres of the proposed thinning will reduce canopy cover below 60% (Table 34). As the result of this canopy cover reduction, these 49 acres will no longer support NRF habitat, causing a 6% loss of NRF habitat (as a proportion of the total area) within the core use area under Alternatives 2 and 3 (Table 33).

Given the silvicultural prescriptions for the proposed timber sales, dispersal habitat would be reduced to non-habitat in some plantation unit treatments, and 392 acres of dispersal habitat would be gained by the reduction of NRF habitat to dispersal habitat. Overall, Alternatives 2 and 3 would lead to a gain of approximately 403 acres or 31 acres of dispersal habitat respectively.

Post treatment canopy conditions for both occupied territories are expected to support quantities of NRF and dispersal habitat sufficient to provide for the survival and reproduction need for the resident owls. Areas in which NRF or dispersal habitat quality is reduced due to thinning would recover in the relatively short term as the stands grow and canopies close at roughly 2% per year (Chan 2006).

Table 34. Summary of Thinning Activity in Occupied NSO Territories

NSO 640					
Core Use Area					
			Canopy Cover		
Thinning Unit	Unit Status	Acres	Alternative 1	Alternative 2	Alternative 3
14	Managed	13	80%	43%	38%
16	Managed	16	77%	46%	42%
Home Range					
			Canopy Cover		
Thinning Unit	Unit Status	Acres	Alternative 1	Alternative 2	Alternative 3
14	Managed	120	80%	43%	38%
15	F-Regenerated	9	79%	50%	50%
16	Managed	20	77%	46%	42%
17	F-Regenerated	4	86%	48%	48%
18	Managed	17	77%	41%	38%
19	F-Regenerated	12	84%	49%	49%
20	F-Regenerated	36	79%	64%	64%
24	F-Regenerated	23	82%	58%	58%
25	F-Regenerated	9	82%	58%	58%
26	F-Regenerated	7	68%	49%	49%
27	F-Regenerated	9	76%	54%	54%
28	F-Regenerated	11	68%	49%	49%
29	F-Regenerated	94	64%	52%	52%
30	F-Regenerated	8	79%	50%	50%
31	Managed	41	72%	42%	38%
NSO 655					
Core Use Area					
			Canopy Cover		
Thinning Unit	Unit Status	Acres	Alternative 1	Alternative 2	Alternative 3
4	F-Regenerated	4	78%	54%	54%
5	F-Regenerated	35	85%	59%	59%
6	F-Regenerated	7	88%	55%	55%
7	F-Regenerated	2	73%	62%	62%
Home Range					
			Canopy Cover		
Thinning Unit	Unit Status	Acres	Alternative 1	Alternative 2	Alternative 3
2	Managed	35	80%	46%	No Thin
3	F-Regenerated	11	79%	61%	61%
4	F-Regenerated	11	78%	54%	54%
5	F-Regenerated	37	85%	59%	59%
6	F-Regenerated	7	88%	55%	55%

Thinning Unit	Unit Status	Acres	Alternative 1	Alternative 2	Alternative 3
7	F-Regenerated	2	73%	62%	62%
8	F-Regenerated	9	90%	63%	63%
9	Managed	22	70%	42%	37%

Most proposed thinning units are directly adjacent to NRF habitats that have no proposed harvest activity within them. Based on the proposed logging systems, approximately 94 guyline trees in adjacent NRF would need felled for safety reasons across the project area. The guyline trees would range in diameter from 16-24 inches dbh. Use of old-growth trees would be avoided, if possible. Of the estimated 94 guyline trees, 22 would occur in NSO territory 640 and about 32 would occur in NSO territory 655. No guyline trees are proposed for felling within LSR4s, and all guyline trees would be in the 2012 CHU (subunits West Cascade South 5 and 6). Overall, guyline tree felling represents a minor direct degradation of NRF habitat at a limited scale. Guyline trees would not continue to function as potential nest or roost trees in these stands, but they would remain on site to serve as habitat for prey. Affected stands are expected to continue to function as NRF following project implementation.

There are also multiple potential indirect effects to spotted owls associated with this project. Dense, closed-canopy second-growth forest without structural legacies (large trees and snags), is poor habitat for most owl prey species (Carey 1995, Carey and Harrington 2001, Carey and Johnson 1995). It is also poorly suited for owl roosting, foraging, or nesting (Carey et al. 1992). This period of low structural diversity can last >100 years (Carey et al. 1999a, Franklin et al. 2002) and can have profound effects on the capacity of the forest to develop biodiversity in the future (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). This project would accomplish variable-density thinning in 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, stimulate the growth of advanced understory trees (Tappeiner et al. 1997), and affect changes in species composition that would provide habitat for a variety of plant and animal species (Muir et al. 2002). Thinning reduces competition among remaining trees and accelerates diameter growth of retained trees. Forest growth simulator and coarse wood dynamics models (FVS & FFE) used to forecast the effects of the silvicultural prescriptions showed that moderate thinning would accelerate successional development, while maintaining down wood at levels within normal ranges for these forest types (Mellen-McLean et al. 2012). Over time, the proposed silvicultural treatments are expected to enhance NRF habitat, improve habitat connectivity in the action area and reduce the risk of loss of habitat due to stand-replacing wildfires. Consequently, Alternatives 2 and 3 would have an indirect beneficial effect to the spotted owl and their habitat in the long-term.

Commercial thinning may indirectly affect NSOs through changes to prey species habitat. However, the potential response to commercial thinning varies by prey species and temporal scale; and there are some contradictory conclusions about prey responses to commercial thinning in current literature. Sakai and Noon (1993) reported that wood rats were not impacted by thinning, although some individuals may be more exposed in the disturbed area or may move away from the disturbed area over the short-term. Some minor changes in prey availability are

likely because implementation of the proposed action would disturb prey habitat and cause animals to move around in the understory. Because some stands currently harboring dusky-footed wood rat would be opened up, spotted owl prey availability might even increase during and immediately after treatment. However, the action area is outside of the portions of the NSO species range where wood rats are documented as being important prey. Thus, potential effects to this prey species, whether negative or positive would have a limited indirect impact on the NSO. Other prey species whose availability is expected to increase during and immediately after project implementation are deer mice, chipmunks and pine squirrels. The development of understory habitat resulting from proposed thinning would favor these and other associated species.

The northern flying squirrel (*Glaucomys sabrinus)* is a known important prey species for the NSO within the action area. Some current literature indicates that northern flying squirrel abundance decreases following thinning which removes midstory canopy layers, increasing predation risk to flying squirrel (Bull et al. 2004, Carey 2000, Hebers and Klenner 2007, Lehmkuhl et al. 2006, Manning et al. 2012, Wilson 2010). Based on the above body of research, it is reasonable to expect some negative, indirect effects to spotted owls from the proposed thinning due to reduced availability of this prey, at least in the short-term. However, the expected changes in the abundance and richness of hypogenous fungi (an important food source for flying squirrels) are also a consideration with regard to this NSO prey species. Gomez et al. (2005) found greater biomass of *Rhizopogon* and *Gautieria* in moderately or heavily thinned stands (two genera of fungi that are highly selected for by flying squirrels) and some evidence that thinning intensity may have positively affected the body mass of flying squirrels. Additionally, if treated stands are allowed to develop over time, the proposed silvicultural prescriptions are expected to result in stand structural conditions that would be considered optimal habitat for supporting high densities of northern flying squirrels. This indicates there are also potential beneficial indirect effects to spotted owls associated with this project through long-term, improved habitat conditions and increased abundance of this prey species.

Effects to NSO Critical Habitat

The Final Rule for the Revised Critical Habitat for the Northern Spotted Owl was published in 2012 (USDI 2012). The Quartz NSO analysis area contains 27,023 acres of designated critical habitat from two West Cascades South (WCS) subunits (18,062 acres from subunit 5, and 8,961 acres from subunit 6). In Alternatives 2 and 3, all but 49 acres of commercial thinning and 2 acres of understory fuel treatments fall within designated critical habitat (Table 35). All proposed commercial treatments would occur in WCS-5, but some understory treatments would occur in WCS-6. The proposed actions are expected to be consistent with forest health and resiliency and biodiversity objectives associated with critical habitat designation.

Table 35. NSO critical habitat acres by subunit in the Quartz action area.

Subunit	Acres	Thinning Acres	Fuel Treatment Acres
WCS-5	18,062	977	324
WCS-6	8,961	0	48
Total	**27,023**	**977**	**372**

The proposed understory fuel treatments will only impact brush, ladder fuels, and small understory trees in a way that are not expected to appreciably alter the ability for the habitat to

provide the PCE's present in the fuel treatment areas, and are therefore not likely to adversely affect critical habitat.

The proposed thinning of 407 acres within 45-65 year old plantations will reduce canopy cover and snag densities in habitats that meet descriptions PCE 1 (Douglas fir and mixed conifer) and 4 (dispersal habitat), and in some cases PCE 3 (foraging habitat). The proposed treatments in the 570 acres of stands 100-120 years old that are currently function as NRF habitat (PCE's 1-4) will have a reduction of canopy below 60% in some stands, and will have both a short term and long term reduction in coarse wood recruitment within unit boundaries. There will be a short term reduction in NSO NRF habitat as a result of these treatments, but there will be a long term benefit in the form of increased structural diversity, increased tree vigor, diameter growth, retention of species diversity and increased fire resiliency. Because these thinning treatments are likely to have negative impacts to PCE's in designated critical habitat, the effects to WCS-5 were analyzed (there are no thinning treatments proposed in CHU-6).

To analyze for adverse effects and adverse modification, the final rule states:

"*(W)e are recommending that the effects determination for a section 7 consultation be conducted at a scale consistent with ''the localized biology of the life-history needs of the northern spotted owl (such as the stand scale, a 500-acre (200-ha) circle, or other appropriate, localized scale).*'' P. 71889

To do conduct this analysis pre and post treatment NRF raster layers were assembled in ArcGIS 10.1. A 500 acre circular focal statistics window was used to get pre and post treatment conditions of the NRF habitat within and surrounding the thinning units. The post treatment NRF values were then subtracted from the pretreatment NRF values to document the change in NRF condition at the 500 acre scale, and a calculated percent reduction in NRF habitat was assigned to each thinning unit.

Table 36. Proportion of NRF habitat within selected units.

Unit Number	No Action	Post Treatment	Difference (NRF Reduction)
30	49%	36%	13%
22	77%	34%	14%
24	65%	50%	15%
29	42%	26%	16%

The units with the highest difference in the pre and post treatment NRF condition were selected for a detailed unit by unit pre and post treatment habitat loss analysis, documented in Table 36 and Figure 38. Other units also experienced reductions in NRF habitat, but to a lesser degree. In terms effects to the critical habitat subunit WCS-5, approximately 392 acres of NRF habitat are expected to be reduced to dispersal habitat, which constitutes 0.17% of the approximately 221,165 acres of NRF habitat currently in WCS-5.

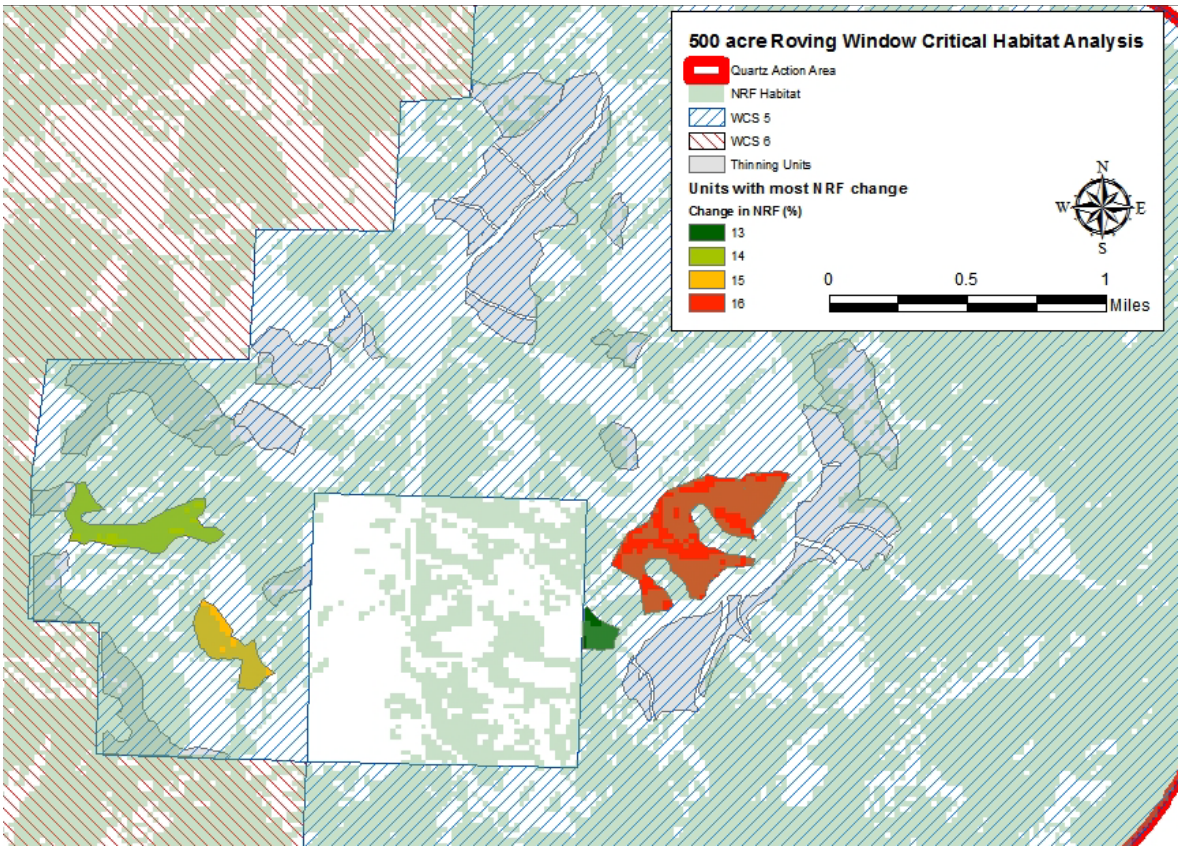

Figure 38. Thinning units which have the highest loss of NSO habitat at the 500 acre scale.

Conclusion - As a result of this analysis, the downgrading of NRF habitat as analyzed at the 500 acre scale for the units within critical habitat containing NRF resulted in the determination that the Quartz Integrated Project will likely adversely affect 2012 critical habitat because adverse effects to primary constituent elements within designated critical habitat are expected. However, the project's objectives of improving structural diversity and heterogeneity in young plantations, increasing structural diversity while retaining species diversity (such as five-needle pines) in all stands, and the improvement of fire resiliency within treated stands and across the landscape is consistent with the 2012 final rule on habitat management within critical habitat.

Consistency with NSO Recovery Actions

In July of 2011, the revised recovery plan for the Northern Spotted Owl was finalized (USDI 2011). The Recovery Plan included four Recovery Criterion and 33 Recovery Actions, of which 2 Recovery Actions apply to the Quartz Integrated Project.

> **Recovery Action 10**: *Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population.*

Recovery Action 10 goes on to suggest that in unsurveyed owl habitat the USFWS and Forest Service should work together to minimize impacts to potential spotted owl sites. The Recovery Plan also defines spotted owl sites as both sites currently occupied and historic sites. As such, effects to all spotted owl sites currently occupied or historically established have been analyzed. All spotted owl sites within the analysis area were assessed for NRF and dispersal habitat quantities available, and to ensure that habitats currently being hindered by lack of suitable habitat would not be further negatively affected. Generally when the area within the circle

contains less than 40 percent of NRF habitat, spotted owl occupancy, survival, and reproduction is reduced (Bart 1995; Bart and Forsman 1992; Dugger et al. 2005 and Thomas et al. 1990). Additionally, data indicates that the quantity and configuration of NRF habitat within the approximate core use area is a valid indicator of the occupancy, survival, and reproduction of spotted owls (Franklin et al. 2000; Dugger et al. 2005; Dugger et al. 2011; Olson et al. 2004; and Zabel et al. 2003). Dugger et al. (2005) also indicated that survival and reproduction are generally supported when 40-60 percent of the core use area is composed of older forests (i.e. NRF habitat). These findings are reflected in the Revised Recovery Plan under Recovery Action 10; priority condition is set at ≥50% suitable habitat within the core use area, and ≥40% suitable habitat within the provincial home range (USDI 2011). One of the 15 NSO territories in the analysis area (territory 0137) currently lacks NRF habitat to these specified quantities (Table 33). 33 acres of commercial thinning is proposed within the home range of this territory. 22 acres of this thinning will take place in a managed stand which will not alter NRF habitat. The remaining 11 acres of thinning will take place in fire regenerated stands which is currently NRF habitat located on ridge tops toward the edge of the home range. The estimated canopy cover in these fire regenerated stands (units 7 and 8) is estimated to remain above 60% allowing the stands to continue to support NRF habitat (see Table 34 for estimated post-thinning canopy cover). The conclusion of this analysis is that the proposed thinning will not further reduce NRF habitat in NSO territory 0137, and will not reduce suitable habitat in the other 14 NSO territories to below the biologically necessary values discussed above. This means that within the analysis area known owl sites both current and historic are being conserved, and so Alternatives 2 and 3 are both consistent Recovery Action 10.

Additionally, all of the treatments proposed within this project are to either reduce the potential for loss of habitat from stand replacing fire and/or are designed to decrease the time needed to develop into NRF habitat than if left untreated. Therefore the objectives of the Quartz Project are consistent with Recovery Action 10.

> **Recovery Action 32**: *Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service as described below to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees*.

The fire regenerated stands proposed for treatment were all selected because they were expected to lack the features which comprise high-quality spotted owl habitat. Biologists assessed habitat quality in these fire regenerated stands, and included the Level 1 Team in the discussion of protecting high quality habitat. As a result of this field review, at least 84 acres were dropped from proposed treatment because they were thought to be of high enough quality to warrant protection in order to be consistent with Recovery Action 32 (RA-32). None of the remaining stands proposed for thinning in the Quartz Integrated Project meet the RA-32 definition of high quality habitat. The thinning proposed in managed stands would aid in the development of the structural components of high quality habitat, meeting a restoration objective for NSO habitat.

There are stands of high-quality owl habitat adjacent to the proposed units that will indirectly benefit from the proposed treatments in that the treated stands will likely burn at a lower severity due to increased ladder fuel heights, decreased surface fuel loadings, and in some cases, decreased canopy covers should a wildfire event occur. The strategic placement of the thinning prescriptions proposed in Alternatives 2 and 3 would also offer more opportunities to manage

wildfire, which would indirectly benefit high-quality habitat by reducing the risk of habitat loss due to the spread of high-severity fire across the landscape. These objectives serve to maintain high-quality habitat against wildfire, and the Quartz Project is therefore consistent with Recovery Action 32.

DIRECT AND INDIRECT EFFECTS FROM DISTURBANCE

NSOs can be affected through noise generating disturbances within close proximity to both known NSO activity centers and spatially suitable habitat that may support nesting owls.[18] It is expected that some potential 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 the NSO, but are not likely to disrupt NSO reproductive success. Timber harvesting and associated activities (e.g. temporary road construction, chainsaw and helicopter operation, etc.) produce above ambient noise levels that have the potential to disturb nesting NSOs, and disrupt normal reproductive activities. Disturbance could cause nest abandonment, flushing of adults off eggs thereby exposing them to harm, depressed feeding rates and avoidance of otherwise suitable habitat.

Potential disturbance to NSOs was analyzed by buffering historic and currently occupied owl sites with a 60 meter buffer and applying a 110 meter buffer to helicopter units, their landings and flight zone (USDI 2009). Any activities that overlap the 60 meter buffered NSO sites had the potential to disturb nesting owls during their breeding season; it was determined that none of the proposed harvest activities or units, or connected actions would have noise-related disturbance impacts to nesting NSOs (Figure 39). Prescribed fire would be used to conduct understory burning on 330 acres within thinning units, and to pile burn on up to 192 acres in two distance categories in thinning units; up to 200 feet from the road (73 acres), and up to 400 feet from the road (119 acres). These areas would be burned over a period of years and days within a year in the Quartz action area. The effects of smoke generated by prescribed burning on NSOs have not been studied. Smoke effects would be short term (2-3 days at the most), and would be most intense during the evenings when inversions often cause smoke to settle into the understory of stands. Burning during the nesting season may cause discomfort to roosting owls breathing smoke and the disturbance associated with the personnel carrying fire through stands. NSOs are potentially affected by fire control activities and drifting smoke during burning. The threshold distance for disturbance from smoke is 0.25 miles for NSOs. The vast majority of proposed fuel treatment acres are located >0.25 miles from the two active sites within the action area (Figure 39). However, NSO site 655 falls within the potential disturbance distance (.25 miles) for the underburning scheduled for Units 5 and 6, and smoke-related disturbance during the critical breeding period could affect nesting owls at this site. In order to avoid this disturbance, these units should be prioritized for burning outside of the critical nesting period (March1 through July 15). If burning outside of the critical nesting period isn't possible, burning should only occur if wind is from the south (blowing smoke away from the owl site), and District wildlife biologists will be contacted beforehand to determine the current status of the resident owls.

[18] Determined by a spatial analysis of NRF conducted in accordance with procedures outlined by the USFWS (USDI/USDA 2007)

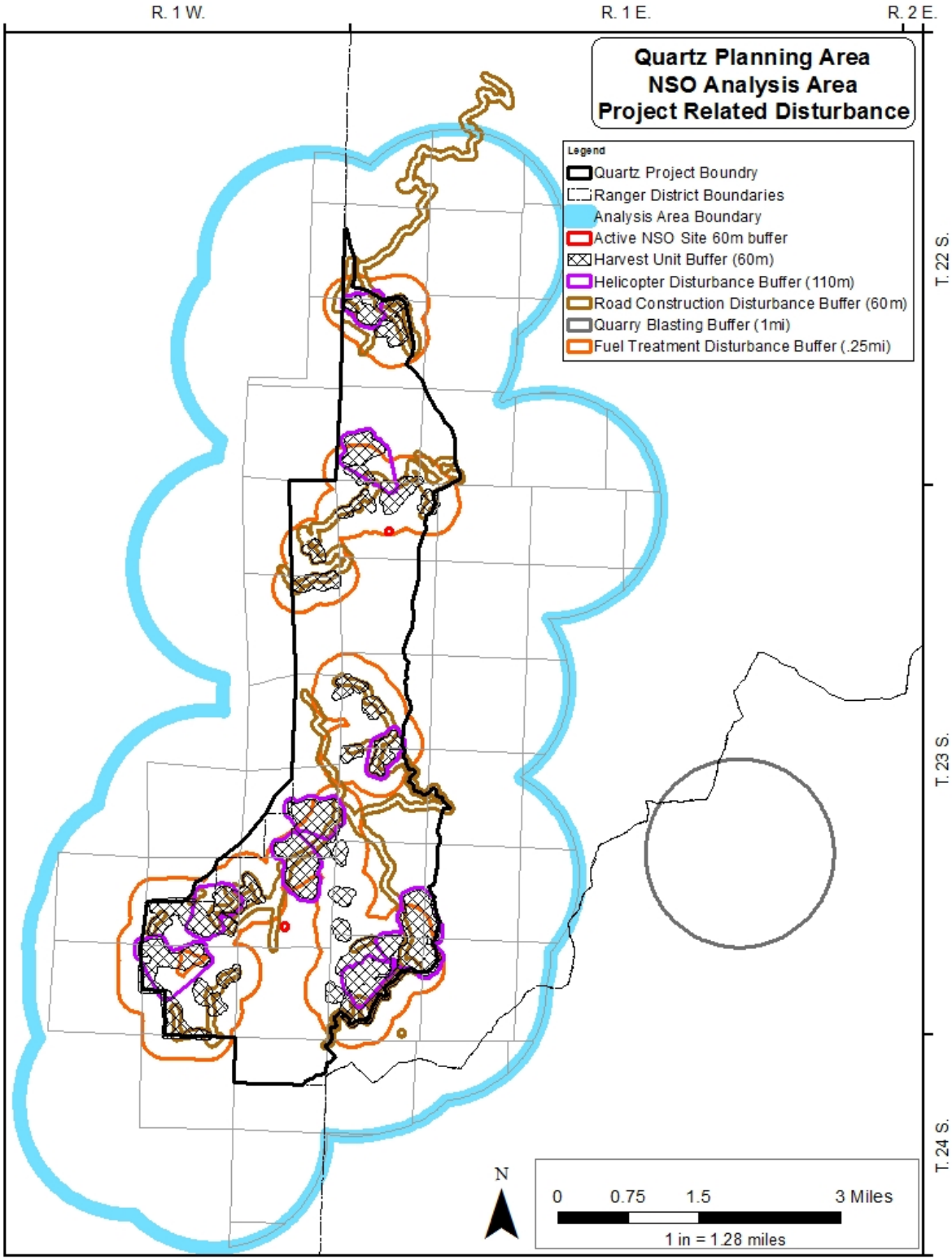

Figure 39. Quartz Planning Area Disturbance Zones.

Road construction and maintenance activity generally occurs outside the 60m disturbance buffer. However the proposed road demolition would occur in the nest patch of NSO 640 and would involve heavy equipment operating for extended periods within this critical space, which may negatively impact nesting owls. In order to avoid disturbance to nesting owls, the proposed road deactivation should occur outside of the critical nesting period (March 1 through July 15)

Project Design Features

Refer to the Quartz Integrated Project Biological Assessment and Best Management Practices in Chapter 2 for Project design features being employed to protect the NSO.

CUMULATIVE EFFECTS

The cumulative effects to spotted owls are analyzed at the Sharps Creek watershed scale. Past clear-cutting of habitat (approximately 21,000 acres of Forest Service, BLM and private land) has had the largest cumulative impact to this species by removing NRF habitat. Future clear-cut harvesting on private land (est. 150 acres per year) would not impact NRF habitat because this harvest would be occurring in second-growth plantations. Alternatives 2 and 3 would modify /downgrade approximately 392 and 323 acres of low quality NRF habitat, respectively. This impact to NRF represents approximately 2.1% (Alternative 2) or 1.7% (Alternative 3) of the available habitat within the watershed. The current trend for NRF habitat within the watershed is stable to increasing.

The reasonably foreseeable Calapooya Divide project, which may occur adjacently to the Quartz Project, would be of similar nature and scope and would have similar effects as those described above. This and future commercial thinning would reduce the risk of future loss of habitat to wildfire by making the stands more fire resilient, potentially reducing the risk of wide-spread habitat loss.

Because this project modifies or downgrades relatively few acres of NRF within the watershed in the short-term, and because reasonably foreseeable actions are likely to be similarly minor in scale of impact, cumulative effects of the Quartz project are considered to be non-substantial and would not affect the viability of this species within the watershed.

EFFECTS DETERMINATION

Given the information above, the direct, indirect and cumulative effects associated with this project “may affect likely to adversely affect” the NSOs and their designated critical habitat.

This is because proposed management actions would modify stand conditions approximately 392 and 323 acres of low quality NRF habitat that occurs within the home range of 15 historic NSO sites (Figure 37) which will change the quantity and arrangement of NRF habitat at the 500 acre scale, and thus may have negative impacts to NSOs through habitat modification. Additionally, the project would modify 543 acres (Alternative 2) or 434 acres (Alternative 3) of dispersal only habitat. Alternatives 2 and 3 would have a beneficial, indirect effect of accelerating the development NRF habitat within the dispersal only habitat and make the area more resilient to wildfire. After harvest there would be an expected one to two percent gain in canopy cover per year after thinning (Chan et al. 2006). Therefore, there would be short-term (10-20 years) degradation effects to NRF and dispersal habitat functions.

This effects determination triggers formal consultation with the USFWS under Section 7 of the ESA.

PACIFIC FRINGE-TAILED BAT

This bat is usually described as cave-dwelling (Christy and West 1993, Verts and Carraway 1998). 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. Arnett and Hayes (2009) found that the likelihood of a tree or snag being used as a roost by forest bats increased with closer proximity to other snags, and with the increased diameter of a potential roost snag or tree. There are documented occurrences of Pacific fringed myotis within the Sharps Creek subwatershed.

DIRECT AND INDIRECT EFFECTS

Alternative 1 would have no direct or indirect effects on the species, as no ground disturbing activities would occur.

Harvest activities and other associated connected actions (see Chapter Two, Connected and Similar Actions) in Alternatives 2 and 3 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. Alternative 2 would thin approximately 1026 acres and Alternative 3 would thin approximately 850 acres with approximately 896 acres and 870 acres of fuel treatments accordingly. 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 (Arnett and Hayes 2009, Weller and Zabel 2001). The proposed thinning area lacks large snags and any large remnant trees or snags will be protected from harvest. Although smaller snags would be protected to the extent possible 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. Based on the proposed logging systems, roughly 94 guyline trees of moderate size would need to be fallen for safety reasons. The guyline trees would range in diameter from 16-24 inches dbh and would not likely be bat habitat, because trees of that size generally do not provide the characteristics needed for roosting (deep furrows, detached bark, cavities). Use of old-growth trees would be avoided if possible. Guyline trees would not continue to function as potential roost trees in these stands. With project design features that would create three snags per acre, the expected impact to bats habitat should not be substantial.

Thinning forested stands has not been shown to change moth (a major food resource) abundance substantially (Muir et al. 2002). However, hardwood shrub densities were higher in thinned stands than in unthinned stands. These hardwoods (e.g., chinquapin and ocean spray) are important food sources for moths. Patriquin and Barclay (2003) found that thinning activity had minimal effect on Myotis species in their study area. Management recommendations for Myotis species include maintaining a variety of stand types and densities across the landscape to promote a diversity of plant species and associated fauna (Muir et al. 2002), as well as to provide for the structure and habitat types for bats (Patriquin and Barclay 2003). Alternatives 2 and 3 meet this recommendation.

Based on the available data, Alternatives 2 and 3 and associated connected actions would not have a major negative effect on the bat or its prey species, thus project effects to this bat and its habitat are believed inconsequential to the species.

CUMULATIVE EFFECTS

Cumulative effects to snag habitat are similar to those discussed in the coarse woody debris discussion. The thinning (Alternatives 2 and 3) of the young plantation stands would accelerate development of large trees. Thinning in mature stands would not appreciably effect forage or roost site availability. Snag densities are expected to increase given current management on public forests. Levels of roosting habitat would remain limited on industrial forestlands. Alternative 1 would prolong the time it takes to develop large trees and maintain closed canopies, which may limit bat utilization of habitat. The Calapooya Divide Project would similarly affect roughly 1,200 acres in addition to Alternatives 2 and 3. Because such a project would be similar in design, the potential effects of such a project would be likewise inconsequential to the species. Since all of the Alternatives, and associated connected actions would not have major negative or beneficial effects on the bat or its prey species and since the only reasonably foreseeable future action with in the watershed would likely produce the same effects, there are no meaningful cumulative effects to the pacific fringed myotis associated with the project.

EFFECTS DETERMINATION

In considering the direct, indirect and cumulative effects of the Alternatives, it is determined that Alternatives 2 and 3 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.

CALIFORNIA SHIELD-BACK BUG

Very little information exists for this sub-species of shield-backed bug. Only a few detections of this sub-species have been documented across its suspected range, with only two detections in the state of Oregon. One of these detections occurred on the H.J. Andrews Experimental Forest on the Willamette National Forest, which lies 45 miles to the northwest. The life history of this sub-species is not well understood at this point. The California shield-backed bug is a tall grass specialist and is associated with natural balds and meadows above 900 meters in elevation. Because of this general habitat description, the California shield-backed bug has been suspected across the Umpqua National Forest. In 2013 a number of surveys were conducted across the Umpqua and Willamette National Forests to attempt to locate populations of the species. These surveys resulted in no detections of the California shield-backed bug on either Forest.

A species fact sheet as is available on the Interagency Special Status/Sensitive Species Program's website at:

http://www.fs.fed.us/r6/sfpnw/issssp/species-index/fauna-invertebrates.shtml

DIRECT AND INDIRECT EFFECTS

Alternative 1 would not impact this sub-species because no meadow habitat would be disturbed.

Alternatives 2 and 3, and their associated meadow restoration projects, would affect roughly 48 acres of meadows and surrounding buffer areas, though not all of this acreage is suitable habitat. The meadow restoration activities include pre-commercial thinning of encroaching trees, removal of invasive weeds by hand removal, and prescribed fire, which would burn through the meadow except where botanical sensitive species exist, and the fire would be allowed to carry into the adjacent transitional zone surrounding the meadow. This would likely

result in a temporary loss of habitat suitability, as the grasses within the meadow would likely be consumed, and would not provide habitat until the meadow recovers. This impact is likely inconsequential to the sub-species, however, because while this habitat falls within the suitable parameters, it is unlikely that the California shield-backed bug exists within these meadows due to the negative results of the surveys conducted throughout the Umpqua and Willamette National Forests. Some beneficial indirect effects would be expected in the long term, as treating these meadows is expected to assist in maintaining the size of the meadow by removing what encroachment does exist, and by the removal of invasive weeds which compete with the native vegetation thereby ensuring the continued existence of habitat.

CUMULATIVE EFFECTS

The cumulative effects to the California shield-backed bug are analyzed at the Sharps Creek subwatershed scale. Meadows are relatively rare within the subwatershed, and are small and isolated in nature. Alternatives 2 and 3 of this project will have short term negative impacts on the meadows being treated, but these 48 acres represent a small proportion of the total amount of meadows suitable for shield-backed bug habitat that exist within the subwatershed. And so, in context of the subwatershed as a whole, the expected cumulative negative effects to shield-backed bug are minimal especially considering the unlikelihood that they exist on the district. As the meadow recovers in relatively short order, some beneficial effects to the habitat would be expected as the treated meadows would likely be able to better function as suitable habitat into the future.

EFFECTS DETERMINATION

Following consideration of the direct, indirect and cumulative effects and the unlikelihood that the California shield-backed bug exists within the project area, it is determined that Alternatives 2 and 3 may impact individuals or habitat, but would not likely contribute towards Federal listing or cause a loss of viability to the population or species. Alternative 1 would have no impact on this species.

JOHNSON'S HAIRSTREAK

Hairstreaks are small (1 ¼ -1 ⅜inch wingspread) butterflies that move very rapidly, flitting in circles or side-to-side. Preferred habitat is late successional and old-growth coniferous forests that contain mistletoes of the genus *Arceuthobium* (dwarf mistletoes). The Johnson's hairstreak is considered the only old-growth obligate butterfly. The species lays its eggs on the mistletoe and the larvae feed on all exposed parts of the host plant. There is usually only one brood per year from May through July. Adults feed on flower nectar (including Oregon grape, Pacific dogwood, ceanothus, pussy paws, and *Rubus* species) and nectar of the mistletoe. Range is local and scarce throughout the Pacific Northwest.

Primary threats to this species include logging of late successional forests, spraying of insecticides, and potential hybridization with another species of butterfly. A detailed summary of habitat associations, life history traits, range/distribution etc. are documented in a species fact sheet on the Forest Service-Bureau of Land Management Pacific Northwest Interagency Special Status /Sensitive Species Program website: http://www.fs.fed.us/r6/sfpnw/issssp/documents/planning-docs/20050906-fact-sheet-johnsons-hairstreak.doc.

There are no known occurrences of this species within the planning area. There are two occurrences on the Cottage Grove Ranger District, one approximately 8 miles to the northeast on the eastern edge of the district; the second is roughly 3 miles to the east along the Calapooya Divide. None of the proposed harvest units are preferred habitat for this butterfly,

but hemlock trees (*Tsuga heterophylla*) and conifers with mistletoe are present in some units; thus, species presence within the harvest units is possible and species presence in adjacent late-successional forests is assumed.

DIRECT AND INDIRECT EFFECTS

Alternative 1 would not impact this species because no trees would be removed. None of the actions proposed in Alternatives 2 or 3 would remove multilayered old-growth forests with a large component of western hemlock, the preferred late successional habitat for this species. However, since some trees infected with mistletoe could be incidentally (not targeted specifically) felled in stands selected for thinning, Alternatives 2 and 3 directly impact low quality potential habitat for the species. There is also a potential for direct effects to individual eggs or larvae, if they were occupying mistletoe brooms during tree felling. The silvicultural prescription will not target hemlock for removal, based on current species composition, so this negative impact would be minimized. Other actions that would occur within the units that may result in short term effects are fuel reduction activities, temporary road construction and snag creation. Because the harvest units are not preferred habitat, the potential negative project effects to this butterfly and its habitat are believed inconsequential to the species.

Alternatives 2 and 3 would also be expected to have indirect beneficial effects to the Johnson's hairstreak butterfly by accelerating movement of 409 acres (Alternative 2) or 327 acres (Alternative 3) within plantation stands toward preferred late successional habitat conditions. Within the 616 acres (Alternative 2) or 521 acres (Alternative 3) of fire regenerated stands proposed for commercial harvest, this progression toward late-seral conditions is also expected. Additionally, thinning would result in a reduction of canopy cover and subsequent increases in grass, forbs, and shrubs in the understory. This could benefit adult butterflies by providing additional food sources in the planning area. Increasing structural and vegetative diversity would be expected to enhance habitat quality for this species in the planning area in the short- and long-terms.

CUMULATIVE EFFECTS

The cumulative effects to the Johnson's hairstreak butterfly are analyzed at the Sharps Creek subwatershed scale. Past clear-cutting of habitat has had the largest impact to this species by removing late-seral habitat. Future clear-cut harvesting on private land (estimated at 150 acres per year) would not affect Johnson's hairstreak habitat because this harvest would be occurring in mid-seral stands. Clear-cutting of late-seral forest is not expected to occur on Forest Service lands in the foreseeable future. Current and reasonably foreseeable actions in the planning area would not include spraying of insecticide. Reasonably foreseeable effects on late-successional forests are limited in scale and magnitude, and would not be expected to meaningfully reduce the ability of the planning area to support the Johnson's hairstreak. The no action alternative has no noteworthy effects and as such, no meaningful cumulative impact. Alternatives 2 and 3 would result in movement of thinned units toward a condition more favorable to the Johnson's hairstreak and reduces the risk of future loss of habitat to wildfire by making the stands more fire resilient. Thus, when considered in the context of past, present, and foreseeable actions, it is determined that there would be no consequential negative cumulative effects to the species associated with Alternatives 2 and 3.

EFFECTS DETERMINATION

Following consideration of the direct, indirect and cumulative effects, it is determined that Alternatives 2 and 3 may impact individuals or habitat, but would not likely contribute towards Federal listing or cause a loss of viability to the population or species because the thinning

proposed in Alternatives 2 and 3 would only affect non-preferred or non-suitable habitat, and would target the habitat elements of preferred habitat within the project area. Alternative 1 would have no impact on this species.

CASCADE AXETAIL SLUG

This is a recently described species of slug which was previously classified as the salamander slug (*Gliabates oregonius*), but is now recognized as an independent species after recent study and anatomical analysis (Leonard et al. 2011, Young and Doerr 2011). Much of the life history of this species is not yet well understood. Habitat in which this species has been found is dominated by Douglas-fir with accumulations of needle duff below most commonly with a vine maple component. Moist soils and duff layers seem to be important components to preferred habitat (Young and Doerr 2011).

Since being added to the Regional Forrester's Sensitive Species List in 2008 (as *Gliabates oregonius*) this species has been extensively surveyed for in the West Cascades, and the local area, including on the Middle Fork Ranger District on the Willamette National Forest (which is adjacent to the Cottage Grove Ranger District) and on the North Umpqua and Cottage Grove Ranger Districts on the Umpqua National Forest. No individuals of this species were detected on the Umpqua National Forest, and it is likely that Highway 58, which lies to the north of the District, is the southern edge of the species' range (Young and Doerr 2011).

A species fact sheet as well as survey information is available on the Interagency Special Status/Sensitive Species Program's website at:

http://www.fs.fed.us/r6/sfpnw/issssp/species-index/fauna-invertebrates.shtml

DIRECT AND INDIRECT EFFECTS

Alternative 1 would not impact this species because no trees would be removed.

Alternatives 2 and 3 would result in timber harvest, fuels treatments, and associated activities that would modify forest stands that may be potential habitat for the axetail slug. Reduction in canopy cover and damage to the understory shrub layer from thinning, along with partial consumption of forest understories, leaf litter, and duff via prescribed fire would likely result in drier soil and duff conditions that together represent direct short term habitat effects that would reduce the quality of axetail slug habitat in treated areas. As canopy closes habitat conditions would return to more suitable conditions. This would likely occur in relatively short order, as Leonard et al. (2011) found axetail slugs in a wide range of stand ages. Most commercial thinning units retain unthinned areas, protect existing large logs within units that serve as habitat refugia, and provide for retention of 40% or greater canopy cover after harvest. These potential impacts are likely to be inconsequential to the species, however, because it is unlikely that the axetail slug exists in the area considering the negative results of the surveys conducted in the past which included sites within the project area.

If axetail slugs were to be occupying potential habitat during project implementation, it is possible that individuals could be displaced, injured, or killed. However, based on negative results from the past in the planning area and everywhere else on the Umpqua National Forest, it is considered unlikely that this potential impact would occur at a frequency of consequence to the species.

CUMULATIVE EFFECTS

The cumulative effects to the Cascade axetail slug are analyzed at the Sharps Creek subwatershed scale. Although the axetail slug could potentially occur on the Umpqua National

Forest, in the context of considering potential population trends and consequence to the species it is worth noting that the axetail slug has not been observed anywhere on the Umpqua National Forest or on the Eugene District BLM.

Alternative 1 would not have direct effects and as such, no meaningful cumulative impact. Reasonably foreseeable effects on late-successional forests are limited in scale and magnitude, and would not be expected to meaningfully reduce the ability of the planning area to support sufficient habitat for the axetail slug. The adjacent private lands are unlikely to be providing habitat for the axetail slug due to intense timber management leading to conditions which are unlikely to provide suitable conditions. When considered in the context of past, present, and reasonably foreseeable actions, it is determined that there would be no substantial negative cumulative effects to the species associated with Alternatives 2 and 3 or connected actions.

EFFECTS DETERMINATION

Following consideration of the direct, indirect and cumulative effects and the unlikelihood that this species exists within the project area, it is determined that the Alternatives 2 and 3 may impact individuals or habitat, but would not likely contribute towards Federal listing or cause a loss of viability to the population or species because of the unlikelihood the species occurs within the project area, because impacts to suitable habitat are expected to be temporary and isolated with pockets of refugia, and because there are no expected substantial cumulative effects. Alternative 1 would have no impact on this species.

MARDON SKIPPER

The Mardon skipper is a small, tawny-orange butterfly currently found at only four geographically disjunct areas in northwest California, southwest Oregon, the southern Washington Cascades, and one population in the south Puget Sound region of western Washington. To date no mardon skippers have been detected on the Umpqua National Forest. Surveys conducted on the Middle Fork Ranger District of the Willamette National Forest, which is adjacent to the Cottage Grove Ranger District, yielded no detections of the mardon skipper. These surveys included habitat directly bordering the Cottage Grove Ranger District.

Information on the mardon skipper, including survey results and site management plans can be found on the Interagency Special Status/Sensitive Species Program's website at:

http://www.fs.fed.us/r6/sfpnw/issssp/species-index/fauna-invertebrates.shtml

DIRECT AND INDIRECT EFFECTS

The No Action alternative would not impact this sub-species because no meadow habitat would be disturbed.

The meadow restoration activities include pre-commercial thinning of encroaching trees, removal of invasive weeds by hand removal, and prescribed fire, which would burn through the meadow except where botanical sensitive species exist, and the fire would be allowed to carry into the adjacent transitional zone surrounding the meadow. This would likely result in a temporary loss of habitat suitability, as the grasses within the meadow would likely be consumed, and would not provide habitat until the meadow recovers. This impact is likely inconsequential to the species, however, because while this habitat falls within the suitable parameters, it is unlikely that the mardon skipper exists within these meadows due to the negative results of the surveys conducted throughout the Umpqua and Willamette National Forests. Some beneficial indirect effects would be expected in the long term, as treating these meadows is expected to assist in maintaining the size of the meadow by removing what

encroachment does exist, and by the removal of invasive weeds which compete with the native vegetation thereby ensuring the continued existence of habitat.

CUMULATIVE EFFECTS

The cumulative effects to the mardon skipper are analyzed at the Sharps Creek subwatershed scale. Meadows are relatively rare within the subwatershed, and are small and isolated in nature. Alternatives 2 and 3 will have short term negative impacts on the meadows being treated, but these 48 acres represent a small proportion of the total amount of meadows suitable for mardon skipper habitat that exist within the subwatershed, and these treatment are expected to provide long term beneficial impacts. And so, in context of the subwatershed as a whole, the expected cumulative negative effects to mardon skipper are minimal especially considering the unlikelihood that they exist on the district. As the meadow recovers in relatively short order, some beneficial effects to the habitat would be expected as the treated meadows would likely be able to better function as suitable habitat into the future.

EFFECTS DETERMINATION

Following consideration of the direct, indirect and cumulative effects and the unlikelihood that the mardon skipper exists within the project area, it is determined that Alternatives 2 and 3 may impact individuals or habitat, but would not likely contribute towards Federal listing or cause a loss of viability to the population or species because of the unlikelihood the species occurs within the project area, because impacts to suitable habitat are expected to be temporary, and because there are no expected substantial cumulative effects. Alternative 1 would have no impact on this species.

CORONIS FRITILLARY

The coronis fritillary is a medium to large butterfly which is associated with openings and meadow habitats at low to mid-montane elevations. Violets (*Viola spp.)* serve as the host plant for this species, which patrols open areas for mates after hatch and metamorphosis. This subspecies occurs in the Siskiyou Mountains, and is associated with serpentine habitats. On the Umpqua, there are two documented occurrences at the southern end of the Tiller Ranger District, roughly 51 miles to the South. To date the majority of the known records are in Jackson County, but this subspecies is suspected to also occur in Curry, Coos, and Douglas Counties. Surveys for this species occurred on the Diamond Lake, North Umpqua and Tiller Ranger Districts on the Umpqua in 2013, but no coronis fritillary were detected. Information on the coronis fritillary including survey results can be found on the Interagency Special Status/Sensitive Species Program's website at:

http://www.fs.fed.us/r6/sfpnw/issssp/species-index/fauna-invertebrates.shtml

DIRECT AND INDIRECT EFFECTS

The No Action alternative would not impact this sub-species because no meadow habitat would be disturbed.

The meadow restoration activities associated with Alternatives 2 and 3 include pre-commercial thinning of encroaching trees, removal of invasive weeds by hand removal and prescribed fire, which would burn through the meadow except where botanical sensitive species exist, and the fire would be allowed to carry into the adjacent transitional zone surrounding the meadow. This would likely result in a temporary loss of habitat suitability, as the flora within the meadow would likely be consumed, and would not provide habitat until the meadow recovers. This impact is likely inconsequential to the species, however, because while this habitat may fall within the

general suitability parameters, it is unlikely that the coronis fritillary exists within these meadows due to the large distance from the Siskiyou Mountains and the lack of serpentine habitats within the area. Some beneficial indirect effects would be expected in the long term, as treating these meadows is expected to assist in maintaining the size of the meadow by removing what encroachment does exist, and by the removal of invasive weeds which compete with the native vegetation thereby ensuring the continued existence of habitat.

CUMULATIVE EFFECTS

The cumulative effects to the coronis fritillary are analyzed at the Sharps Creek subwatershed scale. Meadows are relatively rare within the subwatershed, and are small and isolated in nature. Alternatives 2 and 3 will have short term negative impacts on the meadows being treated, but these 48 acres represent a small proportion of the total amount of meadows that exist within the subwatershed, and these treatments are expected to provide long term beneficial impacts. In context of the subwatershed as a whole, the expected cumulative negative effects to coronis fritillary are minimal especially considering the unlikelihood that they exist on the district. As the meadow recovers in relatively short order, some beneficial effects to the habitat would be expected as the treated meadows would likely be able to better function as suitable habitat into the future.

EFFECTS DETERMINATION

Following consideration of the direct, indirect and cumulative effects and the unlikelihood that the coronis fritillary exists within the project area, it is determined that Alternatives 2 and 3 may impact individuals or habitat, but would not likely contribute towards Federal listing or cause a loss of viability to the population or species because of the unlikelihood the species occurs within the project area, because impacts to suitable habitat are expected to be temporary, and because there are no expected substantial cumulative effects. Alternative 1 would have no impact on this species.

FISHER

Fishers are relatively large forest carnivores found in boreal forest regions of the U.S. The fisher has traditionally been considered a mature-old growth associated species which primarily occurs in lowland areas. The fisher is a generalist predator, preying on various rodents, lagomorphs, and porcupine (Ruggiero et. al 1994). Important habitat elements for den sites include mature or old growth forests with high canopy closures and high densities of very large diameter snags and down wood. Den sites in the Oregon Cascades have averaged greater than 80% canopy cover and greater than 90 cm (35 inch) diameters for snags and down wood. Large snags or living trees with heart-rot are key components of den site selection (Lofroth et. al 2011). There are no known historic sightings of the Fisher on the Cottage Grove Ranger District, and the nearest known siting is 27 miles to the southwest on the Diamond Lake Ranger District.

DIRECT AND INDIRECT EFFECTS

Alternative 1 would have no effects to fishers because no habitat would be altered.

Fishers have been documented using a wide array of habitat types, including second growth stands, for hunting and resting while the needs for reproduction appear to be closely tied with late successional characteristics (Lofroth et. al 2011). Because of this fact, the thinning proposed in Alternatives 2 and 3 in managed stands would only cause temporary disturbance to potential foraging habitat. Alternatives 2 and 3 propose 616 acres and 521 acres of thinning in fire regenerated stands respectively. These stands, while more mature than the managed

stands, are unlikely to be used for denning because they generally lack the components required; these areas are composed of single story, even aged stands which are lacking in trees, snags, or down wood of appropriate size or structure to provide den sites sufficient for rearing young. Therefore the fire regenerated stands proposed for commercial thinning in Alternatives 2 and 3 would only likely be suitable for foraging or dispersal, and the direct effects would only temporarily affect such activities which would not result in any meaningful direct or indirect impact to the species.

CUMULATIVE EFFECTS

Alternative 1 would have no cumulative effect, because no habitat would be altered.

The cumulative effects to fisher habitat are analyzed at the watershed scale. The commercial thinning proposed in Alternatives 2 and 3 would result in the temporary disturbance of foraging activities on 1026 and 850 acres of foraging habitat respectively. The Sharps Creek watershed contains at least 17,930 acres of habitat which would be considered suitable for foraging or denning, of which the actions proposed in Alternatives 2 and 3 would affect only a very small portion. The Calapooya Divide Project is a reasonably foreseeable future action which may occur adjacent to the Quartz project and would likely impact similar habitat at a similar scale (roughly 1,200 acres). The cumulative impacts that would result from Alternatives 2 and 3 would only lead to short term, small scale disturbances spaced out through time and space and would not appreciably impact the species or its ability to persist on the landscape.

EFFECTS DETERMINATION

Following consideration of the direct, indirect, and cumulative effects it is determined that Alternatives 2 and 3 “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 small scale and temporary nature of the negative effects to habitat which is not essential to the reproduction of the species.

NORTHWESTERN POND TURTLE

This highly aquatic turtle occurs in streams, ponds, lakes, and wetlands. Pond turtle habitat is generally characterized by ponds, lakes, or streams which contain deep slow flowing pools with structures which provide for underwater cover and emergent basking sites (Hayes et al. 1999, Reese and Welsh 1998). The pond turtle spends much of its life in water, but requires terrestrial habitats for overwintering and nesting. It overwinters in mud bottoms of lakes or ponds, or in upland habitats adjacent to water bodies. Nesting occurs from May to mid-July in soils with scant vegetative cover where sun can reach the ground to warm the nest (Hayes et al. 1999, Rathbun et al. 2002). Use of upland habitat can be variable in regard to distance from streams. Pond turtles have been documented as nesting or overwintering as far as 500 meters from water, though on average this distance is much less (averages between 28 and 203 meters have been reported) and can vary depending on environmental and climatic conditions (Reese and Welsh 1997, Rathbun et al. 2002).

DIRECT AND INDIRECT EFFECTS

Alternative 1 would have no direct, indirect or cumulative effects on the species, as no ground disturbing activities would occur.

The direct and indirect effects of Alternatives 2 and 3 are analyzed at the scale of units which are within the vicinity of potential turtle habitat. Potential habitat exists in the lower reaches of

Martin Creek to Sharps Creek and below, though there have been no known occurrences within the vicinity of the project boundary. Two thinning units (units 9 and 10) contain acreage which falls within a 500 meter range of potential habitat (15.6 and 0.5 acres respectively). Because of the vicinity of these units to Sharps Creek and Martin Creek, it is possible that turtles could potentially use them for overwintering. However, given that no turtles have been documented in this area and the quality of the potential habitat is poor due to low potential for slow moving deep pools and shallow, rocky soil qualities which offer poor habitat for nesting or overwintering, the likelihood that these units are actually occupied or used by pond turtles is considered low.

Harvesting activities could extend into the late fall, but would likely cease by winter. Thinning may indirectly affect this overwintering habitat by opening up the canopy. This would potentially lower the suitability for these stands to function as overwintering habitat for the next 5 to 10 years, until tree crowns expand and canopy cover increases to above 50%. After harvest there would be an expected 2% gain in canopy cover per year after thinning (Chan et al. 2006). Other proposed connected actions are not expected to result in effects to turtles or their habitat. Therefore, potential negative project effects to pond turtle and its habitat are believed to be inconsequential to the species.

CUMULATIVE EFFECTS

The cumulative effects are analyzed at the scale of the Sharps creek subwatershed. Within this subwatershed there are no known sites. The closest known proximity of turtles is the lower reaches of Sharps and Laying Creek. The biggest effects to the turtle are related to historic human exploitation, habitat loss from dams, and agricultural and urban development (NatureServe 2012). Alternatives 2 and 3 result in a small-scale impact, which is not expected to add cumulatively to the past effects that have caused concern for this species.

EFFECTS DETERMINATION

Following consideration of the direct, indirect, and cumulative effects it is determined that Alternatives 2 and 3 “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 probability that the turtles are using the area, the small scale of impact in relation to available habitat, and limited duration of impact due to harvesting restriction during the winter. Alternative 1 would not impact this species.

MANAGEMENT OF UNSUITABLE TIMBERLANDS

The Umpqua NF LRMP allows timber management in areas of poor regeneration only to enhance wildlife values. The Quartz Integrated Project is designed to restore plantation stands and potentially reduce the risk of losing quality late successional habitat to large wildfires. These objectives serve to enhance values important to various wildlife species, and so the Quartz project is therefore consistent with Umpqua NF LRMP direction. Refer to the project file for more information and discussion about timber management in unsuitable soils.

AQUATIC CONSERVATION STRATEGY

The Quartz project would manage approximately 1.5% (Alternative 3) to 1.9% (Alternative 2) of the Riparian Reserves in the Sharps Creek watershed at the stand scale to move ACS toward restoration at the landscape scale. The harvest in outer portions of Riparian Reserves would occur for the purpose of restoration of stand complexity and species diversity as well as large tree and snag development to achieve the intent of the ACS objectives #1, #8 and #9 of Aquatic Conservation Strategy (USDA/USDI 1994, p. B-11); therefore, proposed activities under Alternatives 2 and 3 are consistent with Aquatic Conservation Strategy.

AQUATIC ENVIRONMENT

The aquatic analysis focuses on how the Quartz alternatives affect water quality, riparian and aquatic habitat 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[19] and Canton Creek Watershed (Figure 40). The Row River 5th Field Watershed is approximately 179,136 acres and the Canton Creek 5th Field Watershed is approximately 40,573 acres. The Quartz planning area is mainly located within the Sharps Creek 6th Field Subwatershed, which is about 42,509 acres; however the planning area does extend into the Brice Creek 6th field Subwatershed which is 36,328 acres and the Pass Creek 6th field Subwatershed (Canton Creek 5th Field Watershed) which is about 10,260 acres. Approximately 42% of the Sharps Creek Subwatershed, 88% of the Brice Creek Subwatershed and 1% of the Pass Creek Subwatershed are Forest Service administered lands. The planning area overlaps nineteen 7th field drainages (Figure 41 and Table **37**), which are a subdivision of the Subwatershed level. The nineteen drainages that are associated with the Quartz planning area total 24,716 acres. Figure 41 along with Table **37** displays how several of the effected drainages such as Lower Sharps and Puddin Rock, are partially within the planning area boundary.

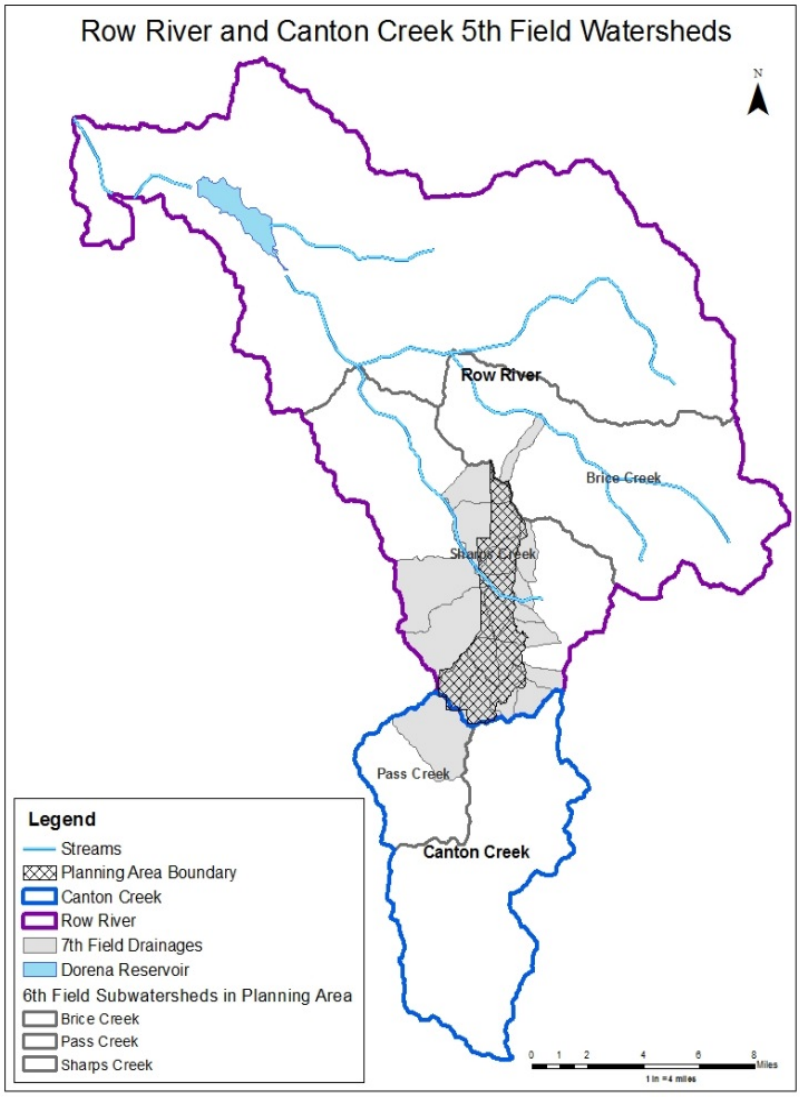

Figure 40. The Row River and Canton Creek 5th Field Watersheds

[19] 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.

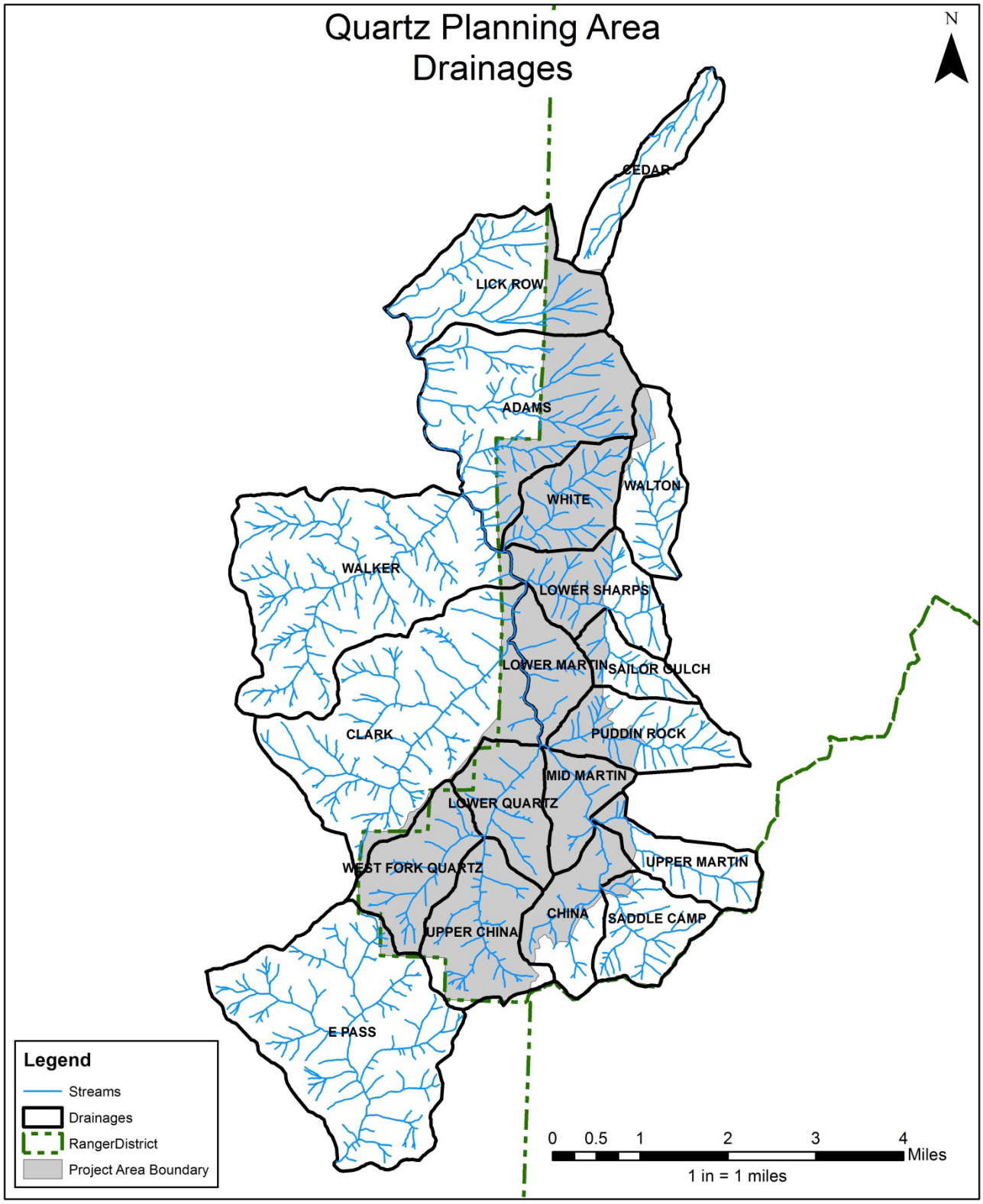

Figure 41. Drainages within the Quartz Planning Area

Table 37. Summary of the 7th Field Drainages

Subwatershed (6th Level)	Drainage Name (7th Level)	Area (Acres)	% of Drainage within the Planning Area	Stream Density (mi/sq. mi)	Resident Fish Bearing (miles)
Sharps Creek	Adams	2424	45%	6.6	2.6
	China	805	64%	4.2	1.2
	Clark	3343	13%	5.5	2.1
	Lick Row	1574	25%	6.5	0.5
	Lower Martin	557	100%	5.9	0.4
	Lower Quartz	774	100%	3.7	1.6
	Lower Sharps	915	58%	7.8	2.1
	Mid Martin	540	100%	4.6	1.2
	Puddin Rock	934	36%	7.2	0.4
	Saddle Camp	764	6%	6.4	0.3
	Sailor Gulch	432	26%	6.5	0.3
	Upper China	1150	91%	4.1	1.3
	Upper Martin	679	15%	5.2	0.9
	Walker	3405	1%	6.3	0.3
	Walton	780	12%	5.6	0.5
	West Fork Quartz	917	99%	4.0	0.7
	White	791	100%	6.0	0.6
Brice Creek	Cedar	639	1%	5.9	1.0
Pass Creek	East Pass	3296	1%	6.0	2.5
Totals or Average:		**24,716**		**5.7**	**20.5**

BENEFICIAL USES OF WATER

To meet the Clean Water Act and standards and guidelines in the Umpqua National Forest Plan (and be in compliance with 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; 9) aesthetic quality; and, 10) hydro power (ODEQ 2005 and 2010).

WATER QUALITY

Summary of Effects

Alternative 1 would result in no direct or indirect effects to water quality, since no riparian trees would be cut along any perennial streams that could affect stream shade and influence stream temperature. The action alternative would thin within the outer portion of the Riparian Reserves in managed stands, but effective shade along perennial streams would not be reduced as a result of thinning prescriptions. Yarding of harvested logs would avoid impacting the no-cut cut buffers in all but a few instances. In three units there is the potential to damage trees within the no-cut buffer of the riparian area thus reducing effective shade in the short-term. As the streams near one unit are already not meeting State criteria for temperature, it is unlikely water quality/riparian area Standard and Guideline #1 could be met for this unit unless logging operations can avoid damaging the trees providing effective shade in the no-cut buffer along Quartz Creek. No cumulative temperature or turbidity effects are expected from the action alternatives.

RELEVANT STANDARDS AND GUIDELINES

The relevant standards 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.

SHARPS CREEK WATERSHED ANALYSIS (WA) RECOMMENDATIONS

The 1999 Sharps Creek WA recommended management of the Riparian Reserves to enhance late-successional conditions and aquatic habitat. The Riparian Reserve section of this Chapter lists these specific WA recommendations.

NORTHWEST FOREST PLAN TEMPERATURE DIRECTION

The Northwest Forest Plan Temperature TMDL Implementation Strategies were revised in 2010 (USDA/USDI 2010). Specific treatment and buffer recommendations are based on balancing thinning and retention of primary shade to minimize effects to stream temperature. According to this strategy, the primary shade zone is the strip of trees along a stream that provides shade to the water between 1000 and 1400 hours during a summer day. This is the most effective shade for protecting water from temperature increases. Guidelines to protect stream temperature specify primary shade zone widths determined by tree height and slope. When these guidelines are followed, sufficient stream temperature protection is assured. Perennial stream buffers in the Quartz managed stands would be 60 feet wide based on slope and tree height. In areas of potential instability or where the stream is incised, an additional buffer distance would be added to avoid unstable areas or begin at the slope break. In the fire-regenerated stands, the no-harvest stream buffers are the full Riparian Reserve width, which for Sharps Creek are one site-potential tree, 180 feet, for non-fish bearing streams and two site-potential trees, 360 feet, for fish-bearing streams.

EXISTING AND DESIRED CONDITIONS

A combination of naturally occurring hydrologic conditions and past management practices have resulted in elevated summer temperatures in the many streams in the planning area. Early studies with small streams in western Oregon found that solar radiation was the primary source of energy causing summertime water temperatures increase when streamside vegetation was removed. Removal of stream shade during timber harvest was a common practice from initial entry into the watershed in the 1940's through the early 1980's on Forest Service administered lands. Flooding and debris torrents also contributed to the loss of stream shade and wider channels. Substantial riparian vegetation removal along perennial streams, from historic timber harvest, has also contributed to increased stream temperatures. In the early 1980's riparian buffers were utilized; however these buffers were not always adequate for maintaining stream shade. Only after the Northwest Forest Plan in 1994 was shade and other riparian dependent functions consistently addressed through maintaining or enhancing Riparian Reserves along streams. Low base flows, typical of the Western Cascades, also contribute to conditions which result in relatively high, naturally occurring summer stream temperatures within the planning area.

The Oregon Department of Environmental Quality (ODEQ) water quality standards are applied to protect the most sensitive beneficial uses in a waterbody. Salmonids and other cold water species that inhabit most streams in the Row River are considered the beneficial uses most sensitive to stream temperatures. Numeric criteria in the temperature standard were developed to protect different aspects of the life histories of these resident fish.

ODEQ has identified water quality limited streams throughout the State of Oregon, including the Row River Watershed (Table 38). Sharps Creek was recently delisted from ODEQs 303(d) list in 2010 after the Willamette Total Maximum Daily Load (TMDL) was approved in 2006. The rest of the Row River Watershed was also delisted for temperature and mercury. Although Sharps Creek has been delisted from the 303(d) list, the Cottage Grove Ranger District continues to collect stream temperature data in the subwatershed during the summer months. Stream

temperatures in the Sharps Creek subwatershed typically exceed the salmonid spawning and rearing temperature criteria of 18 ^{o}C (64.4 ^{o}F). Forest Service activities in the Row River are informed and influenced by the Willamette Basin Water Quality Restoration Plan created to address the goals of the Willamette TMDL (Hogervorst et al. 2008). Following this Plan allows the Forest Service to remain consistent with the Willamette Basin TMDL. Row River/Dorena Lake was added to the 303(d) list in 2010 for aquatic weeds or algae, affecting river miles 7.3 to 11.9.

Table 38. Water Quality 303(d) Listings in the Row River Watershed

Waterbody Name	River Mile	Parameter	Season	List Date
Row River	0 to 20.8*	Temperature	Year Around	Delisted 2010
Row River/Dorena Lake	7.3 to 11.9*	Mercury	Year Around	Delisted 2010
Row River/Dorena Lake	7.3 to 11.9*	Aquatic Weeds or Algae	Undefined	2010
Sharps Creek	0 to 15.2*	Temperature	Year Around	Delisted 2010
Martin Creek	0 to 3.4*	Temperature	Summer	Delisted 2010
Brice Creek	0 to 11.2	Temperature	Summer	Delisted 2010
Layng Creek	0 to 14.4	Temperature	Year Around	Delisted 2010

* Sections of water bodies downstream of the planning area.

An additional water quality parameter that was included in the pre-2010 ODEQ 303(d) list (delisted in 2010) and downstream (approximately 12 stream miles) of the planning area is mercury in Dorena Lake. A 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. However, Brice Creek is thought to be the primary pathway that carries mercury laden sediment downstream to Dorena Lake. Additionally, the presence of mercury in Dorena Lake is not associated with timber management activities.

The desired condition is the maintenance of water quality in keeping with Aquatic Conservation Strategy Objective #4.

DIRECT AND INDIRECT EFFECTS

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

Alternative 1 would result in no direct or indirect effects to water quality, since no riparian trees would be cut along any perennial streams that could affect stream shade and influence stream temperature.

Thinning trees under Alternatives 2 and 3 would not have a direct effect on stream temperature. The silvicultural prescription requires the retention of a no-harvest buffer on all perennial

streams. The action alternatives would thin within the Riparian Reserves of managed stands, but effective shade along perennial streams would not be reduced as a result of the thinning prescriptions. Yarding of harvested logs would be done in such a way to avoid impacting the no-cut buffers of riparian reserves in all but a few instances. The units have logging systems that would yard logs through no-cut buffers (felled on one side of the buffer and yarded to a landing on the other side). Logs would be fully suspended over the stream channels to limit direct impacts to the streams and riparian areas. There is the potential to damage trees within the no-cut buffer of the riparian area thus reducing effective shade (Table 39).

Unit 14 would use downhill yarding with landings along Forest Road 2300-721. These landings would be high above the stream itself but the suspended logs could potentially damage the stand (primarily young alder) along Quartz Creek. These alder provide the primary shade to Quartz Creek during the summer. While alder sprout quickly there would be a few years where the effective shade along this section of Quartz Creek would be impacted. The nearest stream temperature monitoring site at the mouth of Martin Creek has slightly exceeded the water quality standard for this reach. It is unlikely Water quality/riparian area Standard and Guideline #1 could be met for this unit unless logging operations can avoid damaging the trees providing effective shade in the no-cut buffer along Quartz Creek.

Table 39. Potential Impacts to Effective Shade from Yarding Corridors

Harvest Unit	Stream Name	No-cut buffer area (acres)	Potential Skyline corridor impacted area within No-cut buffer (acres)	Percent of no-cut buffer potentially impacted	Temperature Standard (^oF)	Recent Temperature (7 day average maximum ^oF)
14	Quartz Creek	3.4	1.4	41%	64.4	66
9	White Creek	3.2	0.1	0.4%	64.4	67
31	China Creek	2.2	0.5	21%	60.8	60

Unit 9 would have two skyline corridors crossing White Creek to yard felled trees from a small piece of the unit on the opposite side of the creek. The minimal area (< 1%) potentially impacted within the no-cut buffer would not likely have a noticeable impact on stream temperature. However, the closest downstream stream temperature monitoring site indicates the stream is already exceeding the temperature standard for the stream.

Unit 31 would have several skyline corridors crossing China Creek to harvest part of a small ridge within the unit. While not extensive these corridors have the potential to impact over 20 percent of the no-cut buffer over the perennial section of the stream. The difference with this unit is that the nearest temperature monitoring site shows that stream temperatures have been maintained well below the standard even thought this area has a more restrictive standard. At this higher proximity within the watershed the stream temperatures are more controlled by groundwater temperatures than solar inputs and effective shade. It is unlikely that the impacts to the no-cut buffer and effective shading with raise stream temperatures to the extent that the water quality standard is no longer met within Unit 31 due to its proximity within the watershed and its current temperature trend (below the standard).

Indirect effects on stream temperature would be limited to loss of effective shade along skyline corridors in units 14, 9 and 31.

The current conditions of the managed stands in the Quartz planning area are dense, single story stands where inter-tree competition is slowing tree growth. The treatment would benefit stand development by reducing stand density and accelerating the development of large trees which could provide future shade to the streams. Streams within and adjacent to thinning units would be identified with applicable protection in order to meet water quality standard and guideline #5.

Several of the main roads within the planning area have been through some level of reconstruction within the last ten years. Road reconstruction under Alternatives 2 and 3 includes replacement of 20 ditch relief culverts and 18 stream crossing culverts on the 2241, 23, 2300-721, 2301, 2301-436, 2301-742, 2328 and 2358 roads. However, following timber sale activities, the 2241-841 road is proposed to be inactivated and the culverts would be removed. Also, the 2300-106 and 2300-808 roads are proposed to be decommissioned which would remove one stream crossing culvert and one old timbered bridge crossing. A total of 0.70 miles of existing abandoned non-system roads would be reconstructed as temporary roads, and 0.97 miles of new temporary roads would be constructed. No new or reconstructed temporary roads would cross stream channels. All temporary roads would be obliterated following timber harvest.

The use of Best Management Practices and project design features (see Chapter Two) for all in-stream work, including timing of in-stream work and erosion control measures, would minimize effects at the immediate work site and downstream through the first winter season. All the action alternatives would cause in-stream work induced turbid water with potential sediment bearing nutrient release. Direct and indirect effects (turbid water and nutrient release) in response to rain and runoff would be short-term (one season) during the wet season and difficult to discern from background runoff turbidity. These effects would not be expected as project design features (erosion control) become effective with time as vegetation reestablishes by the second season.

Wet season haul on gravel roads requires administrative attentiveness in order to protect water quality. The Best Management Practices (see Chapter Two) identify the Umpqua Road Rules, which call for suspending work when either road or environmental damage such as stream turbidity is predicted. The implementation of the Road Rules would reduce direct and indirect effects to water quality.

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 treatment for Alternatives 2 and 3 that would have the potential to affect water quality is hand pile burning. The burning of concentrated fuels tends to disturb the soil's duff layer, exposing soil to erosion. The project design feature that implements the burning of slash during moist conditions would help retain effective ground cover and reduce the risk of effects to water quality. Additional effects on soil and erosion are included as part of the soil section.

CUMULATIVE EFFECTS

Past harvesting of perennial stream shade occurred throughout the Sharps 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 1 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 reasonably foreseeable future disturbance.

Alternatives 2 and 3 would protect the effective shade along perennial streams to avoid stream temperature increases. Both actions alternatives would cause short term direct and indirect turbidity effects from in-stream work. However, these effects would likely be negligible at the subwatershed scale due to natural turbidity.

The proposed future Calapooya Divide project is expected to include commercial thinning, fuel breaks, prescribed burning, meadow restoration and road improvement activities. The is overlap of this project area in the Upper China, China, Saddle Camp, Upper Martin, Puddin Rock, Sailor Gulch, Lower Sharps and Walton drainages (7th field Hydrologic Unit Code). Early development of the project activities indicates that there may be activities in Sailor Gulch, Puddin Rock, Saddle Camp and a small part of China Creek. Currently, there is no expectation that activities in Calapooya Divide project would result in any cumulative effects downstream with the Quartz project.

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 the action alternatives.

AQUATIC CONSERVATION STRATEGY

As disclosed above in this water quality section, no prolonged or adverse effects 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 subwatershed would continue; water quality in Sharps Creek and planning area streams would continue to support healthy riparian, aquatic and wetland ecosystems consistent with ACS objective #4. Accelerating the development of larger trees would help continue to provide effective shading; maintain and restore landscape diversity and complexity in keeping with ACS objective #1. 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

Summary of Effects

Alternative 1 would not reduce canopy cover; therefore, no change in hydrologic recovery would occur that would potentially increase peak flow. The action alternatives are not expected to increase or enhance peak flow responses that would degrade channel conditions. Alternatives 2 and 3 would not reduce canopy cover 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. The hydrologic recovery would maintain current peak flows and avoid adverse change to physical channel conditions and associated factors such as water quality and fish habitat. No cumulative peak flow effect is expected under the action alternatives when considering past, present, or reasonably foreseeable future activities.

RELEVANT STANDARDS AND GUIDELINES

The relevant standards and guidelines from the Umpqua Land and Resource Management Plan (LRMP) related to stream flow 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 stream flow regime of the Quartz Planning Area is influenced by Western Cascades geology. The Western Cascades stream flow 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 stream flow record from the gauging station on the Row River downstream of the planning area (about 15 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.

Approximately 89% 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% of floods with a return period of greater than six years were associated with rain-on-snow events (Harr 1979; Christner 1981).

The forest canopy has a major influence on snow accumulation, distribution, and melting rates by affecting the interception, microclimate and energy balance of the snowpack. An area is considered hydrologically recovered when the forest canopy cover is 75% and the average tree diameter is eight inches (USDA 1990). Sizeable canopy openings can result in greater snow accumulation and more rapid snowmelt compared to locations lacking large canopy openings. 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. The hydrologic recovery level represents an area compilation of forest canopy re-development following disturbance. It also represents the potential influence on the stream flow 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).

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. Cedar, China, Clark, Puddin Rock, Saddle Camp, Sailor Gulch, Upper China, Upper Martin, Walker, Walton, West Fork Quartz, White, and East Pass are the drainages that meet the above definition. The Adams, Lick Row, Lower Martin, Mid Martin, Lower Sharps and Lower Quartz “drainages” are actually corridors along the main stems of Sharps, Quartz and Martin Creeks and the associated smaller unnamed face tributaries that flow directly into Sharps Creek.

The existing conditions of the hydrologic recovery levels for the drainages associated with the Quartz planning area are currently above 75%, the threshold of concern. Current hydrologic levels are displayed in Table 40. Hydrologic recovery for stands within the Umpqua National Forest was determined using GIS activity layers. Current and past aerial photos were used to delineate stands on private land. A site class IV was used to calculate percent recovered on private land.

Some studies have proposed that forest roads on steep slopes may intercept subsurface flow and hasten its arrival as surface flow to stream channels (Montgomery 1994, Wemple et al. 1996). A more recent study found that in seven of eight small catchments studied (25-625 acres), the subsurface flow interception effect by roads produced moderate (13-36%) increases of large (>1 return period) peak discharge events and increases persisted for decades (Jones 2000). The planning area is composed of many smaller catchments of this size range that contribute to larger drainages. The percentages listed in Table 40 do not include natural openings. These additional openings are likely to show a slight decrease in these percentages but would be part of the background hydrological regime. Roads within the catchments where conservatively estimated to all be 39 feet wide. This is likely close to accurate for larger, higher maintenance level roads but would be an over estimate for small, high clearance and lower maintenance level roads. The wider width was used to have a conservative estimate for the hydrologic recovery percentage calculations.

Interception of ground water at road-cuts and the extension of the channel network through the road ditches with too few relief culverts can potentially alter the timing of water delivery to the stream network. Road ditches draining into a stream and culverts with gullies below that connect directly to a stream channel can extend the stream network (Wemple et al. 1996). Several of the main roads within the planning area have received some reconstruction and upgrades within the last 10 years. These upgrades included drainage improvements, such as an increase in the number of ditch relief culverts.

The desired condition is the protection of flow regimes in keeping with ACS objective 6, while moving stem exclusion forest stands toward the desired range of natural variability.

INDIRECT AND CUMULATIVE EFFECTS

Peak flows represent an indirect effect rather than a direct small-scale effect. The Forest Plan identified an analysis area between 1,000 and 5,000 acres to evaluate potential peak flow response. Consequently, for this analysis, the following combinations were made to fit the criteria: China (805 acres) and Saddle Camp (764 acres); Cedar (805 acres) and Lick Row (1,574 acres); Lower Martin (557 acres) and Lower Sharps (915 acres); Lower Quartz (774 acres) and West Fork Quartz (917 acres); Puddin Rock (934 acres) and Sailor Gulch (432 acres); Upper Martin (679 acres) and Mid Martin (540 acres); and, Walton (780 acres) and White (791 acres). Only downstream indirect effects and cumulative effects are discussed for the peak flow analysis.

The magnitude of flows required for bedload sediment transport differs from channel type to channel type. In general, the frequency of bedload sediment transport increases with decreasing channel gradient. Peak flow effects on channel morphology can be confidently excluded in high gradient streams greater than 10% and bedrock reaches are likely to be minor in most step-pool systems. Moreover, research suggests that peak flow effects on channels are confined to a relatively discrete portion of the stream network where channel gradients are less than approximate 2% (Grant et al. 2008).

Alternative 1 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 research that was done on the Umpqua and Gifford Pinchot National Forests. This research indicated that a shelterwood canopy, which provides about 15% canopy closure, can allow about 60% greater snowpack runoff than mature forest at the site scale (Storck et al. 1999; Storck et al. 2002). The proposed silviculture treatments would increase the potential for snow accumulation in the created gaps and thinned areas but not to the same extent as clearcut areas.

The analysis for the action alternatives utilized average residual canopy covers by treatment as determined using the FVS model discussed in the Forest Vegetation section. Average residual canopy cover ranges from 37 to 67% depending upon the harvest treatment. These are conservative assumptions that allow for a margin of safety in the analysis that addresses scale and treatment differences between the original study and this project.

Using the average canopy cover, a coarse HRP was analyzed for all alternatives (Table 40). Under Alternatives 2 and 3, the proposed silvicultural treatments would maintain the HRP well above the level of concern in the drainages. Thinning these areas would also leave trees that would break up the flow of the warm wind across snow pack and substantially mitigate the rapid snow melt process.

Table 40. Current Hydrologic Recovery Percentage

7th Field Drainages	Alternative 1 (Existing Conditions)	Alternative 2	Alternative 3
Adams	88%	87%	88%
China/Saddle Camp	99%	90%	91%
Clark	100%	99%	99%
Lick Row/Cedar	98%	97%	97%
Lower Martin/Lower Sharps	99%	98%	98%
Lower Quartz/West Fork Quartz	98%	86%	87%
Puddin Rock/Sailor Gulch	100%	100%	100%

7th Field Drainages	Alternative 1	Alternative 2	Alternative 3
Upper China	94%	94%	94%
Upper Martin/Mid Martin	100%	99%	99%
Walker	99%	99%	99%
Walton/White	98%	96%	96%
East Pass	98%	98%	98%

The stream gradients in the fish bearing portion of the planning area are 2% or greater, and the upland streams predominantly have gradients in excess of 10%. Effects to beneficial uses are anticipated to be minimal and not detectable within Sharps Creek.

The action alternatives are not expected to increase or enhance peak flow responses that would degrade channel conditions. There would be a landscape change in canopy cover within the harvest acres; however, effects are expected to be minimal and not detectable within Sharps Creek.

Alternatives 2 and 3 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. The hydrologic recovery would maintain current peak flows and avoid adverse change to physical channel conditions and associated factors such as water quality and fish habitat (consistent with S&G# 2 and S&G# 4, listed above). No cumulative peak flow effect is expected under the action alternatives when considering past, present, or reasonably foreseeable future activities.

AQUATIC CONSERVATION STRATEGY

As disclosed above in this stream flow section, no effects 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. As such, the timing, magnitude, and duration of peak, high, and low flows are maintained 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 FOREST CONDITIONS

Summary of Effects

Alternative 1 has no ground disturbing activities in Riparian Reserves, and as such, has no direct, indirect, or cumulative effects to Riparian Reserves. No temporary roads would be built that would adversely affect riparian site productivity or habitat quality.

The direct effect of thinning in the outer portions of the managed stands' Riparian Reserves is it can approximate a moderate severity fire disturbance process but can also create warmer, drier conditions, and a lower rate of litter input. Concentrated pile burning can expose mineral soil. However, the magnitude of these effects at the site-scale in relation to the planning area and the broader subwatershed scale are inconsequential.

An indirect effect of thinning in the outer portions of the managed stands' Riparian Reserves is it would reduce snag and down wood recruitment rates compared to Alternative 1 by removing trees that would otherwise die from suppression mortality. However, these localized sites of lost recruitment only cover roughly 6 acres and are scattered across the outer portions of the Riparian Reserves beyond the primary recruitment zone. The action alternatives would result in long-term beneficial effects to riparian forest structure and composition; development of stand structural and species diversity would occur sooner than in Alternative 1.

At the scale of the Sharps Creek Riparian Reserve network and the fifth level Row River watershed, the 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.

EXISTING AND DESIRED CONDITION

In the Sharps Creek Subwatershed, approximately 6% of the federally managed Riparian Reserves have been previously clear-cut, burned in fires, or occupied by permanent roads, leaving approximately 31% of this land allocation in mid-seral conditions and 63% in late-seral conditions. Approximately 61% of all the Riparian Reserves, including Forest Service, BLM and private, in the Sharps Creek Subwatershed are less than 80 years old, placing them in early to mid seral condition (USDA/USDI 1999).

There are approximately 3,016 acres of Riparian Reserves within the planning area, of which roughly 23% have been previously clear-cut. The 45-65 year old plantations within the planning area are densely-stocked stands dominated by a single overstory tree species with little understory diversity or natural canopy gaps. These stands were regeneration harvested, burned and planted with Douglas-fir seedlings at a close spacing and managed for uniformity in both species and structure for timber production. Most stands lack natural canopy gaps and associated understory diversity.

The 90 to 130-year-old fire regenerated stands in the planning area are concentrated in the mid to upper slopes near ridgelines. These are primarily even-aged stands that naturally regenerated following stand and partial stand replacement fires that dominated the watershed at the turn of the last century. Today, like the plantations described above, they are densely-stocked stands dominated by Douglas-fir in the overstory with little understory diversity or natural canopy gaps. Many of these fire regenerated stands have scattered sugar and western white pine that is in decline due to heavy competition from other trees coupled with the occurrence of mountain pine beetle and white pine blister rust.

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 Quartz planning area has approximately 32.5 miles of road with a road density of 2.5 miles of road per square mile. The Sharps Creek Subwatershed has approximately 259 miles of road with an average road density of 3.9 miles per square mile (USDA/USDI 1999). This planning area is considered to have a high road density. In the planning area, road segments within the Riparian Reserves total approximately 15 miles.

The desired condition for Riparian Reserves is a decrease in riparian area occupied by permanent roads, and increased stand species and structural diversity.

Proposed Riparian Forest Treatments

The action alternatives would apply restorative thinning to Riparian Reserves using various logging methods and activity fuel reduction techniques (Table 41) and would decrease the amount of existing roads in the planning area (Table 42)

Table 41. Summary of Thinning, Fuel Treatment and Logging in Riparian Reserves

Actions	Alternative 1	Alternative 2	Alternative 3
Thinning in Riparian Reserves			
Commercial Thinning	0	202 acres	169 acres
Gaps	0	0 acres	6 acres
Fuel Treatments in Riparian Reserves			
Underburn (units 1, 3, 4, 5, 10, 13, 19, 20, 23)	0	0.23 acres	0.23 acres
Hand pile and burn (units 9, 14, 16, 31, 32)	0	82.9 acres	75 acres
Total RR fuel treatment		83.1 acres	75.2 acres
Logging Systems in Riparian Reserves			
Skyline	0	111 acres	111 acres
Helicopter (Helicopter Landings)	0 (0)	85 acres (3 acres of existing opening)	53 acres (3 acres of existing opening)
Ground Based	0	5 acres	5 acres

In Alternatives 2, the thinning in Riparian Reserves of the 45 to 65-year-old managed stands would lower the existing canopy cover from 70 to 90% down 45 to 50% while in Alternative 3 canopy cover would be reduced down to 37 to 42%. Approximately 202 acres, which equates

to 7% of the Riparian Reserve acreage within the planning area, would be thinned under Alternative 2. Under Alternative 3, approximately 169 acres, which equates to 6% of the Riparian Reserve acreage within the planning area, would be thinned. Under Alternatives 2, there are 1/10 acre sugar pine release gaps in the fire regenerated stands, but since no commercial thinning would occur in the Riparian Reserves of fire regenerated stands, there would be no gaps in the Riparian Reserves. For the units where gaps are prescribed in Alternative 3, 1-5% of the thinned areas would have small gaps to promote species and structural diversity. This corresponds to roughly 6 acres of gaps located within the outer portion of the Riparian Reserves. Gaps would not be placed within the primary shade zone of perennial streams and would be located at least 50 feet from intermittent channels.

For the Sharps Creek Subwatershed Riparian Reserve widths for class 3 and 4 streams are one site potential tree or 180 feet wide. Riparian Reserve widths for class 2, fish-bearing streams are two site-potential trees or 360 feet wide (USDA/USDI 1999). The thinning in the managed stands' Riparian Reserves would retain 30 foot no-harvest buffers along intermittent stream channels. Based on the Northwest Forest Plan Temperature TMDL Implementation Strategies revised in 2010, the perennial stream buffers in the Quartz managed stand harvest units would be 60 feet wide based on tree height, stand age and slope instability (USDA/USDI 2010). No thinning is proposed in the fire regenerated stands' Riparian Reserves.

Of the 202 acres of proposed thinning in the Riparian Reserves under Alternative 2, 106 acres will be skyline logging, 90 acres will be helicopter logging and 5 acres will be ground based logging. Under Alternative 3, 169 acres are proposed for thinning in Riparian Reserves, with 106 acres of skyline logging, 58 acres of helicopter logging and 5 acres of ground based logging.

Under Alternatives 2 and 3, the fuel treatments include underburning and hand piling and burning. Both alternatives include 0.23 acres of underburning in Units 1, 3, 4, 5, 10, 13, 19, 20, and 23. Since underburning typically covers up to 75% of a treatment area, the 0.23 acres of underburning could result in an estimated 0.17 acres burned. Likewise, under Alternative 2, 82.9 acres of hand piling and burning in Units 9, 14, 16, 31, and 32. The handpile burning prescribed over 82.9 acres would result in about 3% of the burned area (approximately 2.49 acres) affected by hot pile burns where site productivity would be negatively affected. Under Alternative 3, 75 acres of hand piling and burning in Units 9, 14, 16, 31, and 32 would occur. The handpile burning prescribed over 75 acres would result in about 3% of the burned area (approximately 2.25 acres) affected by hot pile burns where site productivity would be negatively affected.

Road work in the Riparian Reserve would be necessary in order to access the stands for thinning (Table 42). No new permanent roads would be constructed within or outside of Riparian Reserves. Under both action alternatives, only 0.07 miles of temporary roads would be created in the Riparian Reserves. Of the abandoned non-system roads proposed for reconstruction, to be used as temporary roads, and obliterated after use, 0 miles would be reconstructed within Riparian Reserves. None of these temporary roads would cross any stream channels. Approximately, 0.05 miles of an existing mining access spur temporarily being used for harvesting access would be reconstructed and returned to the pre-existing condition.

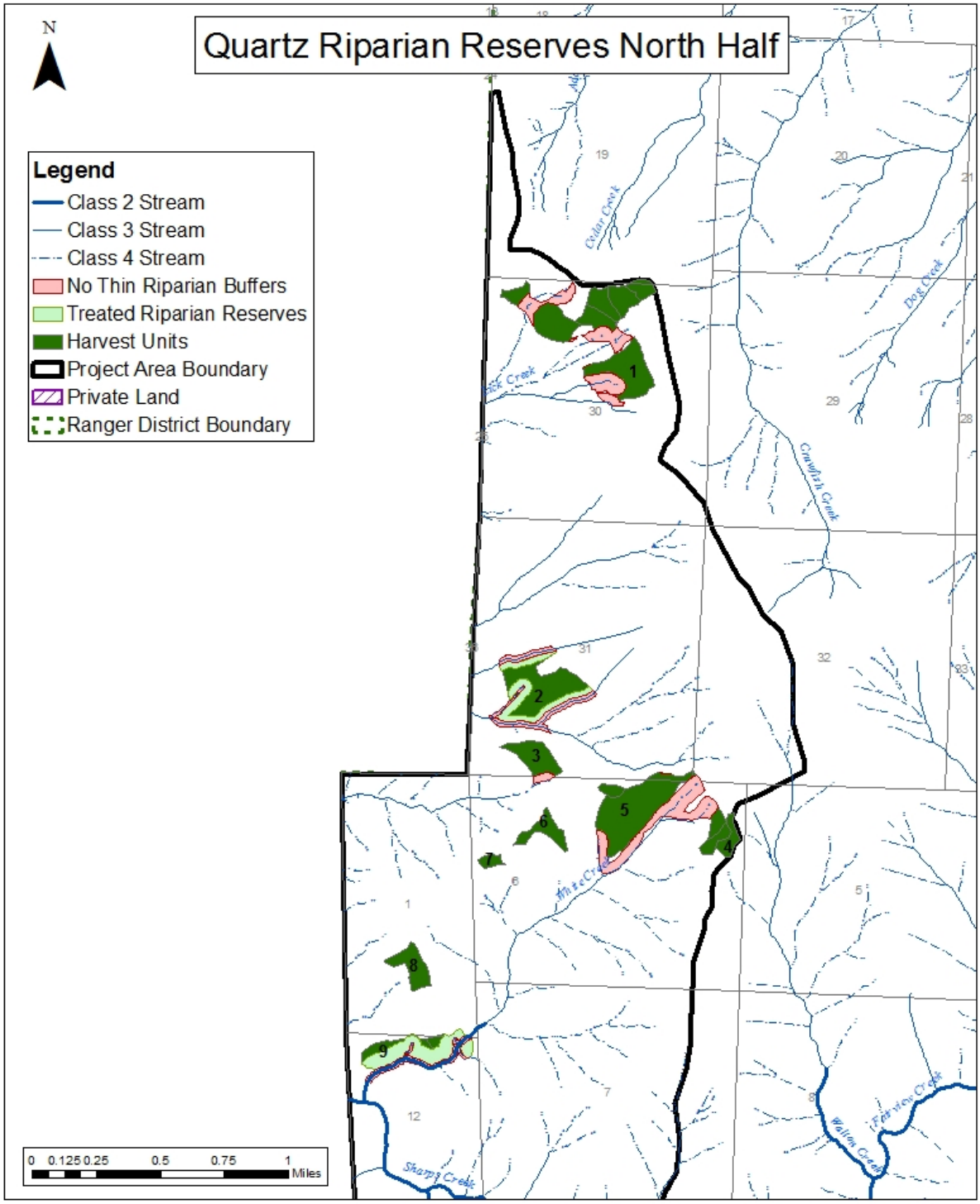

Figure 42. Riparian Reserve Treatments in the North Portion of the Planning Area

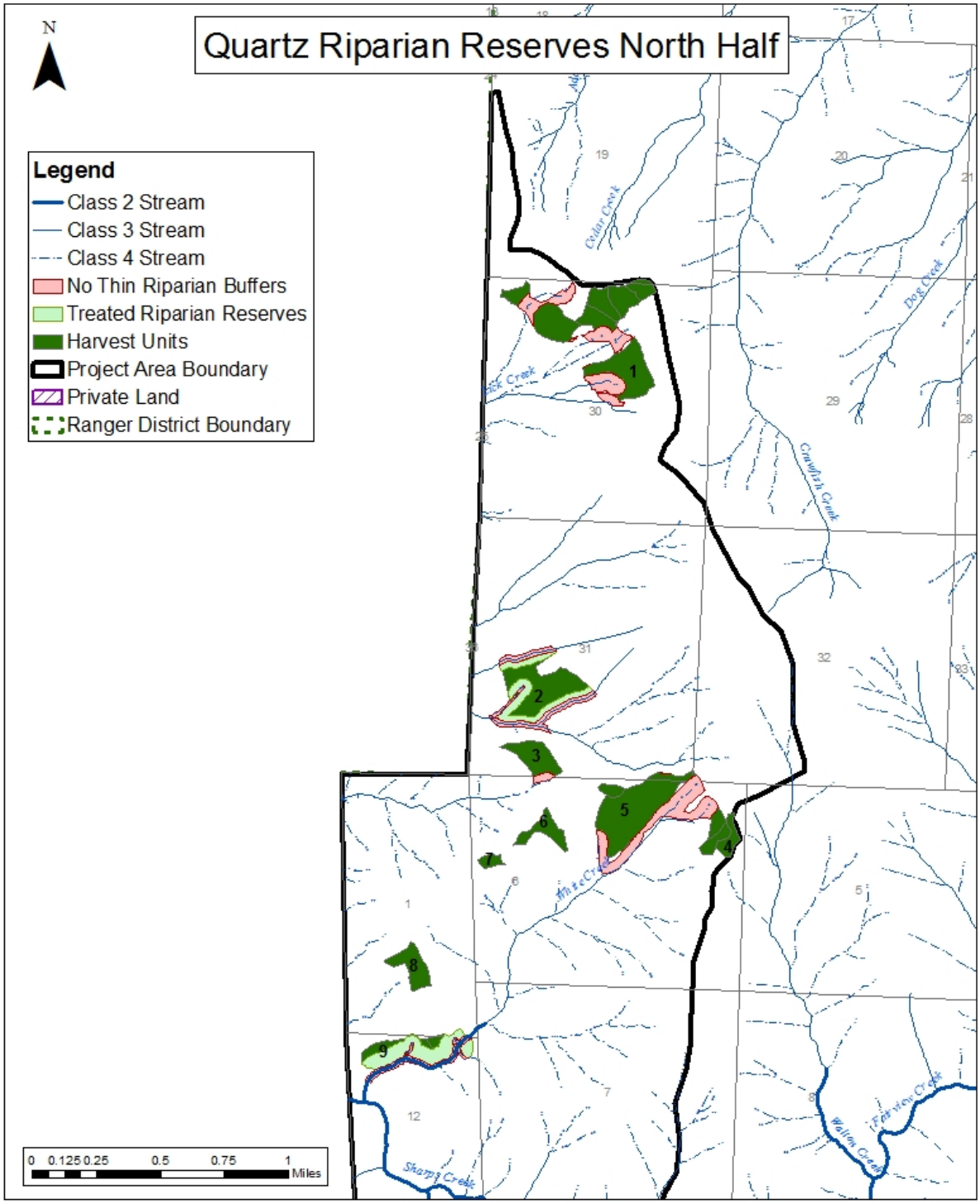

Figure 43. Riparian Reserve Treatments in the South Portion of the Planning Area

Table 42. Summary of Road Actions within Riparian Reserves

Road Action	Alternative 1	Alternative 2 & 3
New permanent roads	0	0
New temporary roads (constructed and obliterated following use)	0	0.07 miles
Abandoned non-system roads (reconstructed and obliterated following use)	0	0
Existing mining access spur (reconstructed and returned to pre-existing condition)	0	0.05 miles
Inactivation of existing system roads	0	0.4 miles
Decommission existing roads	0	1.58 miles
Change from existing condition	**0**	**~2 miles of system road in Riparian Reserve inactivated/decommissioned**

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 1 has no ground disturbing activities in Riparian Reserves, and as such, has no direct, indirect, or cumulative effects to Riparian Reserves. No temporary roads would be built that would adversely affect riparian site productivity or habitat quality.

The reductions in the canopy after thinning under the action alternatives would allow more light penetration, resulting in warmer and drier riparian forest conditions compared to Alternative 1. Thinning would also lower the rate of litter input to the riparian forest floor which represents important nutrient cycling and food bases for riparian organisms. This thinning effect may lower local populations of riparian dependent organisms. Such effects would gradually subside as canopy closure returns over time. Chan et al. (2006) reported that percent skylight through the canopy following a variety of thinning treatments rapidly decreased by an average of 2% per year in the Oregon coast range as the crowns of leave trees and understory vegetation respond to the thinning with rapid growth. The canopy of residual leave trees would gradually fill in, reaching pre-existing conditions within one or two decades.

Under the action alternatives, neither the gaps nor the general thinning surrounding such gaps are expected to exert unusual or extraordinary effects to riparian forest conditions, since these activities approximate moderate severity fire that lowers tree density and creates pockets of dead trees and openings under the natural disturbance processes (Zenner 2005). In contrast under Alternative 1, the absence of disturbance would maintain the stem exclusion stage and delay the development of late successional stand structures for many decades (Andrews et al. 2005).

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.

The fuel treatments that apply fire to concentrated slash piles (hand piles) would also result in direct effects to Riparian Reserves in terms of site productivity and bare soil exposure. Such concentrated pile burning typically removes the soil duff, mineral soil can be exposed, and small, low mobility organisms can be killed.

Under Alternative 1, no soil disturbance or vegetation removal from logging or activity fuel burning would occur, thus no organisms would be killed, no bare soil would be exposed, and no productivity losses would occur in Riparian Reserves.

In summary, several types of direct adverse effects to riparian forest conditions can be expected to occur under both action alternatives. The magnitude of these effects at the site-scale in relation to the planning area and the broader subwatershed scale are inconsequential. This is because both the extent and the duration of these effects (as described above) are predicted to be low.

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 Quartz harvest units over the long-term (greater than two decades).

None of the action alternatives construct new permanent roads within Riparian Reserves. The obliteration of temporary roads, along with the inactivation and decommissioning of system roads within Riparian Reserves under the action alternatives would achieve the desired condition of fewer overall miles of existing road occupying the Riparian Reserve land allocation (Table 42). Alternatives 2 and 3 would result in a net decrease of approximately 2 miles of existing roads in the Riparian Reserves. Alternative 1 would result in no beneficial long-term effects from existing roads removed from Riparian Reserve land allocation.

Thinning under the action alternatives would reduce snag and down wood recruitment rates compared to Alternative 1 by removing trees that would otherwise die from suppression mortality. The loss of suppression mortality associated with thinning in the outer portion of the Riparian Reserves affects a range of trees from seedling size up to about 20 inches in diameter in some riparian stands (Table 45). For more information, see the Course Woody Debris section in Chapter 3.

Most of the wood that naturally recruits to streams comes from within the first 65 feet of the stream (McDade et al. 1990, Murphy and Koski 1989). Therefore, the 60 foot no-harvest buffers established for this project would continue to allow recruitment of large wood to the stream channels. The gaps proposed in the Riparian Reserves under Alternative 3 would result in the most long-term impact to riparian snag and down wood recruitment because of the limited number of leave trees remaining in the gaps. However, these localized sites of lost recruitment only cover roughly 6 acres and are scattered across the outer portions of the Riparian Reserves beyond the recruitment zone. 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 habitats and habitat quality would be diminished, the small scattered extent of the thinning and gap creation is not expected to result in riparian species population declines. In the context of the Riparian Reserve network at the subwatershed level, this amount is inconsequential.

The action alternatives would result in long-term beneficial effects to riparian forest structure and composition; development of stand structural and species diversity would occur sooner than

in Alternative 1. 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 needed to attain Aquatic Conservation Strategy objectives.

The created canopy gaps would approximate a moderate severity fire, the process that historically created gaps and triggered the initiation 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. 1986). The beneficial effects would gradually improve habitat connectivity for riparian dependent species that rely on late-successional forest conditions. Again, the magnitude of the beneficial effects from the action alternatives are moderate, since only 7% 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 1 is less likely to 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.

At the scale of the Sharps 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.

CUMULATIVE EFFECTS AND AQUATIC CONSERVATION STRATEGY

The cumulative effects as well as the restoration and maintenance of the ACS objectives for Riparian Forest Conditions are discussed in conjunction with Stream Channels in the next section.

STREAM CHANNELS

Summary of Effects

Under Alternative 1, no direct effects to stream channels or aquatic organisms would occur since no instream work would occur. Because there are no direct or indirect effects, no cumulative effects would occur.

The direct effects to stream channels from instream, road-related work would be increased sediment input. This level of sedimentation from dispersed instream construction associated with both action alternatives is minimal with respect to the overall sediment regime of the planning area. Overall, both action alternatives would result in long-term beneficial effects to stream channel connectivity compared to Alternative 1, where no instream restoration work would occur. In total, the action alternatives would result in a net decrease of 12 stream crossings in vicinity streams.

Taken in total, the adverse cumulative effects associated with the action alternatives (primarily short term sediment delivery) 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.

Streams in the planning area are primarily affected by roads that cross them or that exist near them, by the age of the adjacent forest that provides bank stability and large wood input, and by the effects of disturbance such as floods and fire. The impact to streams from the various forms of road work is disclosed in this section.

RELEVANT STANDARDS AND GUIDELINES

Relevant standards and guidelines from the Northwest Forest Plan include:

- 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.
- 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 streams.

RECOMMENDATIONS FROM THE 1999 SHARPS CREEK WATERSHED ANALYSIS

- Retain recommended Riparian Reserve standards and Reserve widths from the Northwest Forest Plan for all streams on federal lands.
- The best aquatic habitat is found within the Forest Service roadless areas and should be protected.
- Retain recommended Riparian Reserves standards from the Northwest Forest Plan for all stream classes including reserve widths. Reserve widths average 180 feet for non-fish-bearing streams and 360 feet for fish-bearing streams on lands managed by the Forest Service.
- Priority should be given to enhancement of large coarse woody debris habitat within Riparian Reserves.
- Manage Riparian Reserves to enhance late-successional conditions; consider the impacts to microclimate and associated riparian species prior to management.
- As feasible, remove roads located within Riparian Reserves.
- Maintain Riparian Reserves in a condition that reflects the natural range of successional vegetation and processes within the watershed.

- Minimize salvage of snags and down wood in LSR's and Riparian Reserves except for safety reasons and to meet ACS objectives.

EXISTING AND DESIRED CONDITIONS

Past management practices such as clear-cutting riparian forests and removing large down wood from the stream channel have impacted the stream channels by reducing channel complexity and limiting aquatic habitat.

Streams are common in the planning area with an average stream density of 5.7 miles per square mile (Table 37). The streams in the proposed planning units tend to be first to third order, steep, 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.

Road densities are high throughout the planning area. Runoff from roads can be a source of fine sedimentation to stream channels. This is particularly of concern for valley bottoms (like the roads paralleling Martin Creek and Quartz 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 Quartz Roads Analysis (USDA 2014), 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. Several of the main system roads have received some level of maintenance and reconstruction within the last 10 years. However, there is a need to replace 18 stream crossing culverts and 20 ditch relief culverts to improve drainage in the planning area. The Quartz Roads Analysis also identified roads to inactivate and decommission. These road restoration projects would help further ACS objectives and meet Standard and Guideline RF-3c.

Sharps Creek is the mainstem stream within the planning area. All tributary streams within the planning area flow into Sharps Creek. The most recent stream inventory of Sharps Creek was conducted in 1996 (USDA 1996). The lower mainstem of Sharps Creek is low gradient where deposition processes occur, while the upper reaches of Sharps Creek and all the tributaries are source and transport sections. Hill slopes are highly dissected, with many tributaries. The high gradient, incised streams allow for "flashy" storm events, which are efficient in moving the high flows downstream. A valley bottom road has confined the lower mainstem of Sharps Creek, limiting the meander pattern (USDA/USDI 1999). However, the upper canyon reach of Sharps Creek does not have a road parallel to the stream channel. The road has also increased accessibility into Sharps Creek which has resulted in the past management (late 1970's through early 1980's) of removing several log jams. Much of the instream wood was believed to have been salvaged after the 1964 flood. 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.

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 #2 that addresses connectivity within watersheds; and 3) maintained levels of large instream wood in keeping with ACS objective #3 that addresses stream bed and bank conditions.

Proposed Treatments in Stream Channels

All action alternatives would implement routine timber sale road reconstruction to achieve safe and effective haul conditions. None of the temporary roads that would be re-used under the action alternatives would cross any streams.

All roads related work is similar in both action alternatives. Eighteen stream crossing culverts and 20 ditch relief culverts would be upgraded on haul routes and 12 stream crossing culverts would be removed through the proposed road inactivation projects (Figure 5 and Table 43). Inactivation includes the removal of culverts, the possible installation of cross ditches to disperse water and the blocking of the road entry points to eliminate the possibility of unauthorized use. Two stream crossings, a culvert and an old timber bridge, would be removed through the proposed road decommissioning projects (Figure 5).

Table 43. Instream Projects

	Alternative 1	Alternatives 2 & 3
Number of stream crossings upgraded	0	18 Culverts
Number of ditch relief culverts upgraded	0	20 culverts
Number of existing stream crossings removed through road inactivation	0	12 Culverts
Number of existing stream crossings removed through road decommissioning	0	1 culvert and 1 bridge

Numerous project design features are included as part of all the proposed instream projects (as detailed in Chapter Two) to lower or minimize the risk of water contamination and turbidity when equipment and workers are working in and near these streams.

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, decommission and instream restoration projects.

Under Alternative 1, no direct effects to stream channels or aquatic organisms would occur since no instream work would occur. Because there are no direct or indirect effects, no cumulative effects would occur.

The direct effects to stream channels from instream, road-related work would be increased sediment input caused by exposure of soil throughout the area when working in the channel or along stream banks. Channel banks and beds would also be modified during these activities with equipment working on banks and within channels. Vegetation, which would help stabilize the banks, is expected to establish within two years of construction. The extent of stream channel adversely affected would average about 45 feet for each stream crossing. 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 dispersed instream construction (Table 44) 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.

Table 44. Stream Channel Disturbance by Alternative

	Alternative 1	Alternatives 2 and 3
Stream crossing removal with road inactivation and decommission	0	12 culvert removals ~540 lineal feet ~120 cubic yards (CY) sediment
Stream crossing upgrades	0	18 culvert replacements ~840 lineal feet ~180 CY sediment
Bridge removal on 2300-106 road	0	1 structure removed ~45 lineal feet ~10 CY sediment
Totals	**0**	**31 sites ~1395 lineal feet** **~310 CY sediment**

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 Sharps Creek.

Overall, both action alternatives would result in long-term beneficial effects to stream channel connectivity compared to Alternative 1, where no instream restoration work would occur. In total, the action alternatives would result in a net decrease of 12 stream crossings in vicinity streams (Table 43).

The 12 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 12 stream culvert 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 1.

CUMULATIVE EFFECTS TO STREAM CHANNEL AND RIPARIAN FOREST CONDITION

The potential for the Quartz 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 Sharps Creek Subwatershed. 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.

Effects to streams and riparian forests have resulted from past road building and timber harvest in the Quartz planning area. The existing miles of road in the planning area's Riparian Reserves continues to exert profound local effects to streams at stream crossings with broader stream system effects to connectivity given the hundreds of stream crossings that exist.

Recent timber sales analyzed under the Rail2 and Parker Wyatt EA's include units within similar types of stream channels located in drainages within the nearby Layng Creek and Brice Creek subwatersheds to the North. The effects to riparian and stream channels within these EA's are comparable to those discussed above for the Quartz units. Other activities that would overlap with this project include routine road maintenance, noxious weed control, mining, and public and administrative road use (Figure 7). The Calapooya Divide Integrated Project which is located in the headwaters of Sharps Creek and Brice Creek is the next timber sale planning area on the Cottage Grove Ranger District. The outer portions of the managed stands, outside of the primary shade zone, will be thinned to enhance riparian conditions.

Past clear-cuts on federally administered lands occurred at least one to two decades ago; adverse effects to riparian micro-climates have recovered. There is no temporal or spatial overlap with any other timber sales EAs.

The adverse direct effects of the road actions to stream conditions such as sediment delivery and direct channel habitat effects from culvert removal would temporally overlap with the effects of the existing road network in planning area streams. However, the longer-term beneficial effects of the action alternatives on stream channels, including the inactivating and decommissioning of roads, and stream crossing removals would help off-set the potential cumulative effects of the action alternatives.

Taken in total (Table 45), the adverse cumulative effects associated with the action alternatives (primarily short term sediment delivery) 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 45. Summary of Riparian Reserve Actions and Effects

Riparian Actions	Riparian/Stream Change	Primary Effect (Beneficial and/or Adverse)	Duration	Amounts by Alternative		
				1	2	3
Commercial Thinning	Lower tree density & less crown closure	Beneficial – improved species and structural diversity/late-successional characteristics, lower risk of severe fire effects Adverse – drier microclimate, less litter to streams/forest floor	30+ years 10-20 years	0 acres	202 acres	169 acres
	Change in snag and down wood recruitment process	Beneficial – accelerated growth of larger leave trees for future recruitment Adverse – loss of suppression mortality in smaller-sized trees, near term loss of potential large	30 years up to 60 years			

Riparian Actions	Riparian/Stream Change	Primary Effect (Beneficial and/or Adverse)	Duration	Amounts by Alternative		
		and small down wood in riparian areas.				
Road Actions	Stream crossings removed with road inactivation	Beneficial – lower risk of stream diversion and/or washout Adverse – increased sediment delivery at the site & immediately downstream	10-15 years or in perpetuity if road is never re-opened	0 sites	12 sites	
	Stream crossing upgrades		25 years	0 sites, Higher risk	18 sites, Lower risk	
Treatment of Fuels	Underburning	Beneficial – reintroduction of excluded process Adverse – surface erosion	20 years	0 acres	0.23 acres	
Instream Restoration	Bridge removal	Beneficial – improved connectivity Adverse – sedimentation at the site and downstream	In perpetuity 1-2 years	0	1 structure	

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 Riparian Reserves under the action alternatives would implement Watershed Analysis recommendations (USDA/USDI 1999) to use management activities to enhance late-successional conditions and aquatic habitat. The actions within Riparian Reserves under Alternatives 2 and 3 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 dependent 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 dependent species. 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. 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.

The road decommissioning and culvert removal from road inactivating, 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. 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 1 would not pro-actively implement any of the objectives of the Aquatic Conservation Strategy.

EROSION AND SEDIMENTATION

Summary of Effects

Alternative 1 would not result in surface erosion above background levels but would not implement road maintenance or upgrade culverts. Activities in Alternatives 2 and 3 would not be expected to result in adverse sediment delivery to streams and meet or exceed LRMP standard and guidelines for maintaining effective ground cover. The projected amounts of sediment with the action alternatives are unlikely to result in an indirect adverse turbidity spike downstream of the planning area. No cumulative effects would likely occur that are outside the normal range of variability in the watershed.

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

The most relevant standard and guidelines from the Umpqua Land Resource Management Plan (LRMP) related to soil productivity (USDA 1990) include:

Soil Standard and Guidelines #2 and #3 (LRMP IV-69) 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 project design feature 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 (LRMP IV-71) 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 (LRMP pp. IV-71) 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, 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 (LRMP IV-72) requires the identification of erosion control in existing developed areas where pre-existing surface erosion is on-going

The Commercial Road Rules for the Umpqua National Forest provide rules and regulations for commercial use on the Forest (USDA 2012).

EXISTING AND DESIRED CONDITIONS

Existing timber units located on steeper terrain were originally clearcut using a highlead[20] 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. 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 a lack of adequate aggregate or irregular road maintenance.

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 appropriated funds to do road maintenance have also declined. Annual road maintenance is limited to main use roads.

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.

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[21] 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.

Within the planning area sediment enters the aquatic environment through mass wasting, surface erosion and fluvial erosion.

Road projects that would be considered beneficial for mitigating road drainage issues and reducing future sediment delivery to streams would include decommissioning 1.5 miles of the

[20] Highlead logging was used up until the mid-1970's. 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.
[21] Sedimentation pertains to the deposition or settling of rock and soil materials in an aquatic environment.

2300-106 and 2300-808 roads near Quartz Creek, 1.6 miles of road inactivation on the 2241-841, replacing 18 stream crossing culverts.

The highest risks for delivery potential would come from roads maintenance and winter haul. Approximate 3 miles of road way proposed for winter haul would have a high potential for sediment delivery during winter haul (Figure 44). In addition ditch grading would potentially increase sediment yields more than heavy traffic. Without implementing erosion control measures, graded ditches have been found to yield increased sediment for up to three years until the ditches can become naturally armored or revegetated (Luce and Black 2001), and ditch grading plus heavy traffic increased sediment yields the most.

Restricting wet weather haul is effective in reducing sediment production (Luce and Black 2001) and implementing erosion control to restrict the off-site movement of sediment before it delivers to streams may be an effective means for extending the operating and haul period of sales in this planning area.

Erosion controls such as applying ground cover (loose straw, wood chips, or aggregate) in bare ditches would provide armoring during first season, and grass seeding would provide vegetation for the second and third season. However, the effective implementation and monitoring of erosion control measures is currently dependent on the Purchaser and language has been added as Best Management Practices in Chapter Two to prevent sediment that may affect water quality (S&G 16 LMRP pp IV-72).

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.

Implementing, monitoring, and maintaining effective erosion controls during the life of the project to prevent erosion and restrict the off-site movement of sediment would be key in preventing sediment delivery to streams in the Quartz Creek Watershed. Erosion would have a direct effect to road infrastructure or soil productivity. Sediment delivery may have a direct effect to water quality and the aquatic environment. Without the use of erosion controls even routine road maintenance next to riparian area would result in short-term (1 to 3 year) sediment delivery. Without maintenance such as pulling ditches as needed, grading and shaping road surfaces, and clearing or replacing culverts roads can become less efficient at shedding surface water runoff before it can concentrate and create damage that can cause road failure or increased erosion with a greater potential for delivering sediment to streams.

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 five to ten years from roads after the sale has closed and traffic is reduced.

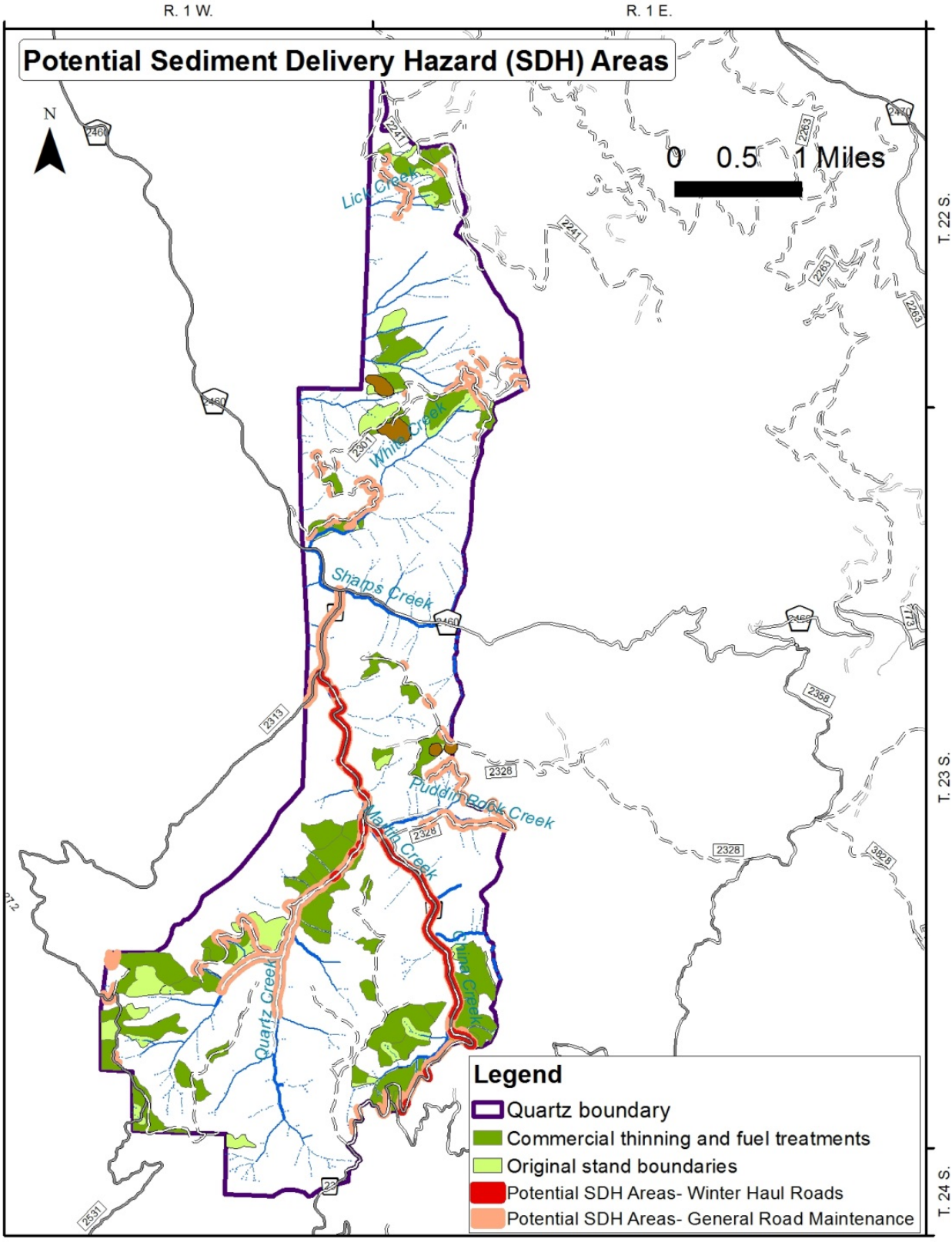

Figure 44. High Sediment Delivery Potential

Erosion and sedimentation from temporary roads are expected to be low and are not expected to be measurable. The project design features included in Chapter 2 regarding subsoiling would have the direct effect of reducing disturbance and restarting the process of restoring site productivity. No temporary stream crossings would be constructed.

Alternative 1 would not result in surface erosion above background levels in the unmanaged sites. However, this alternative would not implement road maintenance or upgrade culverts. In addition, roads that are currently not accessible that have existing culverts would not be inactivated or decommissioned. At present these existing culverts cannot be maintained and would be at higher risk for failing. The no action alternative would have the potential to result poorly drained road with possible failures.

The harvest and fuel prescriptions for Quartz are low impact and would not be expected to result in adverse sediment delivery to streams. Alternatives 2 and 3 would meet or exceed Forest Standards and Guidelines for effective ground cover (Standard and Guidelines 2 and 3 LRMP IV-69).

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 Quartz Creek subwatersheds if a substantial storm event should occur immediately following the ground disturbance.

The projected amounts of sediment associated with the action alternatives 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 (USDA 2006).

Without the restoration projects that include road decommissioning, road inactivation and culverts upgrades, the no action alternative has the potential to increase surface erosion. However, long term indirect effects are not expected to be measurable.

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. Under Alternative 1 existing roads would maintain or slightly increase sediment delivery to streams, but hill slope erosion would remain unchanged. Sediment delivery would increase slightly under Alternatives 2 and 3 in the short term (initial 1 to 2 years) following disturbance but may be expected to decrease slightly during the first year from increased slash on the ground. While project road maintenance would be expected to improve dispersal of surface water runoff and therefore reduce the carrying capacity of runoff to carry sediment to streams, increased road use and truck haul would increase the potential of road surface erosion over background levels particularly during the year of haul. Given the limited indirect effects of Alternatives 2 and 3 no cumulative effects would likely occur that are outside the normal range of variability in the Quartz Creek Watershed.

MASS WASTING

Summary of Effects

The alternatives are not expected to have any adverse direct, indirect, or cumulative effects to mass wasting potential.

Mass wasting is the dominant mechanism of sediment production within temperate rain forests of the Pacific Northwest (Naiman et al 1992), which includes the Quartz Creek subwatershed watersheds. 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, earthflows, and soil creep. Topography has a strong influence on the form of a landslide with the highest risk occurring on the side slope and headwall landforms and colluvial bench and footslope landforms (0.003 failure miles/square mile) of the Quartz Creek Planning Area(figure 12)

RELEVANT STANDARDS AND GUIDELINES

Prepare a risk and hazard analysis when the potential exists for triggering slope mass-movements as a result of proposed land management activities (LRMP S&G 5, p IV-68).

The project analysis will address how the proposed activities plan to meet soil standards and guidelines. Project design features (or alternatives) will be developed and evaluated when detrimental soil conditions are expected as a result of the proposed action (LRMP S&G 10 p. IV-71).

NWFP 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).

NWFP RF-3a. Meet ACS objectives by reconstructing roads and associated drainage features that pose a substantial risk (USDA/USDI 1994).

NWFP 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

A total of 77 acres in the Quartz Planning Area have been delineated as potentially prone to landslide and slope failures. Unstable soils were identified within Units 2, 5, and 32. These acres were dropped from consideration for harvest (LRMP pp B-10).

Improperly functioning (plugged) cross drains or an insufficient number of cross drains are a chief cause of road fill failures (USDA 1999). When road fills become saturated and fail, rapid-shallow landslides can occur. Roads that cross active earthflows often become buckled and slumped. Road grading, reconstruction, and maintenance would improve drainage on all roads that were identified in the Quartz Roads Analysis. Alternatives 2 and 3 would replace 18 stream crossing culverts. Under no action existing culvert concerns would continue to pose an in-stream hazard.

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. Roads that are not maintained develop ruts and carry runoff for several hundred feet down the road surface to where it is finally dumped as concentrated runoff onto fill slopes. Maintaining a well graded road bed is critical for dispersing runoff before it can concentrate and cause erosion with leads to road damage and slope failures.

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 more unstable soils were removed from the timber harvest base and “no treatment” was prescribed to these areas. Alternatives 2 and 3 are not expected to trigger any new mass movement within the units or in downslope locations.

The upgrades of priority relief culverts, along with road drainage maintenance 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 culvert replacements are expected to last for up to 20 or more years assuming some level of road maintenance would occur.

Alternative 1 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.

FISHERIES

Summary of Effects

The action alternatives would not affect fish and sensitive aquatic invertebrates by measurably affecting downstream water quality or aquatic habitat in fish bearing channels of the planning area watersheds. The reconstruction and subsequent obliteration of temporary roads would disconnect compacted soils from the stream network and would prove beneficial to habitat over the long term by potentially eliminating chronic sediment sources. Maintenance that would occur on system roads would help in reducing chronic sediment production and delivery by improving road surfaces and drainage structures and design.

Neither action alternatives nor associated connected actions would have meaningful or measurable elements (either adverse or beneficial) that would incrementally add to any other past, present, or reasonably foreseeable actions in the affected 5th, 6th, or 7th field watersheds.

EXISTING CONDITION

The 8,331-acre Quartz planning area is located about 22 miles southeast of Cottage Grove, OR, primarily within the upper portion of the Sharps Creek watershed. Sharps Creek is a tributary to the Row River that then flows into Dorena reservoir, above Dorena Dam and the Coast Fork Willamette River. The planning is distributed by watershed as follows: 8,285 acres within Sharps Creek, 4 acres within Brice Creek, and 42 acres within Canton Creek.

The Sharps Creek, Canton Creek, and Brice Creek Watershed Analysis documents provide detailed descriptions of fish habitat in the planning and surrounding areas and are incorporated by reference into this document (USDA/USDI 1999; USDA 1997a; USDI 1995).

AQUATIC SPECIES PRESENT

The planning area is over 15 miles upstream of the extent of anadromous fish distribution at Dorena Dam and therefore would not affect anadromous fish including any ESA-listed fish. No Sensitive or otherwise special status fish species are present in the project area and therefore would not be affected by any Project Alternative. Refer to the Wildlife section of this chapter for an analysis of semi-aquatic State sensitive species.

Two aquatic mollusk species and one aquatic macroinvertebrate have special status on the Umpqua National Forest:

Rotund Lanx (FS Sensitive)

The rotund lanx (*Lanx subrotuna*) is known to occur on the Umpqua National Forest, in the Umpqua River basin. The rotund lanx is a small freshwater limpet and the current distribution appears to be scattered and local in portions of the Umpqua National Forest in Douglas County. The rotund lanx is found in unpolluted rivers and large streams at low to moderate elevations. They prefer highly oxygenated, swift-flowing streams with stable cobble, boulder or bedrock substrates. They are not typically found where aquatic macrophytes and epiphytic algae occur. Suitable habitat can be found in the planning area. Surveys have not been conducted in the planning area but suitable habitat can be found in the planning area, but this species range is confined in the Rogue and Umpqua Rivers in Southwestern Oregon.

Western Ridged Mussel (FS Sensitive)

The Western ridged mussel (*Gonidea angulata*) is suspected to occur on the Umpqua National Forest, although suitable habitat exists, no documented sites are known to occur within the planning area. Western ridged mussels occur in streams of all sizes and are rarely found in lakes or reservoirs. They are found mainly in low to mid-elevation watersheds, and do not often inhabit high elevation headwater streams where western pearlshells can be found. They often share habitat with the western pearlshell throughout much of the Pacific Northwest. They are more tolerant of fine sediments than western pearlshells and occupy depositional habitats and banks. They can withstand moderate amounts of sedimentation, but are usually absent from habitats with unstable or very soft substrates. Lack of information on life history, reproduction, and ecology of western ridged mussels will hinder effective conservation and management.

Namamyia plutonis (FS Sensitive)

This aquatic caddisfly is suspected to occur on the Forest based upon its documentation elsewhere in southwest Oregon and preference for mature temperate riparian habitats to maintain appropriate water levels and temperatures for development. Lack of information on population distribution and abundance of this species will hinder effective conservation and management.

In addition, several resident fish taxa are found within the planning area boundary, primarily in perennial channels of the Martin Creek drainage, including sculpin, trout (cutthroat and rainbow), dace and lamprey (see Figure 45). 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).

DIRECT AND INDIRECT EFFECTS

Harvest and Haul

Log harvest and haul activities for Alternatives 2 and 3 are described in Chapter 2 of this Environmental Assessment. Alternatives 2 and 3 would not authorize any activities that would modify in-stream habitat or otherwise directly affect fish, sensitive aquatic invertebrates, or their habitat; thus, there are no measurable direct effects associated with Alternatives 2 and 3. This conclusion is based on the following rationale: no-harvest buffers would be placed on all stream channels (measured from the edge of the stream channels) thereby eliminating any direct logging effects to fish and sensitive aquatic invertebrates.

Indirect effects that have been identified as having a potential to impact the aquatic environment include stream sedimentation, increased stream temperature, and future large wood recruitment.

There is a limited amount of riparian area proposed for vegetation management under Alternatives 2 and (Table 46). No harvesting of the Riparian Reserves within the 90 to 130-year-old fire regenerated stands is proposed. All riparian harvest would occur outside the inner gorge of stream channels within the riparian areas with all streams being protected by no cut buffers. Large wood recruitment and stream temperatures would be protected from measurable negative impacts through project design criteria that include no cut stream buffers and no clearcut harvest. Intermittent stream channels would be protected through maintaining 30 foot minimum buffers while perennial streams would be protected with 60 foot riparian buffers. These no cut buffers will also act as living filters to capture any overland sediment transport that may come from harvest units.

Table 46. Riparian Harvest by Alternative

Alternative	Acres Riparian in Planning Area	Stream Miles Adjacent to Proposed Riparian Harvest by Stream Class				Percent of Riparian Proposed for Harvest
		1	2	3	4	
Alternative 1	~8,331	0	0	0	0	0%
Alternative 2 & 3	~8,331	0	0.31	0.80	0.35	<6%

Log haul would be limited to the normal operating season, described as June 1 to October 1 for a majority of the planned harvest units. Wet season log haul may occur on approximately 6.8 miles of existing roads and 0.28 miles of temporary roads. Units included for wet season haul activities include skyline units 14, 20, 31, and 32. The wet season haul route would cross 7 fish bearing perennial streams, no non-fish bearing perennial streams, and 12 intermittent stream channels. All of these channels would likely be flowing water during wet season haul.

Road maintenance prior to log haul would improve road drainage and assure stream extensions due to ditch lines are minimized by cleaning culverts and adding cross drains where necessary. In addition, blading, spot rocking, and reshaping roads, where necessary, would decrease water channeling and ponding on the road surface. Identified / required pre-haul maintenance on identified wet season haul routes would be completed prior to October 1 of the year haul is expected to occur. If identified maintenance is not completed by October 1, no wet season haul would be allowed that logging season.

Haul during suitable dry conditions has little potential to create or deliver road-derived sediment to live stream channels.

Wet season haul has a greater potential to increase sediment delivery to area waterways. Roads can become saturated and log haul traffic can cause fines to move up through the road bed to the surface of the road where they can be easily transported to waterways. Road generated sediment and its delivery are expected to be negligible due to specified wet season haul route, road maintenance and improvements that would occur prior to haul, BMPs that would be in place, and the monitoring of road conditions during wet season haul to assure that resource damage is not occurring. Logging activities including log haul can be suspended at any time of year when precipitation events are imminent or excessive road deformity would occur during haul due to road moisture conditions. Log haul would be suspended if there is potential for road surface run off to carrying sediment to roadside ditches. All Umpqua Forest Road Rules will be enforced.

As part of the maintenance plan, dust abatement may occur on the graveled haul routes during dry road conditions. Magnesium chloride or water would be applied for dust abatement. In the event magnesium chloride is used, application rates would conform to industry standards of up to 19 tons per mile. Application would be required to maintain a one foot buffer along each road edge and no application within 25 feet of any stream channel. These buffers are designed to prevent effects to the aquatic environment. Therefore, the application of magnesium chloride as dust abatement is not expected to have a measurable adverse impact on water quality or aquatic species in or downstream of the planning area.

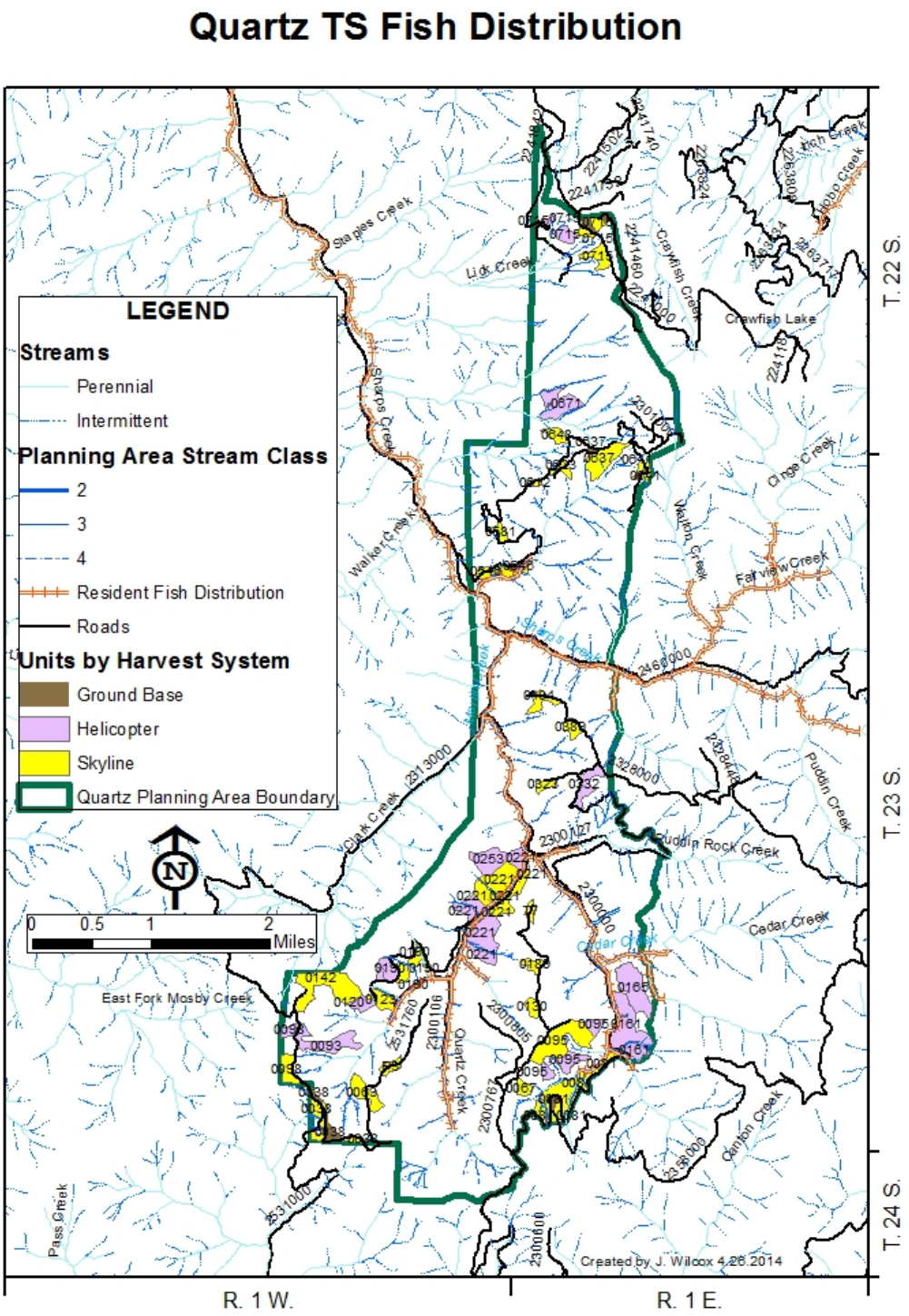

Figure 45. Fish Distribution within the Quartz Integrated Project

No direct effects from timber harvest, log haul, or fuels treatment on fish or sensitive aquatic invertebrate species are expected to occur. Maintaining a no-harvest buffer along all streams and no clearcut harvest would adequately protect future large wood recruitment, filter and disperse overland flow before it reaches the streams, and protect stream vegetation and associated shade that in turn helps to maintain healthy stream temperatures.

Fuel Treatments

Alternative 2 would not create or burn piles within the no-harvest buffers. This, along with the no-harvest stream buffers and the hand and grapple piling mitigations, would minimize the potential for any meaningful direct effects to aquatic habitat. Activity fuels in harvest units would be treated by grapple piling in ground-based yarding system units. Skyline systems would yard trees with tops attached and fuels would be treated at the landing or by hand piling and burning. The no-harvest buffers are expected to be sufficient to prevent any meaningful amount of sediment from disturbed ground from reaching the stream channel. Burning of slash piles would be limited to the interior of the units, and landings with low erosion potential. There would be no hand piles or grapple piles within the no-harvest buffers. Sediment resulting from slash burning is expected to filter into the forest floor before reaching stream channels.

Road Maintenance and Temporary Roads

Alternative 2 proposes approximately up to 54 miles of road maintenance. This would include brushing, ditch line and culvert cleaning, road surface blading and shaping, and adding crushed rock where needed. Up to 20 ditch relief culverts would be replaced or installed to facilitate road network drainage. These culverts are typically associated with the road ditch line and not connected to stream channels. Project design features and Best Management Practices would be implemented during road maintenance activities (See Chapter 2). Any closed system roads opened for the project will be closed after use. This would include the same type of work as road improvements. Any instream work associated with road improvements such as culvert replacements would occur during low flow conditions.

Proposed road improvement would reduce road-derived sediment generated during increased road use over the life of the project. Road-derived sediment would be directed onto the forest floor through cross drains where it would be filtered and settle out before reaching stream channels. There would be about 0.97 miles of new temporary spur road constructed and 0.70 miles of existing temporary spur road reconstruction under Alternative 2. Temporary road placement, minimizing new temporary road construction, no-harvest riparian buffers, and distant proximity to fish bearing streams would be sufficient to prevent adverse amounts of sediment delivery from temporary road construction or use from being delivered to downstream occupied habitat. All temporary roads would be decommissioned and obliterated after use. All pre-haul road work, all temporary road reconstruction/construction, temporary road closures, and temporary road obliteration would occur prior to October 1 of any given year during the life of the timber sale. Any closed system roads opened for the project will be closed after use.

A small amount of instream work would occur during spot reconstruction to facilitate log haul. All reconstruction sites are located on non-fish bearing stream channels and would include 18 culvert replacements on non-fish bearing streams. These replacements will help restore aquatic connectivity and reduce the probability of road failures and debris torrents. Instream work would occur during low summer flow conditions, July 1 to September 15, with all culvert sites being temporarily dewatered with flow being diverted around the work area. Due to timing of construction, project design features and BMPs, the reconstruction is expected to transport an immeasurable amount of sediment to downstream fish habitat. Any increase of sediment to the

system would be short-lived, localized, and would likely be undetectable against background levels in occupied downstream habitat.

This project would have negligible amounts of fine sediment from road activities that would enter stream channels at stream crossings. The impacts are expected to be inconsequential to aquatic habitat relative to the effects of otherwise existing natural sediment inputs. This is due to the focused and limited wet season haul as indicated above; sediment input would be minimized through project design features and BMPs (e.g. turbidity reduction measures and suspension of haul operations if suspended sediment is flowing off of the road).

Road maintenance activities would minimize disturbance to grasses and forbs that are growing in the ditch line that act as sediment traps. Where haul routes parallel stream channels, a sufficient filter strip between the ditch and the stream exists to slow and capture any sediment laden runoff in the event of a rain storm during haul. During wet season haul erosion control would be used to filter sediment moving off of the haul roads. These filters would be maintained as needed to remove trapped sediment. Removed sediment would be disposed of in areas not connected to stream channels. The contract administrator maintains the authority to suspend operations if weather conditions arise that would cause a transport of sediment from the road surface to the stream.

Considering the information above regarding vegetated ditch lines, the presence of an adequate filter strip between the road and the stream, following established BMP's, project design features, instream work timelines, road improvements prior to haul, and the use of erosion control, the likelihood and potential quantity of material reaching fish bearing streams is discountable and inconsequential.

Alternative Comparison

Alternative 1 would leave stands of timber in stem-exclusion condition. Temporary roads constructed during the last timber entry into this area 15 to 35 years ago and not rehabilitated would remain on the landscape as hydrologic barriers and potential sources of chronic erosion to local waterways. No road maintenance would occur under this alternative, potentially leaving the road system with a greater risk of producing chronic sediment to area streams and an elevated risk of mass failure. Thus, Alternative 1, through lack of action, would have a negative indirect impact by leaving compacted roads on the landscape. Alternative 2 and 3 propose to obliterate new as well as existing temporary spur roads after use.

Alternative 2, as described in the above analysis, would not affect fish and sensitive aquatic invertebrates by measurably affecting downstream water quality or aquatic habitat in fish bearing channels of the planning area watersheds through the release of additional nutrients, reduction of large wood recruitment, increases in stream sedimentation, or by increasing water temperature. The reconstruction and subsequent obliteration of temporary roads would disconnect compacted soils from the stream network and would prove beneficial to habitat over the long term by potentially eliminating chronic sediment sources. Maintenance that would occur on system roads would help in reducing chronic sediment production and delivery by improving road surfaces and drainage structures and design.

Alternative 3 is similar to Alternative 2 in aquatics effects. The main differences between Alt 2 and 3 are 99 fewer acres of commercial thinning in older stands, and the number of ½ acre gaps created within units. There is no meaningfully measureable difference in the effects determination between these alternatives as they maintain the same amounts of road, obliterate, decommission, and inactivate the same amount of temporary roads, and replace the same number of ditch relief and stream crossing culverts.

None of the connected actions described in Chapter 2 would result in any indirect effects over the long-term or in downstream areas as described previously. All of the connected actions are minor activities of limited scope and duration. As such, these connected actions would have little chance of resulting in a negative effect to water quality or instream habitats, but may have long term beneficial effects.

CUMULATIVE EFFECTS -

The scope of analysis for cumulative effects is the subwatershed scale and includes past and future activities that may have impacted aquatic organism habitats in the planning area. The action Alternatives do not have the potential to result in any meaningful cumulative effects to water quality, stream flows, or the sediment regime that would affect fish or sensitive aquatic invertebrates. This is due to the lack of any substantial risk of direct or indirect effects to aquatic species associated with this project. Neither Action Alternative nor associated connected actions will have meaningful or measurable elements (either adverse or beneficial) that would incrementally add to any other past, present, or reasonably foreseeable actions in the affected 5th, 6th, or 7th field watersheds.

AQUATIC CONSERVATION STRATEGY

The proposed action would be implemented in accordance with applicable US Forest Service Best Management Practices (BMPs) and Forest Standards and Guidelines, resulting in no meaningful or measurable negative impacts to habitat elements or the associated beneficial uses of water from any of the proposed activities in Alternatives 2 or 3 and associated connected actions, including those actions proposed to take place within the riparian reserve land use allocations. Moreover, both Action Alternatives were designed to accomplish broad landscape objectives that are designed to restore diversity and variability within previously managed stands, and to contribute to restoring the watershed over the long term. Fish and other aquatic organisms are expected to benefit from the adherence to the Aquatic Conservation Strategy, as described in detail in the Aquatic Environment section. Alternatives 2 and 3 are designed to accomplish the intent of the Aquatic Conservation Strategy, whereas Alternative 1 would not proactively implement this conservation strategy.

DETERMINATION OF EFFECTS

ESA Listed Fish and Essential Fish Habitat

The planning area is over 15 miles upstream of the extent of anadromous fish distribution at Dorena Dam and therefore would have No Effect upon anadromous fish including any ESA-listed fish. Downstream effects to salmon commercial fisheries or marine species would not occur and therefore the Project would have No Adverse Effect upon Essential Fish Habitat as defined under the Magnuson-Steven Fishery Conservation and Management Act (MSA).

FS Sensitive Fish and Aquatic Invertebrate Species

Western Ridged Mussel, Rotund Lanx, and Namamyia plutonis caddisfly*: No Impact (NI).* The Project would have No Impact upon special status fish species, as these species are not known or suspected to occur in the project area (Table 47).

Table 47. Determination of Effects to Sensitive Aquatic Species

Species	Alts. 1-3
Rotund Lanx	NI
Western Ridged Mussel	NI
Namamyia plutonis caddisfly	NI

SOCIAL ENVIRONMENT

ROAD BUILDING AND ACCESS

Summary of Effects

Under Alternative 1 the 0.70 miles of compacted temporary roads would continue to exist within the planning area. No new temporary roads would be constructed and no road reconstruction, inactivation or decommissioning would occur. In addition, no purchaser road maintenance would occur.

Under Alternatives 2 and 3 the new (0.97 miles) and re-used (0.70 miles) temporary roads would be obliterated; approximately 54 miles of road reconstruction and maintenance would occur to provide safe and economical timber haul, as well as improved drainage capacity and reduced risk of failure; and road inactivation (1.7 miles) and decommissioning (1.9 miles) would occur to reduce future road costs and potential impacts to other resources.

EXISTING CONDITION

A project-level roads analysis (USDA 2014) was conducted for the planning area and is part of the project record (USDA 2014). A complete description of the current road system, and the risks associated with it, are listed in the analysis,

The transportation system in the Quartz planning area includes 32.45 miles of roads, which equates to a density of 2.49 miles per square mile of land.

The transportation system provides access for commercial users, including forest product harvesters. Most roads were built to facilitate timber harvest, mining activity and access to private land holdings. Recreation use focuses on providing access to hiking trails, hunting, fishing, and driving for pleasure, with the majority of the use taking place in the summer and early fall.

RELEVANT STANDARDS AND GUIDELINES (USDA 1990)

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

- ✓ Safety hazards to the road user exist.
- ✓ Prescriptions in the Forest Plan recommend closures in elk winter range.
- ✓ To provide security to contractors/cooperators, special use permittees, private land owners, and Forest Service administrative facilities.
- ✓ Road maintenance costs to keep a road open are high compared to existing or expected use of the road.

WATERSHED ANALYSIS AND ROADS ANALYSIS RECOMMENDATIONS

The Sharps Creek Watershed Analysis (USDA/USDI 1999) and the Quartz Roads Analysis (USDA 2014) made several recommendations in order to improve the current condition. Specific recommendations for this project are found in the project-level roads analysis.

DIRECT AND INDIRECT EFFECTS

The environmental effects of roads are disclosed in numerous places in Chapter 3 including the sections on Forest Wildlife, Botany, Aquatics, and Mass Wasting. This section displays the overall effects of the alternatives in terms of miles of roads, access and economics. The scale used in this analysis for direct/indirect effects is the planning area. Table 48 provides a summary of road activities by alternative.

Table 48. Summary of Road Activities Associated with Each Alternative

Alt	Total road miles	New temporary road construction/ obliteration (miles)	Existing temporary road use/ obliteration (miles)	Road decommissioning (miles)	Road Inactivation (miles)	Roads maintained by purchaser (miles)
1	32.45	0	0	0	0	0
2	32.45	0.97	0.70	1.5	1.6	56.35
3	32.45	0.97	0.70	1.5	1.6	56.35

Temporary Roads

Alternative 1 - Under Alternative 1 the 0.70 miles of compacted temporary roads would continue to exist within the planning area. No new temporary roads would be constructed and no road reconstruction, inactivation or decommissioning would occur.

Alternatives 2 and 3 - No new system roads are proposed for construction. As displayed in Table 48, both Alternatives 2 and 3 would build 0.97 miles of new temporary road and re-use 0.70 miles of existing temporary road. These temporary roads are the only proposed road construction for both action alternatives and would subsequently be obliterated after logging is complete. The existing mining access spur, located in unit 32, will be temporarily used for logging and will not be obliterated after use. Temporary road obliteration involves subsoiling as appropriate, and pulling displaced soil and duff back over the road surface.

Road Reconstruction

Alternative 1 – Alternative 1 provides for no road reconstruction.

Alternatives 2 and 3 - The reconstruction identified for each action alternative in Chapter Two addresses the specific recommendations of the Watershed Analysis and Roads Analyses. 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. Both Alternatives 2 and 3 include placement of surface rock and reconditioning and reshaping road surfaces, the repair of three slump/slides, bridge approach and wearing surface improvement, installing drivable cross ditches and abandoning sections of ditchline in areas due to cut slope stability issues, replacement of approximately 20 ditch relief culverts and 18 stream crossing culverts, and bridge maintenance. Placement of surface rock, combined with reconditioning and reshaping of road surfacing, would help minimize stream sediment delivery, improve road drainage, and help facilitate log haul. Six roads, 2300-708, 2300-721, 2301, 2301-742, 2328-739, and 2531-760, have been identified as having cut slope stability issues which has caused ditches to plug and drainages to be ineffective. Ditch flow is blocked and traveling down the road surfaces causing loss of surface rock and draining in undesired locations. Abandoning these sections of ditchline and installing drivable cross ditches will minimize the flow along road surfaces and focus the flow to desired drainage locations. Replacement of the 18 stream culverts would help to either eliminate the potential for stream diversion or to accommodate 100-year flood flows. Replacement of approximately 20 rusted ditch relief culverts would help to continue to accommodate flood flows, lessen the risk of erosion and provide for safe road use.

Road Maintenance

Alternative 1 - Alternative 1 provides for no purchaser maintenance and allows existing road related drainage problems to continue

Alternatives 2 and 3 - Alternatives 2 and 3 would provide similar amounts of maintenance and improve the road conditions in the planning area. The cost to the purchaser for both action alternatives would be about $20,650 annually for three years. 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.

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 2003b) 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 $45,419 (USDA 2014). Maintenance that would be performed by timber purchasers could provide a substantial portion of the total needs for several years.

Under the action alternatives, the reconstruction and maintenance work would be implemented in order to meet the Standards and Guidelines of the Northwest Forest Plan which are designed 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.

Road Inactivation

Alternative 1 - Alternative 1 includes no road inactivation and allows existing road related problems, including erosion from roads currently in poor condition, to continue.

Alternatives 2 and 3 – Alternatives 2 and 3 would include approximately 1.62 miles of road inactivation of the 2241-841. Road inactivation includes the removal of culverts, cross ditching where necessary and blocking entrances.

Road Decommissioning

Alternative 1 - Alternative 1 includes no road decommissioning and allows existing road related problems, including erosion from roads currently in poor condition, to continue, and would not reduce the density of roads in the project area.

Alternatives 2 and 3 – Alternatives 2 and 3 would have approximately 1.50 miles of roads decommissioned. Roads 2300-106 and 2300-808 will be decommissioned and are no longer needed for providing access to implement resource management objectives. Decommissioning these roads will provide opportunities to restore stream channels while continuing to provide access for mining activities. Decommissioning would remove culverts, outslope where necessary, subsoil and permanently remove the road from the Forest Transportation System.

Shane Saddle Rock Pit Expansion

Alternative 1 – Under Alternative 1 the Shane Saddle Rock Pit would continue to exist as a rock source, but quantities are limited.

Alternative 2 and 3 – Alternatives 2 and 3 would expand the Shane Saddle Rock Pit, on the North Umpqua Ranger District, to provide a rock source for the road work. The expansion would include about 100 horizontal feet into the previously undisturbed rock outcrop area, to the North, above the current top of the pit. The expansion of the pit would provide a source for the needed rock required for road reconstruction and maintenance activities within the project area.

Summary

Under the action alternatives, 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 inactivity and decommissioning would provide opportunities to reduce potential adverse impact to surrounding natural resources from fill failures and sediment delivery to streams and provide opportunities to restore stream channels while continuing to provide access for mining activities.

CUMULATIVE EFFECTS

The Quartz Planning Area is the scale at which cumulative effects are analyzed for roads. Several roads have received some level of road maintenance or reconstruction work in the past 10 years. This work includes road brushing, culvert cleanout, road grading, spot rocking, resurfacing with crushed rock, culvert upgrades and asphalt patching. All of the roads listed above will receive periodic road maintenance into the foreseeable future as well. All past, present and planned road improvement projects did not or would not have adverse effects to access, condition, or economics of the transportation system within the planning area. Therefore, no cumulative adverse effects would occur as a result of this project. All road maintenance and improvement work incorporates specifications that meet applicable Standards and Guidelines and Best Management Practices (see Chapter Two).

RECREATION

Summary of Effects

Alternative 1 would have no direct, indirect, or cumulative effects to recreation activities. Alternatives 2 and 3 may have short-term directs effects of noise disturbance from increased logging traffic in the area.

EXISTING CONDITIONS

According to the Recreation Opportunity Spectrum[22] (ROS) inventory system, the Quartz planning area is inventoried mostly as "roaded modified". This characterizes the landscape as generally natural, with some heavily modified areas such as roads or recreation opportunities and facilities. A small portion of the planning area is inventoried as "roaded natural". This characterized the landscape as predominantly natural-appearing with moderate evidence of the sights and sounds of humans. However there are no proposed units in the "roaded natural" areas within the planning area.

The Quartz planning area is within the Sharps Creek watershed which is a popular corridor for recreation and mining activities. Most of the recreation use in the Sharps Creek watershed occurs along the main stem of Sharps Creek as well as Martin, Quartz and China Creeks. There are no developed recreation sites within the boundary of the Quartz planning area. However, there are numerous dispersed camping sites within the Quartz planning area. Most forest visitors to these areas use these sites for overnight and/or day use recreational and mining activities.

Existing developed trails and trailheads within the Quartz planning area are limited. Martin-Sharps Creek trail #1416 follows along the east side of Martin Creek between its intersection with Clark Creek and Sharps Creek. Knott trail #1417 begins on the northeast boundary of the Quartz planning area then diverts to the east, outside of the planning area.

Primary recreational activities that occur within the Quartz planning area include camping, picnicking, swimming, fishing and trail uses. Other common activities include mining, hunting, gathering of forest products, and driving roads for pleasure.

DIRECT AND INDIRECT EFFECTS

Alternative 1 would have no direct, indirect, or cumulative effects to recreation activities.

Both Alternatives 2 and 3 may have some short-term direct effects on recreation from noise disturbance as well as from increased traffic during logging operations. However there are no harvest units in close relation with any trails therefore the need to close trails will not be necessary.

Temporary road reconstruction activities proposed in both Alternatives 2 and 3 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, 1.5 miles of existing system roads are proposed for decommissioning in both action alternatives. Of the 1.5 miles, 0.6 miles are currently passable by vehicular traffic; the remaining miles are not drivable due to overgrown road beds and unsafe bridge crossing conditions.

[22] 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.

The decommissioned roads would eliminate all vehicular traffic and be slightly more difficult to walk on, and therefore would affect the ability of hunters to travel the roads by foot. The impact to vehicles and off road vehicles is small as the road system does not connect to any other road system or loops and is a short, out and back riding opportunity. The decommissioning of this road would be helpful to law enforcement activities as the road is narrow and does not allow for very good access to the end of the road where illegal activities could take place without law enforcement knowledge.

Considering the above minimal effects, the implementation of Alternatives 2 or 3 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 projects proposed as reasonably foreseeable actions within the planning area that would overlap in time or space that contribute to a cumulative effect to recreation experiences; therefore, given the limited direct and indirect effects to recreation, no cumulative effects would occur.

MINING

Summary of Effects

Alternative 1 would have no direct, indirect, or cumulative effects to mining activities. Alternatives 2 and 3 may have short-term direct effects on miner access during timber harvesting but can be mitigated through early communication with the affected mining claims and implementing the project design criteria identified in Chapter 2.

EXISTING AND DESIRED CONDITIONS

According to the Umpqua's LRMP we are to encourage and foster the prospecting, discovery, exploration, development and extraction of locatable minerals, gas, oil, and geothermal leases, and common variety minerals within the limits of applicable laws.

There are approximately 20 unpatented mining claims within the Quartz planning area. These are mostly placer claims within the Sharps, Martin, Clark, Pudding Rock and Quartz Creek areas. The "In Water Work" period (dredge season) for these placer claims is set by the Oregon Department of Fish and Wildlife (ODFW) and is May 15th through November 30th of each year. Most mineral operations are considered small scale and use motorized equipment (dredge) to prospect for gold within the stream.

There are two lode (hard rock) claims within the planning area. These claims are usually accessed seasonally and are also considered as small scale prospecting or exploring. Currently no mechanized equipment is being used.

Most prospecting and exploring is done seasonally by individuals or families during weekends and holidays. Camping during mining most often occurs at hardened dispersed campsites between May 15th and Labor Day.

DIRECT AND INDIRECT EFFECTS

Alternative 1 would have no direct or indirect effects to mining operations.

Alternatives 2 and 3 could have some short term effects on mining operations. Due to the ODFW "In Water Work" period overlapping with the timber sale operating season, there may be conflicts where mining activities are adjacent to harvest units. This would mostly occur in the Quartz Creek draining as well as the upper portion of China Creek. This effect can be mitigated through communication with the mining community as well as by implementing "Design Criteria" into contract specifications. Mining claimants potentially affected have been contacted and no extraordinary circumstances were found which could not be mitigated due to timber sale operating season overlapping with ODFW "In Water Work" period.

Alternatives 2 and 3 could have an effect on future mining access when 1.5 miles of Forest Service Road, 2300-808, is decommissioned. This decommissioned road of which, 0.6 miles are passable by vehicular traffic would eliminate all motorized traffic and would be slightly more difficult to walk on. The locatable mineral regulations require operators to submit a Notice of Intent, if the operator/miner is uncertain if their activities might cause a disturbance of surface resources. If a miner choses to access the creek by way of the decommissioned road via a vehicle they may be required to submit a Notice of Intent to operate prior to the activity taking place. Depending on the level of work and access needed to operate, it could trigger a Plan of Operations dependent on the resource concerns associated with reopening the decommissioned road.

Alternatives 2 and 3 could have an effect on miner access and productivity during hauling operations due to the increase of log truck traffic on single lane roads and the need for the miners to park further from their mining location due to safety concerns. These effects would be minimal and short term in nature due to the majority of miners working on weekends, and the majority of log haul happening during the week. Due to unforeseen safety concerns, the Forest Service may decide to administratively close an area for a short period of time. If so, this may affect the time an operator can conduct dredging or other activities. If this becomes necessary, the Forest Service will take steps to limit the duration so as not to interfere with ongoing mining activities and post the closure on bulletin boards in the area as soon as the closure is known so as to give operators as much advance notice as possible.

CUMULATIVE EFFECTS

The scale at which cumulative effects are analyzed is the planning area. There are currently no projects proposed as reasonably foreseeable actions within the planning area that would overlap in time or space that contribute to a cumulative effect to mining experiences; therefore, given the limited direct and indirect effects to mining, no cumulative effects would occur.

VISUALS

Summary of Effects

Alternative 1 would have no direct, indirect, or cumulative effects because no additional created openings would be produced. The creation of small gaps of ¼-acre or less in size in Alternatives 2 and 3 would meet the visual quality objectives and there would be no substantial change to the landscape as viewed from any sensitive viewing area.

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) 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) (USDA 1995). 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). Table 49 lists the percent of the planning area by VQO. There are no "special features" identified in the LRMP that are located in the Quartz planning area; therefore, there are no sensitive or substantial visual quality concerns.

Table 49. Acres and Standards for Implementation (Visuals)

Visual Quality Objective[23]	Planning Area Acres	Percent of Planning Area	Distance Zone	Recommended Range of Opening Size (Acres)	Recommended Maximum Percent of Created Opening at Any One Time
Partial Retention (Alternative 3 Unit 9, ¼ acres gap, 1 acre total)	518	6%	Foreground 0-500'	0.5-1.5	10%
			Foreground 500'>	1-8	15%

[23] There are no acres of Retention within the Quartz Planning area.

Visual Quality Objective[23]	Planning Area Acres	Percent of Planning Area	Distance Zone	Recommended Range of Opening Size (Acres)	Recommended Maximum Percent of Created Opening at Any One Time
Modification	507 295	6% 4%	Middle Ground Back Ground	Site Specific Analysis	25% 30%
Modification	6,248	75%	All	Site Specific Analysis	33%
Private Land Section 36	610	7%	N/A	N/A	N/A
BLM Land	153	2%	N/A	N/A	N/A
Totals	8331	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:

- 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 47.
- A harvest unit is considered to be a created opening when the average stand height is less than 20 feet tall in foreground and middle ground distance zones, and is less than 4.5 feet tall in background distance zones. Commercial thinning is not considered to meet the definition of a created opening.
- Activity slash within view sheds shall be treated commensurate with the VQO. Areas within 500 feet of sensitive routes, County Road 2460, shall have high priority for treatment.

DIRECT AND INDIRECT EFFECTS

Alternative 1 would have no direct, indirect, or cumulative effects to the visual quality of the area because no additional created openings would be produced.

Alternative 2 would commercially thin 1,026 acres while creating 1/10-acre sugar pine release gaps, in various units, none of which are in the partial retention VQO. Alternative 3 would

commercially thin 850 acres while creating 1/10-acre sugar pine release gaps in various units and ¼-acre gaps in the managed stands. Alternative 3 proposes ¼ acre gaps, up to 4 gaps in Unit 9, which is the only unit partially within the partial retention VQO. All other gaps in both alternatives are within modification or maximum modification VQO's.

Because these proposed gaps or created openings would be equal to or less than ¼ acre in size they meet the VQO's and would remain visually unnoticeable from any sensitive viewing area. The percentage of created openings would continue to be below the recommended maximum percentages in the partial retention, modification and maximum modification VQO's allowed by the Forest Plan as described in VQO Table 49, thus complying with Forest Plan Standards and Guidelines. 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 clear-cut harvest units in the Quartz planning area were harvested in the late 1980's. All of the areas have since re-vegetated. 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

Summary of Effects

Based on the results of the heritage surveys, review and mitigation of known resources, mitigation of undiscovered sites, and consultation with tribes, there would be no direct, indirect, or cumulative effects on the known heritage resources as the result of implementing any of the proposed Quartz planning area alternatives.

The affected environment for heritage resources falls within the areas of proposed activities with the potential to affect those resources (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 the significant historic properties as required under the National Preservation Historic Act. All significant aspects of potentially eligible sites shall be protected through mitigation measures.

A heritage resource inventory was conducted as part of the compliance process of section 106 of the National Historic Preservation Act of 1966. The Quartz Planning Area reconnaissance report will be completed and submitted to the State Historic Preservation Office (SHPO) as required. The Quartz Planning Area project cultural resources inventory and monitoring meets

the criteria for Case-by Case Review required by the Programmatic Agreement[24] among the United States Department of Agriculture Forest Service, Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer Regarding Cultural Resources Management in the State of Oregon (PA).

The potential exists for unidentified heritage resources in the Quartz project implementation areas. This is especially true in areas that were covered by dense down wood, thorn brush, and bracken fern. Mitigation measures described in Chapter 2 would protect undiscovered heritage resources, lowering the potential for effects to these resources. Overall, proposed project activities have met the criteria of historic properties avoided for known heritage resources. Standard contract provisions would provide for protection of 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 and projects that may be of interest to the Tribes; the Quartz planning area was identified as a new project when the project was first initiated. The Confederated Tribes of the Grand Ronde, Confederated Tribes of the Siletz, and the Cow Creek Band of Umpqua Tribe of Indians were contacted by letter. Other contacts in the form of phone calls, letters, and opportunities to participate in public tours and public meetings, and meetings at Tribal offices were also utilized to interact with 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.

Based on the results of the heritage surveys, review and mitigation of known resources, mitigation of undiscovered sites, and consultation with tribes, there would be no direct, indirect, or cumulative effects on the known heritage resources as the result of implementing any of the proposed Quartz planning area alternatives. Mitigation measures have been established which would protect historic properties' significance for eligibility to the National Register of Historic Places affected by the project.

ECONOMICS

Summary of Effects

Both Alternatives 2 and 3 would likely result in a positive timber sale contract and have sufficient stumpage funds to pay for restoration activities. Alternative 3 is more cost efficient than Alternative 2 based on higher volume per acre and lower logging costs.

Alternative 1 would not change the conditions or level of economic activity in the area. Alternatives 2 and 3 would have a beneficial direct effect to the local economy.

The economic analysis focuses on the direct, indirect, and induced costs and benefits of the alternatives and the connected actions described in Chapter 2. Net present value and benefit/cost ratio are the primary criteria used to compare the direct effects of the alternatives to the Federal Government, termed economic efficiency analysis. Impacts to the general economy of the analysis area are modeled using IMPLAN Professional version

[24] The Stipulation III (B)2 Programmatic Agreement is between the Advisory Council on Historic Preservation (ACHP), Oregon State Historic Preservation Officer, and the United States Forest Service, Region 6.

3.0, an input/output model developed by the Forest Service (IMPLAN 2009). The most current IMPLAN data available is for calendar year 2012. 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 Douglas and Lane counties, in Oregon. Logging and forestry support companies routinely operate in both counties, and logs are marketed between both counties. Therefore, the analysis area for economic impacts is both counties.

EXISTING CONDITION

Total softwood mill capacity in both counties is estimated at about 1,400 million board feet (MMBF) using processing capacity figures for 2008 (Gale et al. 2012). Actual harvest and processing in 2008 in the two counties was about 865 MMBF, or 63% of mill capacity. Harvest levels and mill output in Western Oregon have increased since 2008 as markets have recovered. A figure of 1,000 MMBF 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.

Douglas and Lane Counties Economic Situation

Total employment in each county is difficult to quantify exactly, as the Oregon Labor Market Information System (OLMIS), Census Bureau, and IMPLAN use different criteria to measure employment. OLMIS has the most current information.

The 2008-2009 economic recessions impacted the timber industry in the region especially hard. Unemployment in Douglas County rose from 8.3% in January of 2008 to its highest point in May, 2009 at 16.5%. During the same time period, unemployment in Lane County rose from 5.8% to 12.3%, close to its high mark. Current unemployment (Feb, 2014) stands at 10.1% in Douglas County and 6.9% in Lane County (OLMIS 2014).

According to OLMIS as shown in Table 50, Douglas and Lane counties lost 4,068 forestry, logging and wood products manufacturing jobs from a recent high in June, 2005 to the low in December, 2010. Since then, 1,005 jobs have been added back as log and lumber markets have improved.

Table 50. County Employment (not seasonally-adjusted)

County	Sector	June, 2005	Dec, 2010	Dec, 2013
Douglas	Forestry & Logging	1,073	705	941
Douglas	Wood Products Manufacturing	4,396	2,678	2,951
Lane	Forestry & Logging	804	547	791
Lane	Wood Products Manufacturing	4,936	3,211	3,463
Total		11,209	7,141	8,146

In 2013, the logging, forestry and wood products manufacturing sectors provided about 5.8% of the two-county non-governmental employment (OLMIS 2014). The average annual wage paid in the two-county area in 2013 was $37,756, compared to the forestry, logging,

and wood products manufacturing average wage of $49,220 based on the OLMIS data. The forest products industry continues to be a key part of the economies of both Douglas and Lane Counties.

DIRECT, INDIRECT AND CUMULATIVE EFFECTS

Economic Efficiency Analysis

The direct economic effects of the alternatives are displayed in Table 51. A standard criterion for deciding whether a government program can be justified on economic principles is net present value (NPV) – the discounted[25] monetized [26]value of expected net benefits (OMB A-94). Another standard criterion for economic efficiency is the benefit/cost ratio (B/C ratio) which is the product of the present value of benefits divided by the present value of costs.

Forest Service planning costs are not included in the economic efficiency analysis since they are considered sunken (OMB A-94). It is estimated that this project has cost about $312,000 to plan over the last three fiscal years. Alternative 1 is considered below-cost since there would be no return to the U.S. Treasury with expenditures for planning. Based on the expected return to the Federal government plus the value of restoration activities potentially funded by stumpage[27] shown in Table 51, Alternatives 2 and 3 would also be below-cost if expenditures for planning are included.

Table 51. Economic Efficiency Analysis

	Alternative 2	Alternative 3
Timber Volume (MBF)[28]	19,208	16,602
Acres by Harvest Method		
Skyline	578	578
Ground-based	42	42
Helicopter	406	230
Total Acres	1,026	850
Volume (MBF)/Acre	18.7	19.5
Total Present Value Benefits		
Gross Benefits	$9,702,373	$8,353,291

[25] 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).

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

[27] 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.

[28] MBF is thousand board feet. The Forest Service estimates MBF using east-side Scribner rules, therefore the volume as shown, is higher than if west-side, long log Scribner rules would be applied.

	Alternative 2	Alternative 3
Value/MBF[29]	$505	$503
Value/Acre	$9,457	$9,827
Total Present Value Costs		
FS Prep & Admin	$752,378	$654,441
Logging	$7,676,274	$6,048,139
Slash Disposal	$392,252	$391,400
Road Work	$473,525	$443,511
Reforestation	$0	$0
Restoration Activities potentially funded by stumpage	$351,670	$346,293
Restoration Activities not funded from stumpage	*$0*	*$0*
Total Cost	$9,646,099	$7,883,785
Cost/MBF	$502	$475
Cost/Acre	$9,402	$9,275
Net Present Value	$56,275	$469,507
Stumpage (2014 dollars)	$1,273,935	$1,622,590
Predicted Stumpage Price/MBF	$66.32	$97.73
Potential Return to the Treasury[30]	$350,332	$446,212
B/C Ratio[31]	1.01	1.06

The action alternatives 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[32].

Log prices fluctuate due to a variety of market forces, many of which are external to Western Oregon. Typically, log prices are higher in the winter months and lower in the summer/fall, reflecting the availability of logging due to weather. The recent recession and slowdown in

[29] West side delivered log prices derived from ODF log price surveys have been adjusted to reflect equivalent east side values due to the differences in scaling rules.

[30] This is calculated to at least cover the requirement for 25% Payments to Counties and 10% Road & Trail Fund.

[31] 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.

[32] 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. The minimum advertised rate for Douglas-fir is $6.00 per MBF.

nation-wide housing caused the local log market to fall drastically from 2006 to 2009. Figure 46 displays a composite Douglas-fir log price average ($/mbf) for the Douglas County market since 1990 using Oregon Department of Forestry log price information (ODF 2014). The data in Figure 46 are not adjusted for inflation and are equated to west side long log Scribner scaling rules.

The economic efficiency analysis displayed in Table 51 uses average delivered[33] log prices in the Lane and Douglas county markets from the most recent four calendar quarters, adjusted for short log volume. An additional adjustment was made for potential hauling of some of the volume in the winter months, when log prices are typically higher. Over the last 10 years, Douglas-fir average log prices have been 5.6% higher in the 1st quarter than in the 3rd quarter (summer season) according to the ODF data. Helicopter and skyline logging below about 3,000 in elevation can reasonably be operated during the average winter conditions in this area.

Log prices hit historic lows during the 1st quarter of 2009 and have since raised to near or above "average" levels. The outlook for continued recovery is tenuous, but indications are for housing to continue to improve, providing a more stable log market. In the short-term, log prices could fluctuate based on import/export pressure, natural disasters, or general economic trends. If log prices decline, less money would be available for post-sale restoration activities, and the value of the timber could reach a point where an individual sale may not be marketable. It would be speculative to predict the local markets at the time of sale offer or operation.

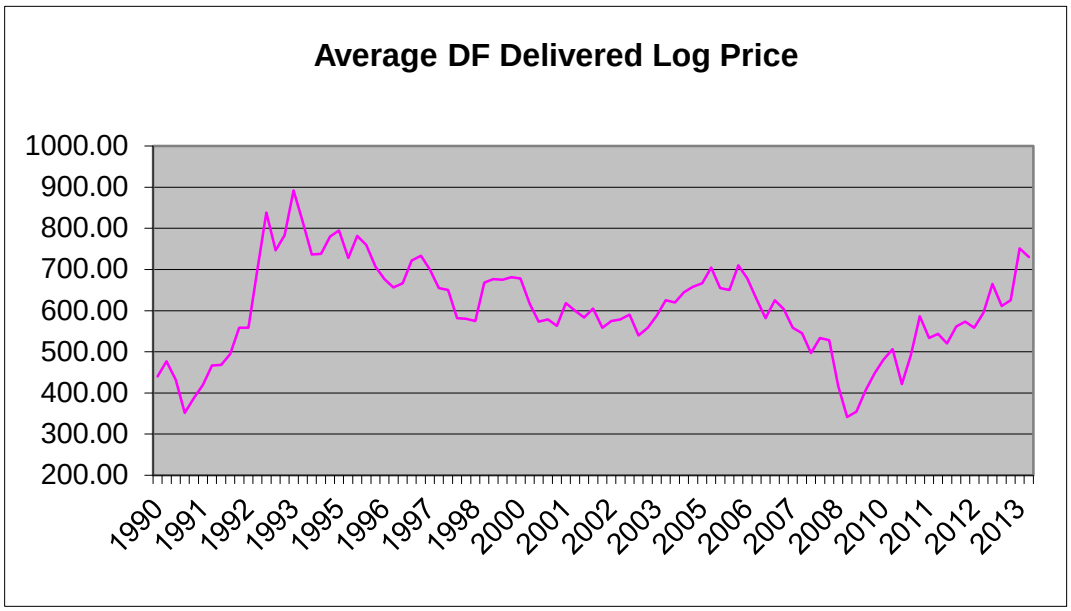

Figure 46. Average Composite Douglas-fir Log Price, Douglas County Market Area.

Alternative 2

At current log prices and logging costs, this alternative would likely result in a positive timber sale contract, indicating the sale(s) would receive bids in a competitive market. The estimated stumpage price is $66.32 per MBF. The amount of helicopter yarding (40% of the commercial harvest acres), the relatively small timber to be logged, and the cost of road reconstruction and

[33] Delivered log price is the amount paid per MBF at the mill location.

maintenance limit the total amount of stumpage that would be paid. However, it appears there would be sufficient stumpage funds to pay for restoration activities identified in Chapter 2 and the B/C Ratio is 1.01

Alternative 3

This alternative is more cost efficient than Alternative 2 based on slightly higher volume per acre and substantially lower logging cost (helicopter is 27% of the commercial harvest acres). The timber sales marketed from this alternative would likely receive bids in a competitive market, and the expected stumpage price would be $97.73 per MBF, or 47% higher than Alternative 2. It also appears there would be sufficient stumpage funds to pay for restoration activities identified in Chapter 2 and the B/C Ratio is 1.06.

This alternative would generate sufficient stumpage to fund the restoration activities identified in chapter 2 through the timber sale receipts, where appropriate according to the Knutson-Vandenberg Act.

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. An individual timber sale may not substantially change the overall economic activity of the county, since the amount of timber volume represents a small percentage of the total demand. Since 2005, Umpqua National Forest timber volume has been offered at a somewhat consistent level, at about 40 MMBF per year. Timber sales from the National Forest are viewed as raw material available for the local industry, allowing production and support for jobs in the local economy to be sustained. Local National Forest timber would offset logs imported to the area, potentially reducing overall costs and increasing production.

Table 52 displays the results of the economic impact analysis by alternative. In general, the sale of timber from the National Forest would result in sustained or increased employment in the logging and wood products manufacturing sectors, in the forestry services (slash treatment, planting, etc.) and indirect and induced employment in many other sectors. Payments in lieu of taxes due to Lane County from timber receipts are not included in these figures, as they are accounted for in the return to the Federal Treasury shown in Table 51.

Other direct, indirect, and induced benefits are derived from road reconstruction and other restoration activities that may be funded by revenue from the timber sales or other funding sources. These work activities are treated as costs in the benefit/cost analysis since they reduce the revenue to the Federal 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 51.

Table 51 does not include impacts to the local economies from Federal salaries paid to produce and administer the timber sales, or taxes paid to state and local governments as a result of harvesting timber.

The numbers in Table 52 are not intended to be absolute. The analysis should be used to compare the relative differences among alternatives. An estimate was made of the percent of each contributing 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 et al. 2002). The percentage of value assigned to

sawlog and veneer production is 80% and 20%, respectively, based on the estimated average diameter of harvested trees and the milling capacity in the analysis area.

Table 52. Economic Impact Analysis

Impact	Alt 2	Alt 3
	Value*	**Value***
Change in Total Industrial Output	$39,731,000	$34,413,000
Change in Employment	221	192
Change in Labor Income	$12,288,000	$10,663,000
Contribution to local mill capacity	19.2 MMBF (1.9%)	16.6 MMBF (1.7%)

* Employment is number of jobs.

Alternative 1

Alternative 1 is not shown in Table 52 since by definition it would not change the conditions or level of economic activity in the analysis area. This alternative may, however, contribute to a decline in the local timber industry, since it would keep federal timber from the market, at least in the short-term. Other sources of logs would be used to meet the needs in local mills, or total production would decline. No attempt was made to quantify the impacts, as it is beyond the scope of this analysis to speculate on the reasonably foreseeable timber supply changes in the local area.

Alternatives 2 and 3

Alternatives 2 and 3 would have a beneficial direct effect to the local economy, as it is likely the timber sales would sell and the restoration activities would be accomplished. These effects are relatively small in terms of the total economic activity in the analysis area activity in each category. Of the total jobs contributed by each alternative, 51% are direct jobs in the forestry, restoration, logging and milling sectors, and 49% are indirect and induced jobs in many sectors of the local economy. The direct jobs contribute 60% of the increased labor income, indicating these are higher wage jobs.

This project, when combined with other federal timber sales from the Umpqua National Forest, would contribute to a beneficial cumulative effect of sustaining the wood products infrastructure in Douglas and Lane counties.

POTENTIAL WILDERNESS AREAS

Summary of Effects

There are no areas within the planning area the meet the criteria for potential wilderness areas and there are no direct, indirect or cumulative effects to potential wilderness areas.

A wide range of terms have been used by respondents, the courts, and the Forest Service when referring to inventoried roadless areas, wilderness areas and potential wilderness areas. The terms and definitions, as stated below, are used in this analysis.

Inventoried Roadless Areas (IRA) - an area identified in the 2001 Roadless Area Conservation Rule in a set of inventoried roadless area maps (contained in Forest Service Roadless Area Conservation Final Environmental Impact Statement, Volume 2, dated November 2000), or any subsequent update or revision of those maps (36 CFR 294.11). These areas were set aside through administrative rulemaking and have provisions, within the context of multiple-use management, for the protection of inventoried roadless areas.

Wilderness Areas – an area established by the Congress as part of the National Wilderness Preservation System and administered to preserve its primeval character and influence (USDA 1990).

Potential Wilderness Areas (PWA) – Forest Service Handbook 1909.12 directs the identification of potential wilderness areas during project level analysis and provides guidance on what constitutes a PWA. The inventory of PWAs is completed to identify lands that meet the criteria being evaluated for wilderness suitability and possible recommendation to Congress for wilderness study or designation. Evaluation would occur during Forest Plan development or revisions.

Areas of potential wilderness are identified using the following inventory criteria found in Forest Service Handbook 1909.12, Chapter 71:

> Areas qualify for placement on the potential wilderness inventory if they meet the statutory definition of wilderness. Include areas that meet either criteria 1 and 3, or criteria 2 and 3 below.
>
> 1. Areas contain 5,000 acres or more.
> 2. Areas contain less than 5,000 acres, but can meet one or more of the following criteria:
> a. Areas can be preserved due to physical terrain and natural conditions.
> b. Areas are self-contained ecosystems, such as an island, that can be effectively managed as a separate unit of the National Wilderness Preservation System.
> c. Areas are contiguous to existing wilderness, primitive areas, Administration-endorsed wilderness, or potential wilderness in other Federal ownership, regardless of their size.
> 3. Areas do not contain forest roads (36 CFR 212.1) or other permanently authorized roads.

The inventory of potential wilderness is not a land designation, nor does it imply or impart any particular level of management direction or protection. The inventory is not an evaluation of potential wilderness, as described in Chapter 72, or a preliminary administrative

recommendation for wilderness designation, as described in Chapter 73. The inventory of potential wilderness areas does not change existing administrative boundaries.

EXISTING CONDITIONS

Figure 2 in Chapter 1 shows two IRAs in or adjacent to the Quartz boundary: 1) the 7,200-acre Fairview IRA partially in the northern part of the planning area and 2) the 6,700-acre Canton IRA which is adjacent to the southwest part of the planning area.

An inventory was done in the Quartz project area to identify areas that meet the criteria for PWA. During the inventory, areas of previous timber harvest were removed from consideration. These harvest areas are clearcuts which have not yet regenerated to the degree that canopy closure is similar to the surrounding uncut areas and/or there are stumps and skid trails that are still recognizable. In addition, 200 foot buffers were used on roads, consistent with buffers used for wilderness areas. Based upon the inventory, no potential wilderness areas beyond the Fairview IRA were identified within the Quartz project area boundary for the following reasons:

- There are no areas within the project area boundary that contain 5,000 acres or more that do not contain forest roads.
- There are areas less than 5,000 acres in size that extend out from the eastern portion of the project area that do not contain roads but are not considered self-contained ecosystems or preserved due to natural conditions. They are separated from the Fairview and Canton IRAs by roads.
- A portion of the Fairview IRA is within the project area but expansion is limited because it is bounded by roads and/or timber harvest areas.
- The adjacent Canton IRA is separated from the project area by roads.

DIRECT, INDIRECT AND CUMULATIVE EFFECTS

The Fairview Inventoried Roadless Area within the planning area is protected and no activities are proposed in the area. There are no wilderness areas in the planning area and no areas within the Quartz planning area meet the criteria for PWA. Therefore, there are no direct, indirect or cumulative effects to potential wilderness areas.

CLIMATE CHANGE

Summary of Effects

Alternatives 2 and 3 action's direct and indirect contribution to greenhouse gasses and climate change would be negligible. Because the direct and indirect effects would be negligible, the action's contribution to cumulative effects would also be negligible.

Management approaches in the face of potential increases in temperature and decreases in precipitation and snowpack accumulation can include maintaining the full range of biodiversity, managing forest densities for reduced susceptibility to drought stress and using prescribed fire to reduce susceptibility to high-intensity, large disturbances are incorporated. The management approaches are included in the actions for the Quartz project.

National direction and guidance regarding climate change in project-level National Environmental Policy Act (NEPA) analysis and documentation was released in *Climate Change Considerations in Project Level NEPA Analysis*, dated January 13, 2009. This document

discusses two types of climate change effects to consider for NEPA: 1) The effect of a proposed project on climate change and 2) The effect of climate change on a proposed project (USDA 2009). For the Quartz Project, the Forest Service proposes thinning 850-1,026 acres, depending on alternative. Alternative 3 also proposes creating 9.5 acres of ¼-acre gaps. The harvest units represent 10-12% of the 8,331 acre project area, or ~2% of the 42,509 acre Sharps Creek Watershed. Within the commercially thinned units, Alternative 2 proposes hand pile and burn fuel treatments of 113-192 acres, underburn fuel treatments of 330 acres and no treatment on the remaining 504-583 acres. Alternative 3 proposes hand pile and burn fuel treatments of 103-174 acres, underburn fuel treatments of 322 acres and no treatment on the remaining 354-425 acres. In addition to fuel treatments in the commercially thinned areas, both alternatives propose 374 acres of understory fuel treatment (hand pile and burn) along major ridgeline roads.

EFFECTS OF THE PROPOSED PROJECT ON CLIMATE CHANGE

Forests play an important role in the global carbon cycle and its impact on climate change. In the United States, forest carbon sequestration offset ~15.1% of U.S. CO_2 emissions (EPA 2014). The fuels treatments will have a direct effect of releasing additional CO_2 into the atmosphere. In thinned stands, individual trees will experience increased growth and therefore sequester additional CO_2. However, due to the lower overall wood growth in the remaining stand, the net carbon benefit of thinning may not outweigh the growth potential of the unthinned stand even if 100% of the harvested material is used for wood products or biomass energy (Ryan et al. 2010).

As per the *Climate Change Considerations in Project Level NEPA Analysis* (USDA Forest Service 2009) document, “Because greenhouse gases mix readily into the global pool of greenhouse gases, it is not currently possible to ascertain the indirect effects of emissions from single or multiple sources (projects). Also, because the large majority of Forest Service projects are extremely small in the global atmospheric CO_2 context, it is not presently possible to conduct quantitative analysis of actual climate change effects based on individual or multiple projects.”

All managed areas will remain forested and will maintain an ability to sequester CO_2. A project of this magnitude would have such minimal contributions of greenhouse gasses that its impact on global climate change would be infinitesimal. Therefore, at the global scale, the proposed action’s direct and indirect contribution to greenhouse gasses and climate change would be negligible. In addition, because the direct and indirect effects would be negligible, the proposed action’s contribution to cumulative effects on greenhouse gasses and climate change would also be negligible.

EFFECT OF CLIMATE CHANGE ON THE PROPOSED PROJECT

Regional climate change models (see for example, Spies, et. al., 2010) generally predict, for the west slope of the Cascade Mountains, that average temperatures increases would result in longer and more intense summer dry periods, increasing summer soil moisture deficits, and intensifying wildfire activity and frequency. Variable trends in precipitation are projected, which could result in more intense precipitation events resulting in changes to peak flow regimes, and a rising of snowpack elevations.

The actions that are proposed in the Quartz Project Area would, to some extent, preserve plant communities since less dense and diversified second-growth stands would be more resilient in the face of insect and disease infestation and wildfire that could increase in frequency due to a changing climate. The proposed action would have no effect on the current hydrologic regime

in the project area as a whole, and would maintain vegetation currently providing shade to perennial streams channels, so it would not affect stream temperature that could increase as a result of climate change. It is not known what could be done to maintain peak flow regimes in the face of changing precipitation patterns, nor how the amount of shade produced by riparian stands could be increased in the face of a warming, drier climate.

According to Mote, et al. (1999) successful forest management approaches in the face of potential increases in temperature and decreases in precipitation and snowpack accumulation include maintaining the full range of biodiversity, managing forest densities for reduced susceptibility to drought stress, and using prescribed fire to reduce susceptibility to high-intensity, large disturbances. All these management approaches are included in the actions that have been developed for the Quartz project.

SPECIFICALLY REQUIRED AND OTHER DISCLOSURES

SMOKE MANAGEMENT/AIR QUALITY

Standards for ambient air quality[34] are set by the Environmental Protection Agency (EPA) and are designed to protect human health and welfare. Air quality can be impacted by the presence of particulate matter and other pollutants produced by both prescribed burning and wildfire.[35] Although smoke from wildfire is considered a natural event by the EPA's Natural Events Policy (air quality standards do not apply), smoke generated from prescribed burning must meet federal and state air-quality standards set forth in the Clean Air Act (USC 2002, Section 160). All activities associated with this project would be implemented to meet standards in the Clean Air Act.

The Forest Service is required to file a burn plan with Oregon Department of Environmental Quality (ODEQ) and would comply with its strict standards for air quality. ODEQ would not provide approval for burning when atmospheric conditions exist that may result in an inversion or other atmospheric conditions that would cause air-quality violations. ODEQ strictly regulates burning; as such, there is very little likelihood that the effects to air quality from any action alternative would exceed air quality standards, even when combined with other burning and pollution sources.

The Regional Haze Rule was designed by the EPA to call on states to establish goals for improving visibility in mandatory Class I areas and to develop long-term strategies for reducing emissions of air pollutants that cause visibility impairment to these areas. At this time, Oregon does not yet have a State Implementation Strategy (SIS) to deal with regional haze or visibility impairment, and no standards currently exist.

Because prescribed burning is not a stationary source of pollutants, and because no burning associated with this project is within a non-attainment area, Prevention of Significant Deterioration, and the conformity provisions (see Glossary) of the Clean Air Act are not applicable.

[34] Ambient air quality is defined under the Clean Air Act of 1963 as the air quality outside of industrial site boundaries.

[35] Although prescribed burning affects air quality in ways similar to wildfire, it offers some advantages over wildfire. Prescribed burning plans are developed and implemented to minimize impacts on the airshed by the consideration of atmospheric conditions, season of burn (e.g., burning is restricted between July 1 to September 15 under the Oregon Visibility Protection Plan), fuel and duff moisture, diurnal wind shifts, ignition techniques and rapid mop-up.

Other air-quality impacts that may occur related to prescribed burning include: temporary and localized loss of aesthetic qualities due to visibility reduction, reduced visibility on roads causing potential safety issues, health problems for sensitive people (i.e., asthma), and human discomfort. These impacts may occur at pollutant levels that are within air-quality standards. Smoke impacts to safety, human health or visibility that occur within air-quality standards are termed “nuisance smoke”. In addition, due to concerns over potential effects to Northern spotted owls (NSO) in the vicinity of Unit 20, burning would only occur outside of breeding season (see Wildlife Management BMP section in Chapter Two).

The closest smoke-sensitive receptors[36] are the communities of Cottage Grove and Oakridge each within 15 to 20 miles of the planning area. In addition, the northernmost portion of the planning area 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 prior to and during periods of prescribed fires. These instructions may put further restrictions on burning done on the District during this time.

The closest Class I airsheds are Diamond Peak and Three Sisters Wilderness areas. The closest Class II airsheds are the Boulder Creek and Waldo Lake Wilderness areas. Burning would not impact these airsheds 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 as 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.

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 burning consumes 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 combustion 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.

[36] Smoke-Sensitive Receptors are areas designated by the State Board of Forestry, in consultation with the Department of Environmental Quality, that are provided the highest level of protection under the smoke management plan because of its past history of smoke incidents, density of population, or other special legal statuses.

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 stream banks and surrounding area. The action alternatives propose thinning and fuel treatments in several riparian areas. The action alternatives would also include general road maintenance activities within riparian areas and reconstruction of 18 stream crossings. Road inactivation of up to 1.6 miles includes removing culverts. The 1.5 miles of road decommissioning is primarily in the floodplain of Quartz Creek, but will result in floodplain improvement. No new occupancy of project floodplains would occur; the culvert replacements and related road work would occur within the original locations. These actions would be improvements over the existing condition by reducing erosion risks and enhance floodplain functioning.

No effects to floodplains associated with timber harvest under the action alternatives 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 and have been evaluated and declared in the LRMP Final EIS (USDA 1990). Since the activities in this project follow those Standards and Guidelines, they would not be declared separately for this sale.

Wetlands are considered unique habitats and are described under Unique Habitats in the Terrestrial Environment section. Alternatives 2 and 3 are consistent with Aquatic Conservation Strategy Objective 7, which calls for the maintenance of water table elevations in meadows and wetlands. Given the design features and mitigation incorporated into Alternatives 2 and 3 for unique habitats no adverse direct, indirect, or cumulative effects to wetlands are anticipated.

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

Alternative 1 would not require expenditure of fuel. Alternatives 2 and 3 would require expenditures of fuel for workers to access the project area, use power equipment, and to utilize the logging systems. Jet fuel use for helicopter operations would also occur. Overall, Alternatives 2 and 3 would not result in any unusual 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.

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 chapter.

According to the 2012 statistical data for Lane County, about 16% of the population is made up of minorities. Unemployment in the county is at about 6.9%, which is currently the same as the State average. Several small communities are located along the haul routes, including Dorena and Culp Creek, and would see an increase in log truck traffic during logging operations. The city of Cottage Grove, which lies about 20 miles to the west/northwest, may also see an increase in business and an increase in traffic. Log truck traffic is currently coming from Forest Service sales in the Layng and Brice Creek watersheds and is expected to continue over the next five years. Private land harvesting has been contributing to traffic and will likely continue to contribute to that traffic. The increase in log truck traffic from the Quartz project is not likely to cause a measurable change to current levels. No other direct, indirect, or cumulative effects to these communities or minorities are expected to occur.

CHAPTER FOUR

CONSULTATION WITH OTHERS

The Forest Service consulted the following individuals, Federal, State, tribal and local agencies during the development of this environmental assessment:

Interdisciplinary Team Members	
Leslie Elliott, Team Leader & Silviculturist	Amy Nathanson, Ecologist
Aili Gordon, Geologists & Aquatics	Melissa Swain, Recreation & Minerals Specialist
Ted Huffman, Watershed Program Manager	Gabe Dumm, Fire Ecologist
Cameron Mitchell, Wildlife Biologist	Greg Orton, Soil Scientist
Upekala Wijayratne, Botanist	Steve Hanussak, Engineer
Eric Risdal, Writer/Editor & Fuels Specialist	Miles Barkhurst, Engineer
Jason Wilcox, Fisheries Program Manager	Rob Cox, Wildlife Biologist & Logging Systems
Federal, State and Local Agencies	
Scott Center, USDI Fish and Wildlife Service	Faye Stewart, Lane County Commissioner
Bill O'Sullivan, Area Field Manager, Bureau of Land Management, Eugene District, Upper Willamette Resource Area	Thomas Munroe, Cottage Grove Mayor
Max Yeager, Area Field Manager, Bureau of Land Management, Roseburg District, Swiftwater Resource Area	Jan Wellman, Cottage Grove Public Works Department
Greg Wagenblast, South Cascade District Forester, Oregon Department of Forestry	Bob Dill, Row River Valley Water District
Melvin Thorton, District Manager, Douglas Forest Protective Association	Pam Reber, Coast Fork Watershed Council
Doug Robertson, Douglas County Commissioner	
Tribes	
Delores Pigsley, Tribal Chair, Confederated Tribes of Siletz Indians	Eirik Thorsgard, Cultural Protection Program Manager, Confederated Tribes of Grand Ronde Indians
Dan Courtney, Tribal Chair, Cow Creek Band of Umpqua Tribe of Indians	
Comments Provided by	
Andy Geissler, American Forest Resource Council	James Hershiser, Interested Citizen
Doug Heiken, Oregon Wild	Francis Eatherington, Cascadia Wildlands
Melvin Thorton, Douglas Forest Protective Association	Greg Willie, Seneca Mills
Bruce Stewart, Interested Citizen	Thomas Munroe, Cottage Grove Mayor
Cristina Hubbard, Forest Web of Cottage Grove	

There were a total of 117 individuals and organizations contacted for this projected. Additional contacts are in the project record and are available upon request at the Cottage Grove Ranger District.

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GLOSSARY OF TERMS

- Conformity Provisions are provisions in the Clean Air Act (Section 176(c)) that prohibit federal agencies from taking any action within a non-attainment area that causes or contributes to a new violation in standards of, increases the frequency or severity of an existing violation, or delays the timely attainment of a standard as defined in the area plan.
- Crown fire is a forest fire that advances with great speed jumping from crown to crown of trees ahead of the ground fire burning in surface fuels.
- Hand pile burning is accomplished with hand crews where slash is piled in relatively small piles and burned under moist conditions.
- 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.
- Machine piling is done by a small excavator that picks up and piles slash in large piles, which are later burned during moist conditions.
- Resilience is the capacity of a system to undergo change and still retain its basic function and structure. In other words, it's the capacity to undergo some change without crossing a threshold into a different…regime (Walker 2008).
- 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.
- 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 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 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.

- 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.
- Succession is the process of development of vegetation involving changes of species and communities with time.
- 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.
- 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.
- 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.