United States Department of Agriculture

Forest Service

2019

Environmental Assessment
North Clack
Integrated Resource Project

Clackamas River Ranger District, Mt. Hood National Forest
Clackamas County, Oregon

The project is located in T.4 S., R.5 E.; T.4 S., R.6 E.; T.4 S., R.7 E.; T.5 S., R.6 E.; Willamette Meridian.

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Figure 1. Tree planting after a fire within the North Clack project area in 1913.

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1.0 Introduction

1.1 Summary

This vicinity map [1] shows that the project is located in the Clackamas River Ranger District (District) of the Mt. Hood National Forest (Forest), in Oregon.

The District is proposing a number of activities in the North Clack project area (described below) to achieve the goals of the Forest Plan, as amended. Based on a review of field conditions and available data, there are needs and opportunities to improve forest conditions, provide wood products, manage recreation, enhance aquatic/riparian habitat, manage wildlife habitats, reduce fire hazards, and make changes to the transportation system within the project area. An interdisciplinary team of agency resource specialists has developed a proposed action to address these needs and opportunities. Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Estacada Ranger Station in Estacada, Oregon. Specialist reports are incorporated by reference and summaries of each are included in each resource topic in section 3.

The majority of the project area is designated as C1- Timber Emphasis interspersed with Riparian Reserves. A document titled North Clack Project Information Sheet[2] contains tables that show the various land allocations and their management themes and is incorporated by reference.

1.1.1 Project Area

The North Clack project area is located along the western edge of the Clackamas River Ranger District. It includes parts of the Middle Clackamas Watershed. It is bounded by the Clackamas River on the southwest, Roaring River on southeast, by the Forest boundary on the northwest, and the watershed boundary on the northeast. This project area is approximately 25,000 acres in size and is located in Clackamas County, Oregon. Within the project area the Forest has established an Off-Highway Vehicle (OHV) management area at LaDee Flat. The planning area was delineated and chosen because it encompasses a landscape with similar terrain features and a transportation system that provides logical access for management activities.

The District has developed story maps[3] that utilize ArcGIS Online software to help display some of the information in an interactive-map format. The story maps are incorporated by reference. They explain some background and history of the area, past management, land use allocations, and they include access to the maps and data. For example, the story map shows where the project is in relation to the broader Forest; it shows past fires and past ownership patterns; it shows the legal survey information of sections, township and range; it shows land allocations, roads, streams, contour lines, proposed units, and a satellite image.

1 https://www.fs.usda.gov/nfs/11558/www/nepa/105362_FSPLT3_4286411.pdf
2 https://www.fs.usda.gov/nfs/11558/www/nepa/105362_FSPLT3_4630683.pdf
3 https://www.fs.usda.gov/nfs/11558/www/nepa/105362_FSPLT3_4291838.pdf

1.2 Management Direction

Management direction is derived from the following land management plans. This assessment is tiered to the Environmental Impact Statements and the listed plans are incorporated by reference.

The Mt. Hood National Forest Land and Resource Management Plan Record of Decision and Final Environmental Impact Statement (USDA 1990a) and Standards and Guidelines (USDA 1990b), as amended, are referred to as the **Forest Plan**. The FEIS discusses environmental effects for Forest-wide programs and sets the stage for project-level analysis. The Forest Plan contains standards and guidelines applicable to this project. Consistency with the Forest Plan is addressed in each resource topic of section 3.0 and in specialist reports.

The Forest Plan was amended by the Northwest Forest Plan Record of Decision and Final Supplemental Environmental Impact Statement (USDA, USDI 1994a) and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. (USDA, USDI 1994b) (hereafter referred to as the **Northwest Forest Plan** or NFP). The NFP contains standards and guidelines for Matrix, Riparian Reserves and Late-Successional Reserves. Consistency is addressed in certain resource topics of section 3.0 and in specialist reports.

The Forest Plan was amended by the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA, USDI 2001).

The Forest Plan was amended by the Pacific Northwest Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision (USDA 2005); and Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia Gorge Scenic Area in Oregon, including Forest Plan Amendment #16 (USDA 2008). Standards and guidelines from these amendments are addressed in section 3.11.

The Forest Plan was amended by the Record of Decision for Off-highway Vehicle (OHV) Management Plan, including Forest Plan Amendment #17 (USDA 2010), which specifically designated the LaDee Flat OHV Area.

1.2.1 Forest Plan Goals, Standards and Guidelines

Each resource heading in section 3 contains a discussion of management goals and standards and guidelines applicable to that resource. The Forest Plan describes the process for documenting exceptions to “Should” standards and guidelines (p. Four-45). The Forest Plan does not require a Forest Plan amendment for project-level exceptions to these standards and guidelines. Where exceptions are appropriate to achieve Forest goals, they are described in section 3 along with the rationale for the exception.

1.2.2 Other Direction

There are numerous plans that provide recommendations or guidance that help shape projects such as three watershed analyses and the Northern Spotted Owl Recovery Plan. These are summarized in a report titled North Clack Project Additional

Information.[4] This report is incorporated by reference. Elements of these plans that are relevant, are discussed in the resource topics in section 3.

1.3 Purpose and Need for Action

An interdisciplinary team of agency resource specialists has reviewed existing conditions within the project area against the desired conditions specified in the Forest Plan, as amended. Based on this review, the Clackamas River Ranger District is proposing a variety of actions to address the needs. The North Clack Integrated Resource Project includes several different types of projects. These proposed actions and their purposes and needs are organized into the following headings: Improving Forest Health, Diversity, and Productivity; Transportation System Management and Aquatic/Riparian Habitat Enhancement. For each heading, the purpose and need is described in terms of desired conditions which are not currently being met.

Greater detail on the proposed action including Project Design Criteria can be found in section 2.2.

1.3.1 Improving Productivity, Forest Health and Diversity

1.3.1.1 Productivity

The desired condition for the matrix component of the landscape is to have live productive forest stands that can provide wood products now and in the future. This need is described in the Northwest Forest Plan on page 26 and Forest Plan on pages Four-3 & Four-26. A primary purpose of this project is to keep forests productive to sustainably provide forest products now and in the future. For more information, see sections 2.4, 3.1 & 3.9.

An important element of this purpose and need is to treat as many mid-aged stands as possible within the parameters of the Forest Plan to move them toward desired conditions in an operationally efficient and sustainable manner.

The proposed actions provide forest products while achieving several other stand and landscape scale objectives described in sections 1.3.1.2 & 1.3.1.3 below. The accomplishment of this objective is measured by volume of timber removed and the acres treated in the matrix for long-term forest productivity.

1.3.1.2 Health

Another desired condition is to have stands that are healthy with growth rates commensurate with site capability. This desired condition is discussed in the Forest Plan on pages Four-3, Four-5, Four-26, Four-91 & Four-289. There are many stands in the project area that are overcrowded and relatively uniform. A primary purpose of this project is to improve the health and increase diversity of forested stands.

There is an opportunity to gain greater variability of vertical and horizontal stand structure by the inclusion of skips, gaps and other adjustments to the thinning prescriptions. This technique to develop non-uniform conditions in a stand is an

[4] http://www.fs.usda.gov/nfs/11558/www/nepa/105362_FSPLT3_4630706.pdf

example of variable-density thinning. Thinning is proposed on various land allocations, each with a different emphasis. The features of variable-density thinning will vary between units to achieve the differing goals of each land allocation.

For example, in Riparian Reserves and Late-Successional Reserves there is an opportunity to make some of these changes to accelerate and promote desired conditions in these land allocations. The desired condition in reserves is a multi-layer canopy with large-diameter trees, a well-developed understory, more than one age class, and sufficient quantities of snags and down woody debris. These desired conditions are described in the Forest Plan on page Four-67 and in the Northwest Forest Plan on pages B-5, B-6 and C-32.

In the Matrix land allocation, particularly where it overlaps the C1 Timber Emphasis land allocation, the emphasis of thinning is for timber production, health and growth. The Forest Plan also includes objectives and Forest-wide Standards and Guidelines that apply to all Matrix land allocations for the enhancement and protection of many resources. Some of these other resources can be enhanced by the incorporation of variable-density thinning and other treatments, such as underburning, that are designed to achieve timber production, health and growth goals while at the same time achieving other objectives such as enhancing forage for deer and elk, providing scenic views, and promoting huckleberry productivity.

The accomplishment of the health and growth objective is measured by acres treated and the change in average tree diameter in 50 years. Section 3.1 has more detail on stand growth and health dynamics. The accomplishment of the diversity objective is measured by acres treated, the change in tree species composition, the change in the abundance of other desired plants, the change in vertical canopy layers, the change in horizontal structure with skips and gaps, and the changes to snags and down logs. For more information on diversity, see sections 2.4, 3.1 & 3.7.

1.3.1.3 Diversity

One desired condition for this area is to have forest stands across the landscape with a mix of ages and densities. This includes early-seral habitat that would provide for dependent species including forage for deer and elk. This desired condition is discussed in the Forest Plan on pages Four-22 & Four-71. The project area is a relatively uniform landscape with an abundance of second-growth stands. In recent years, early-seral habitats have declined across the planning area. Deer and elk are management indicator species that require a mix of habitat types, including early-seral habitats that provide forage. A primary purpose of this project is to change that uniformity by introducing regeneration harvests that result in variable-looking early-seral stands.

The accomplishment of this is measured by acres treated for forage enhancement. For more information, see sections 2.4 & 3.7. These sections describe the change over time in the scientific literature and in local forest structure from an emphasis on cover years ago, to a current-day need for quality forage.

1.3.1.4 Other Opportunities

While achieving the primary needs discussed above, there are additional opportunities to alter vegetation to meet other objectives.

One such opportunity is to reduce **hazardous fuels** to minimize resource impacts from fire, and to provide for enhanced safety for the public and for fire-suppression forces. The desired condition is to have a landscape of primarily live trees with relatively low

fire hazard. The project area has had a history of repeated fires and there is a concern that fires could start within, and spread out from adjacent wilderness areas. There is also an adjacent wildland-urban interface that is a concern. The goal is to have an appropriate fire-suppression response on the stands in the project area. These desired conditions and goals are discussed in the Forest Plan on pages Four-3, Four-4, Four-9 Four-25 & Four-76. The proposed action is to treat activity fuels in some harvest units and create fuel breaks along a portion of Road 4610 and along the Forest boundary. The accomplishment of this opportunity is measured by the amount of hazardous fuels treated to increase opportunities for suppression effectiveness. For more information see sections 2.2.1.6, 2.4 & 3.12.

Another opportunity is to reduce the occurrence of **invasive plant species**, particularly where they are at risk of spreading and competing with native vegetation. The desired condition is to have a landscape where ecosystem-altering invasive plants are not present and where common invasive plants are kept in check. These desired conditions and goals are discussed in the Forest Plan on pages Four-82. The project area has some concentrations of Scotch broom, false brome and other invasive plants that may spread from their occurrence along roadsides into forest stands where they would compete with desired vegetation. The treatment of invasive plants is covered by the "Site-Specific Invasive Plant Treatments for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon, including Forest Plan Amendment #16" FEIS, which was completed in 2008. This FEIS identifies appropriate herbicides and non-herbicide treatments for sites that were known at the time, and includes an Early Detection / Rapid response strategy for uninventoried and newly established populations. The North Clack Environmental Assessment will not revisit the decisions made in 2008, but will identify areas of potential treatment so that they may be coordinated with other proposed actions. For more information see section 3.11.

1.3.2 Transportation System Management

The project area currently includes approximately 83 miles of system roads, with 62 miles currently open for public and administrative use. These desired conditions are described in the Forest Plan on pages Four-3, Four-5 & Four-34 and the Northwest Forest Plan on page C-32. A primary purpose of road management is to provide access to the other proposed projects, and to reduce resource risks and maintenance costs while providing appropriate and safe access to the Forest. The accomplishment of this is measured by miles of roads treated. For more information, see sections 2.2.2, 2.4 & 3.2.

A mix of road treatments is considered, including culvert replacement, temporary road construction, road repair, maintenance, stormproofing, closure and decommissioning.

1.3.2.1 Reducing Resource Risks and Maintenance Costs

In 2015, the Forest completed a Travel Analysis Report, which was a synthesis of previous transportation planning efforts and set the stage for project-level decisions about whether to retain roads, close or decommission them, and what level of maintenance they should receive.

Based on a review of previous travel management analyses and recommendations, there remain opportunities to make additional adjustments to the transportation system to either reduce resource risks or maintenance costs. There is also a

commensurate need to consider long-term administrative and public access needs when making proposals to change the transportation system within the project area.

1.3.2.2 Unauthorized User-Created Routes

In 2010, the Mt. Hood National Forest issued a Record of Decision for the Off-Highway Management Plan Environmental Impact Statement. The North Clack project area contains the LaDee OHV Area. However, the project area contains numerous unauthorized, user-created trails. Such trails can result in damaged soils, bare ground that may serve as vectors for noxious weed infestations, and undesirable erosion and sedimentation. Within the project area, there are at least 7 miles of mapped unauthorized routes. There is opportunity to reduce negative resource impacts associated with unauthorized routes by closing them to use and rehabilitating the land.

1.3.3 Aquatic/Riparian Habitat Enhancement

The desired condition for streams, lakes and riparian areas is for them to be fully functional to meet the needs of aquatic and riparian species and to provide clean water. It is also desirable to maintain an appropriate network of roads and access points that provide for visitor enjoyment of the Forest while minimizing risks to aquatic resources. These desired conditions are described in the Forest Plan on pages Four-3, Four-5 & Four-34 and in the Northwest Forest Plan on pages B-9 and C-32. A primary purpose of this project is to enhance aquatic and riparian habitat. The accomplishment of this is measured by stream reaches enhanced. For more information, see section 2.2.3.

1.3.3.1 Stream Habitat Enhancement - Large Woody Debris

Within riparian areas, the desired condition is to have mature riparian vegetation with large trees that periodically fall into streams to provide large woody debris and the in-stream diversity needed to provide for good water quality and aquatic habitats. Due to past fires and management practices, large trees are lacking adjacent to project area streams. There is an opportunity to take actions to enhance stream habitat by increasing the amount of large woody debris in streams.

1.3.3.2 Riparian Habitat Enhancement - Release Riparian Conifers

Due to past fire history, many riparian areas are dominated by alder and lack large conifers to provide late-successional structure or large wood recruitment. There is an opportunity to release young conifers that are trying to grow up through the alder within riparian areas by felling a few alders at each site to release individual conifers or small groups of conifers.

1.3.3.3 Riparian Habitat Enhancement – Tumala Meadow

Many years ago, beavers lived in the streams and ponds in Tumala Meadow. They were trapped out and as a result, the stream has been down-cutting and the area no longer provides quality habitat for aquatic and riparian species. There is an opportunity to enhance habitat that might attract beavers back to the area.

1.4 Public Involvement

A scoping process to request public input for this project was conducted. A letter describing the proposed project and requesting comments was sent out on April 10, 2018. The Forest publishes a schedule of proposed actions (SOPA) quarterly. The project appeared in numerous issues since 2016. Two public field trips were conducted in 2016 and 2017 to visit the project area and discuss the purpose and need and resource concerns. The legal notice for the 30-day comment period for this project was published in The Oregonian on March 15, 2019.

This project is subject to objection regulations. Section 428 of The Consolidated Appropriations Act of 2012 included a provision establishing a pre-decisional objection process (36 CFR 218) for projects and activities implementing land management plans. This project is subject to the Project-Level Pre-Decisional Administrative Review Process (Objection Process) as identified in 36 CFR 218, Subparts A and B. Eligibility requirements and other aspects of the objection process can be found on the Forest Service web site[5].

1.4.1 Results of Public Involvement

Many comments were received through scoping, field trips, meetings with collaborators and the 30-day comment period.

Some comments expressed support for the project while others did not like it or certain aspects of it. Comments were considered and used in various ways. Some generated incremental changes to the proposed action, others are addressed as alternatives to the proposed action that were considered, and some resulted in additional analysis and discussion in specialist reports. The sections below highlight a few of the key topics that arose.

1.4.1.1 Temporary Roads

Temporary roads are those roads that are built by timber contractors to access log landings and to facilitate efficient logging operations. After use, they are rehabilitated and closed as described in section 2.2.2.2. Some commenters suggested that temporary road construction be minimized, or eliminated altogether. Some pointed out that the proposed mileage is more than in previous projects on the Forest.

There are several reasons why the proposed action contains the new temporary roads that it does.

- The project area contains vast areas of second-growth timber that grew up after large fires. Previously, the stands were too young to be viable for stand management and they were deferred until now. Some of these areas are just now developing to the point where thinning and other treatments are viable. Since much of the area is in the C1 - Timber Emphasis land allocation, it is proposed to manage the stands in an operationally efficient manner with temporary roads as opposed to creating permanent system roads.

[5] https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5442116.pdf

- The LaDee Flat OHV Management Plan identified some roads for motorized trail use and decommissioned others that were cut off. A substantial investment has been made on some of these routes to provide diverse motorized recreation experiences. The proposed action includes some new temporary roads to provide access for stand management that bypass or replace some of the roads that have been converted to motorized trails.

- Helicopter logging is one means to provide for vegetation management that would not require new roads, but it is very expensive and very fuel intensive. The option of helicopter logging is described in s. 2.1.1.1.

- The terrain in some areas is very variable with relatively steep slopes that would be logged with skyline systems interspersed with flat benches that would be logged with ground-based equipment. To access this terrain, roads are proposed on the slope breaks between these two systems.

After comments were received expressing concerns about temporary roads and the potential impacts they might create, the interdisciplinary team calculated the potential for sediment to reach streams and reassessed the entire proposed action as it relates to roads.

Several incremental changes were made to the proposed action based on comments received. Since most of the modeled sediment would not originate from new temporary roads, changes were also proposed for other roads. The following changes have been made to the proposed action.

- After examining each temporary road segment, some were shortened or eliminated for a total reduction of about one mile.

- Road 4613200 would be actively decommissioned after the junction with road 4613205. This road parallels the North Fork Clackamas River, and a more careful look at future needs for access found that Road 4613013 and an existing temporary road alignment would adequately access this part of the landscape.

- Road 4613205 would be actively decommissioned at mile post 0.18. This road parallels and crosses Dry Creek, and a more careful look at future needs for access found that a new ridgetop temporary road in Unit 174 and one in Unit 179 would adequately access this part of the landscape.

- Road 4612130 would not be reopened as originally proposed, but would be left to continue to revegetate.

- Roads 4610 and 4610180 would receive additional work of stormproofing to reduce chronic sediment contribution. These segments of road (approximately 8 miles), would not be used for log haul or receive maintenance for log haul but would be stormproofed with drivable waterbars.

- On several roads, sediment modeling showed some concern for sediment production with log haul on native surfacing. To reduce sediment, rock would be placed on 4613016, 4613017, 4612140, 4610028 and 4614120.

The above listed incremental changes to minimize road related impacts are in addition to the following features that were originally proposed to minimize road related impacts.

- Active and passive road decommissioning
- Road maintenance including blading, shaping, ditch cleaning
- Road closures with stormproofing, using techniques to minimize OHV intrusion
- Rehabilitation of unauthorized OHV routes
- Road redesign and repair, particularly on OHV dual-use routes
- Adding large woody debris to streams
- Replacing poorly functioning culverts
- Project Design Criteria that address erosion and sedimentation

1.4.1.2 Regeneration Harvest

Regeneration harvest is proposed to provide a diversity of age classes across the landscape, to provide forest products, and to create forage for deer, elk, and other early-seral dependent species. Some commenters suggested that regeneration harvest be eliminated while others suggested the quantity be increased. Some questioned how the proposed quantity was determined, and why it couldn't be more, given the C1 – Timber Emphasis land allocation.

The potential to increase regeneration harvest is complex and involves a number of factors.

- The Forest Plan encourages regeneration harvest in the C1 – Timber Emphasis land allocation, but it is also permitted in most of the B allocations.
- Much of the C1 – Timber Emphasis land allocation across the District is restricted by an overlay of Critical Owl Habitat. While the North Clack area represents 6% of the Clackamas River Ranger District it contains 27% the C1 allocation outside Critical Habitat.
- The Forest's current management strategy is to rotate through project areas and have a major planning effort for vegetation management once per decade to achieve the desired stand conditions over time. In other words, the North Clack project is not the only opportunity to create regeneration harvest because there will be another planning effort in this area in about 10 years.
- Within this land base, there are standards and guidelines such as FW-195 that suggest that a consistent quantity of early-seral conditions be created through timber harvest over time. Adding too much regeneration harvest now would not leave land available to create early-seral conditions in future decades.
- To manage the planning workload with limited staffing and funding, the Forest has chosen a path that does not involve harvest in inventoried roadless areas or in suitable spotted owl habitat because there is no compelling reason to do so at this time.
- Regeneration harvest is also constrained by the visual quality objectives associated with the North Fork Clackamas eligible Wild and Scenic River.

Options for regeneration harvest are discussed at section 2.1.2.

2.0 Alternatives

This section describes the alternatives considered for this project. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and no action.

2.1 Alternatives Considered but Not Fully Developed

Some options for managing the land were considered by the team during project development while others were elevated during public involvement efforts.

2.1.1 Temporary Roads

The issues surrounding temporary roads are discussed at s. 1.4.1.1. While several comments expressed concern about the quantity of new temporary roads, or the quantity of old temporary road alignments proposed for reuse, none specified a level at which there would be no concern. The proposed action was modified in several ways and the analysis of sediment showed that the proposed action would meet Forest Plan standards and guidelines; therefore, a wholly separate alternative further addressing temporary roads was not evaluated in detail. Nonetheless, the other options considered are described in the following section.

2.1.1.1 No Temporary Roads

Options were considered that would manage the same suite of harvest units while building no temporary roads. If no new temporary roads were built, approximately 1,650 acres would need to be switched to helicopter logging. If no existing road alignments were reconstructed as temporary roads, there would be an additional change for 475 acres which would need to be switched to helicopter logging. This represents 57% of the harvested acres. Helicopter logging is marginal economically given the high cost of jet fuel. For this work to be achieved the value of the timber needs to exceed costs. The Forest has considerable experience packaging high-cost portions of a project, such as road repairs or helicopter units, with lower-cost portions to gain operational efficiency and to develop a project that is likely to receive bids. While the proposed action includes a few helicopter units (4%), the option of 57% helicopter logging is so marginal economically that it would not likely receive bids. The accomplishment of marginal helicopter units is affected by the fluctuations of the timber market and the cost of jet fuel at the time of bidding, and the appropriate mix of less expensive ground-based and skyline systems.

In a project with a high proportion of helicopter yarding, most of the value of the timber would be used to compensate for the high cost of operations and jet fuel. Little value would be left over to cover the costs of road reconstruction, fuel reduction, reforestation, or the other important restoration work associated with the project.

The environmental impact of the temporary road work associated with the action alternatives has been fully analyzed and disclosed in section 3; the effects were found to be minimal. Section 2.2.2 discusses the details for roads and impacts are discussed in several parts of section 3 such as, s. 3.3.3.3, s. 3.4.5, s. 3.7.3.2. The analysis found the impacts to be sufficiently minimized by project design criteria (s. 2.2.4). The techniques to keep unauthorized OHV from using rehabilitated temporary roads is found at s. 2.2.2.4. Forest Plan standards and guidelines would be met and the project would be consistent with the Aquatic Conservation Strategy (s. 3.4.7.1).

The alternative of logging with helicopters instead of constructing or reconstructing temporary roads was considered but not fully developed because it would not likely be viable and would not likely achieve the purpose and need on a large portion of the landscape allocated to timber emphasis in the Forest Plan.

2.1.2 Regeneration Harvest Options

The issues surrounding regeneration harvest are discussed at s. 1.4.1.2. Some comments suggested additional regeneration harvest particularly given the C1 – Timber Emphasis land allocation and the lack of early-seral conditions in the project area. Others objected to regeneration harvest and suggested that there was plenty of early-seral habitat and the land would be better used for carbon sequestration and the development of old growth. While the regeneration associated with the proposed action was found to be an appropriate quantity, other options were considered and are discussed in the following sections.

2.1.2.1 No Regeneration Harvest

The option of thinning units instead of regeneration harvest was considered. This would reduce regeneration harvest on 255 acres and would not create the associated early-seral conditions.

While the Forest Plan and the Northwest Forest Plan allow regeneration harvest in old-growth stands, the District has not pursued that strategy in recent years. As a result, early-seral forests have declined dramatically in the past 20 years. The Forest Plan, as amended, provides direction for the consideration of regeneration harvest in the C1 – Timber Emphasis land allocation. The proposed action identified regeneration harvest with skips and scattered retained trees in carefully chosen locations to address the area's needs without impacting old-growth stands.

The environmental impact of regeneration harvest associated with the proposed action has been fully analyzed and disclosed in section 3; the effects were found to be minimal. The impacts and benefits are discussed in several portions of section 3 such as s. 3.3.3.3, s. 3.4, s. 3.7.3.3, and s. 3.8. The analysis found the impacts to be sufficiently minimized by project design criteria (s. 2.2.4). Forest Plan standards and guidelines would be met and the project would be consistent with the Aquatic Conservation Strategy (s. 3.4.7.1).

Some commenters' suggestion that the land be allowed to grow into old growth is outside the scope of this analysis and is contradictory to the goals of the Forest Plan in this area. There are other portions of the Forest, such as Wilderness areas and Late-Successional Reserves where stands grow to become old growth and contribute toward carbon sequestration.

The alternative of no regeneration harvest was considered but not fully developed because it would not achieve the purpose and need on a portion of the landscape allocated to timber emphasis in the Forest Plan. It would reduce timber outputs by approximately 10 million board feet.

2.1.2.2 More Regeneration Harvest

The option of creating additional regeneration harvest was considered.

Since the project area contains 10,775 acres of the C1 – Timber Emphasis land allocation, some commenters suggested that proposing regeneration harvest on only 255 acres was not enough. Before addressing this issue further, the following will identify some of the rationale for how the proposed action was developed in regards to the quantity and location of regeneration harvest. The acreage figures below are only where the item overlaps the C1 – Timber Emphasis land allocation.

- Some stands had been clearcut in previous decades and are now plantations with small trees (1,100 acres).
- The option of regeneration harvest in stands that have been thinned in the past decade was considered but not fully developed because they have not yet reached culmination of mean annual increment[6] (4,400 acres).
- The option of regeneration harvest in suitable spotted owl habitat was considered but not fully developed to provide for the species' needs (520 acres).
- While the inventoried roadless area overlaps the C1-Timber Emphasis land allocation, regeneration harvest is not consistent with roadless rules. (900 acres).
- The rest of the C1 – Timber Emphasis landscape was considered available for thinning or regeneration harvest (3,855 acres) with the following considerations.
    - The Forest Plan, at Four-71, has guidance to spread out regeneration harvest over time, and other standards and guidelines address unit size, adjacency and culmination of mean annual increment.
    - The Forest Plan, at Four-53 has standards and guidelines for hydrologic recovery that constrain the quantity of regeneration harvest.
    - The Forest Plan, at Four-103 has standards and guidelines for the North Fork Clackamas River which is an eligible scenic river with retention and partial retention Visual Quality Objectives (1,300 acres). Thinning can meet these objectives, but regeneration harvest would have to be carefully designed and located.
    - Regeneration harvests were carefully located to provide benefits to deer and elk in areas with palatable forage plants.
    - Regeneration harvests were spaced away from recent private-land clearcuts to provide cover buffers. These areas would likely be considered for regeneration harvest in subsequent decades when the private-land plantations close up.
    - Stand exam information was gathered and analyzed. A certified Silviculturist made a determination of the appropriate use of thinning and regeneration harvest prescriptions.

[6] Culmination of mean annual increment is a technical term that describes when a stand's growth has slowed. See section 3.1.

- After these complex interactions were evaluated by the interdisciplinary team, 255 acres of regeneration harvest were identified for the proposed action.

Because landscape diversity was part of the purpose and need (a mix of ages and densities at section 1.3.1.3), and because commenters suggested creating more early-seral conditions, the interdisciplinary team was asked to reassess the treatments to determine whether additional opportunities existed to create early-seral conditions through regeneration harvest. Since surveys are required for some actions and not for others, the option of developing new regeneration units across the landscape was considered but not fully developed because of the delay that would be required to accomplish needed surveys. Instead, the team developed an additional alternative that would change some of the proposed thinning units to regeneration harvest where Forest Plan standards and guidelines would be met and where surveys were already conducted. This fully developed alternative is described at section 2.3.

2.2 Proposed Action

The Clackamas River Ranger District proposes a suite of integrated project types that work together to meet the desired conditions and goals of the Forest Plan as amended. Section 1.3 discusses the purpose and need and desired conditions that lead to these proposals, along with some introductory discussion. This alternative may be referred to as the Proposed Action or Alternative 1.

2.2.1 Vegetation Management Actions

Table 1. Summary of Vegetation Management Actions (see additional information below)

Purpose & Need	Proposed Action	Acres	Notes
Improve Forest Health, Growth and Diversity while Providing Forest Products	Variable-density thinning with Skips and Gaps[7]	4,330	• 2,080 acres in Matrix, with two acre gaps and heavy thins for forage enhancement • 191 acres in LSR • 934 acres in Riparian Reserves • 88 acres of thinning with a huckleberry enhancement emphasis • 985 acres of young-stand thinning and brushing • 52 acres of young-stand thinning and brushing and the removal trees in diseased areas followed by planting
Improve Owl Habitat	Create gaps and thin	262	• 60 acres cut and leave trees in small gaps to improving owl habitat in Matrix • 202 acres of Matrix thinning with an emphasis of improving owl habitat in the home range
Provide Forest Products and Create Early-Seral Habitat	• Regeneration Harvest with Reserves • Site Preparation and Planting	255	In Matrix, Includes units 82, 94, 96, 116, 120, 131, 132, 152, 165, 170, 182, 184, 191 & 204.

[7] Some stands with a fire history have legacy trees. The term, 'legacy tree' is used to describe large trees, often with fire scars, that survived a fire. Legacy trees are typically much older and much larger than the other trees that seeded in after the fire. Variable-density thinning would retain legacy trees where feasible and where safety permits.

Purpose & Need	Proposed Action	Acres	Notes
Enhance Forage	• Meadow Burn	2	An unnamed meadow near Road 4612130
Fire Hazard Reduction	• Burning • Fuel Break	541	• 150 acres of piling and burning of slash along Road 4610 and property lines • 136 acres of under burning of thinned stands • 255 acres of under burning and grapple piling in regeneration harvest units

2.2.1.1 Riparian Reserves

Protection buffers are a subset of Riparian Reserves and are areas adjacent to streams where thinning would not occur. These areas vary in width depending on site-specific factors to provide some woody debris recruitment to streams and shade. Protection buffer widths are discussed in section 2.2.4. Outside the protection buffers, thinning would occur in the upland portions of Riparian Reserves. For this project, Riparian Reserve widths are 180 feet for non-fish-bearing streams and 360 feet for fish-bearing streams. In Riparian Reserves, the thinning outside the protection buffers would be designed to create conditions suitable for tree growth and to enhance diversity while providing sufficient quantities of large wood for future recruitment. The intention is to enhance Riparian Reserves by accelerating the development of mature and late-successional stand conditions. Regeneration harvest is not proposed for Riparian Reserves. Section 3.4 has more information on impacts and benefits to riparian dependent species.

Riparian Skips - Skips would be created outside of protection buffers that would vary in size and would be up to 5% of each unit. Gaps would not occur within Riparian Reserves.

There are some small seeps and wet areas. Riparian features that are not perennial or intermittent streams such as seeps, springs, ponds or wetlands would be protected by the establishment of protection buffers or skips that incorporate the riparian vegetation.

2.2.1.2 Late-Successional Reserve (LSR)

Thinning in LSRs would be designed to accelerate the development of mature and late-successional stand conditions and to enhance diversity. Section 3.7.1 has more information on impacts and benefits to late-successional dependent species. Where Riparian Reserves overlap Late-Successional Reserves, the protection buffers, and skips as described for Riparian Reserves would be used. Trees would be retained so that the average canopy cover including Riparian protection buffers, skips and gaps equals at least 40% canopy cover. In Late-Successional Reserves, trees would not be cut if they are greater than 20 inches in diameter (at a height of 4.5 feet) unless they need to be cut for skyline corridors, skid trails, landings or temporary roads, in which case they would be left on the ground. (The LSR units contain few trees of this size.) Regeneration harvest is not proposed for LSRs.

LSR Skips & Gaps - Skips would vary in size and comprise a minimum of 10% of each unit. Where Riparian Reserves overlap Late-Successional Reserves, the protection buffers adjacent to streams may be counted as skips. Gaps would be created on 3 to 10% of each unit. Gaps would be up to 1/4 acre in size.

2.2.1.3 Matrix

In the matrix, thinning would be designed to increase health and growth that results in larger wind-firm trees and to enhance diversity and forage.

Skips would vary in size and comprise up to 5% of each unit. Where Riparian Reserves cross through matrix, the protection buffers adjacent to streams may be counted as skips. **Gaps** would be created on up to 5% of each unit to help create variability and diversity while meeting stand-level objectives. Gaps would be up to 2 acres in size. **Heavy thins** with about 40 trees per acre would be created on up to 10% of the matrix component of each unit. **Brushing** would occur in parts of some of the proposed thinning stands with areas of sparse stocking, where thinning is not viable but silvicultural treatments are proposed to release trees so they can grow to their full potential. Brush and small trees would be cut in parts of units where they are competing with conifers.

2.2.1.4 Regeneration Harvest

Regeneration harvest is proposed to provide wood products, and to create early-seral conditions and a more diverse landscape (s. 1.3.1). Approximately 15% of the trees would be retained in skips and as scattered individual trees. Some areas would be seeded with appropriate forage species, and some large shrubs would be cut to encourage resprouting. Primary skid trails, landings and temporary roads would be decompacted and seeded to provide additional forage. Site preparation would treat the slash and brush prior to planting.

2.2.1.5 Young Stand Thinning and Brushing

Precommercial thinning and brush release would be implemented in young plantations, reducing tree densities and competition. By increasing growing space, young trees would have more availability to resources, such as light, water, and nutrients.

Unit 346 is a young plantation that is currently experiencing a high level of mortality due to an Armillaria infection. A sanitation treatment is proposed to cut the dying and dead Douglas-fir trees and to inter-plant species that are less susceptible to Armillaria infection.

2.2.1.6 Fuel Treatments

Slash that ends up at landings would be piled for later burning or removed and used to block roads scheduled for closure. In most thinning units where harvesters are used, slash would be placed in front of equipment and crushed down as the machine moves.

Other fuel treatments are estimated based on initial field visits. It is often difficult to estimate the eventual quantity and distribution of activity fuels; therefore, sometimes adjustments are needed after post-logging inspections. Project design criteria would be used to guide changes to fuel treatments, if any.

Table 2. Fuel Treatments

	Estimated Acres
Grapple Piling [1]	135
Fuel Break Piling [2]	150

	Estimated Acres
Under Burning [3]	256
Lop and Scatter [4]	1,037
Meadow Burn	2

[1] Grapple piling would use a tracked excavator or log loader machine to mechanically pile slash for later burning. In all or portions of Units 82, 116, 120, 151, 152, 182, 184, 191 and 204.

[2] Piling of slash and brush along Road 4610 and along the Forest boundary.

[3] Under burning to reduce fuels, and in regeneration harvest units, to prepare the site for planting. In all or portions of Units 94, 96, 131, 132, 136, 138, 152, 164, 165 and 170.

[4] Cutting and moving activity fuels so that it lies within 18 inches of the ground.

Two fuel breaks are proposed: one along Road 4610 past the junction with Road 4613 and one along the property boundary. The purpose of the action is to reduce the potential for wildfire hazard, reduce wildfire behavior and the spread of wildfires moving on or off the Forest. Creating fuel breaks along the Forest and private boundary will reduce fuel loading and increase the canopy height by reducing ladder fuels. Fuel breaks along roads connecting to harvest units will create a larger landscape with reduced fuel continuity. Additional fuel break detail is located at section 2.2.4 L5.

2.2.1.7 Snags & Down Wood

Except in certain root rot patches where snags are abundant, live trees would be treated within harvest units and protection buffers to provide future snags and down wood. Tree topping is generally the technique used to create longer lasting snags and to create live trees with decay. Girdling is the technique used to create snags quickly but they decay, fall over sooner, and become down wood. Some trees are felled to get immediate down wood. After harvest, and after one or two winters elapse, the units would be examined to determine whether trees died or fell down. In areas where the following target levels are not already met, additional trees would be topped, felled or girdled. In LSRs, there should be three trees per acre with broken tops, five trees per acre should be dead and two trees per acre should be on the ground. In thinning units outside LSRs, there should be one tree per acre with a broken top, and two trees per acre should be either dead or down. If trees need to be treated to meet these numbers, they would be treated farther than one tree-height from system roads to minimize safety issues and potential losses from firewood gathering. Within regeneration harvest units, similar numbers would be created but they would be placed around the perimeter of units.

2.2.1.8 Logging Systems

Table 3. Yarding Systems

	Estimated Acres
Ground Based	1,836
Skyline	1,807
Helicopter	108

Logging systems are estimated based on aerial photo interpretation, terrain considerations and field visits. Further detailed analysis is needed in the field particularly for skyline systems to verify that they would work appropriately. Project design criteria are considered standard operating procedure when analyzing the feasibility of the type of logging system.

The project includes the use of landings. Landings are areas on or directly adjacent to roads where logs are brought to be loaded onto log trucks. Landing sizes vary based on the logging system and the types of equipment that need to be safely accommodated.

Many units that were logged before have existing landings that would be reused where feasible. Some existing landings have brush or small trees growing on them that would need to be removed. Most of the landing disturbance overlaps with the road prisms or other created openings that remain on the landscape from past timber management activities.

The final landing locations, quantity and sizes are approved by contract administrators using the project design criteria (PDCs). The PDCs include minimum spacing away from streams and post-harvest restoration.

2.2.2 Transportation System Management

The North Clack project area currently includes approximately 83 miles of system roads, with 62 miles currently open for public and administrative use. The desired condition is to have a landscape accessed by an appropriate network of roads that provide for management access and visitor safety while minimizing risk to resources. These desired conditions are described in the Forest Plan on pages Four-3, Four-5 & Four-34 and the Northwest Forest Plan on page C-32. A primary purpose of road management is to provide access to the other proposed projects, and to reduce resource risks and maintenance costs while providing appropriate and safe access to the Forest.

Table 4. Summary of Transportation Actions

Purpose & Need	Proposed Action	Miles	Notes
Manage the Road System to Allow for Safe Timber Hauling	Maintain and Repair Forest Service System Roads	63	The intensity of work varies based on location and the work recently accomplished by the Forest and other operators.
Provide Access for Vegetation Management	Construct and Reconstruct Temporary Roads	19.5	• 14.4 miles of new road construction in locations where no road alignment previously existed. (1.5 mi. of this is needed due to OHV conversion of system roads to trails) • 3.6 miles of existing road alignment reconstruction on road alignments that were once temporary roads.(0.6 mi. of this is needed due to OHV conversion of system roads to trails) • 1.5 miles of existing road alignment reconstruction on road alignments that were once system roads.(1.1 mi. of this was decommissioned by OHV plan)
Reduce Resource Risks and Maintenance Costs Associated with Forest Service System Roads	Decommission, Close, and Stormproof System Roads	41.2	• 7 miles of active and passive decommissioning of roads no longer needed. • 26.2 miles of closure and stormproofing of roads that remain on the System. • 8 miles of stormproofing of system roads not used for haul that remain on the System (4610, 4610180).
Reduce Resource Risks and Maintenance Costs Associated with Forest Service System Roads	Convert Road to Non-Motorized Trail	1.2	4611 Remove culverts, retain a trail tread

Purpose & Need	Proposed Action	Miles	Notes
Provide Access for Vegetation Management	Return Former System Road Back to the System	1.2	4610115
Reduce Resource Impacts Associated with Unauthorized OHV Routes	Rehabilitate Unauthorized OHV routes	7.1	

2.2.2.1 Road Use and Management in Support of Vegetation Management Proposals

To facilitate the vegetation management activities proposed for the project area, it is important to ensure that the roads to be used by log trucks are safe. To address this need, the proposed action includes road maintenance and repair activities on 63 miles of Forest Service System Roads. Maintenance and repair include activities such as brushing, blading, deep patch repairs, culvert replacement, ditch cleaning, culvert cleaning and the addition of aggregate rock to road surfaces. A description of system roads needed for vegetation management and treatment needs are included in the transportation report which is incorporated by reference.

2.2.2.2 Temporary Roads and Existing Road Alignments

There has been some confusion over the use of the term 'temporary road.' In previous assessments, roads that were not system roads were referred to as temporary roads even though the road may have been constructed many years ago or the road was once a system road but had been decommissioned. The term 'temporary road' is contractual terminology and is used to describe non-system roads that are used by operators and have no planned need for public use. In today's contracts, they are rehabilitated when project use is completed using one or more of the techniques described below. There is no implication that the effects of these roads are temporary or that they would never be used again for future management. It is likely that road alignments built in appropriate locations on the landscape would someday be used again. The road locations are shown on the North Clack Story Map.

For this document, the term rehabilitation is used to describe the work that would occur on non-system roads whether existing or new. Rehabilitation includes a suite of actions that are tailored to site-specific situations and may include placement of one or more berms at the road's entrance, construction of water bars, and/or placement of debris such as root wads, slash, logs or boulders where available. Native surfaced roads would be decompacted as needed with the jaws of a log loader or excavator. Roads or sections of roads that have rock surfacing may be decompacted where site-specific circumstances warrant. The technique known as "cratering," which is a standard practice often used for system road decommissioning, may be used to decompact temporary roads or reused existing road alignments. In some cases, rehabilitation would occur immediately after logging while other roads are needed for site preparation and planting would be rehabilitated when treatments are completed.

2.2.2.3 Road Management for Reducing Resource Risks and Maintenance Costs

The Forest has developed a Transportation Analysis Report (TAR) described at section 1.3.2.1. To address opportunities to reduce resource risks and maintenance costs associated with Forest Service System Roads, the proposed action includes changes to roads. A project-level analysis was conducted that considered the recommendations in the TAR and looked at the local roads with proposals that may differ from what was

listed in the TAR based on better site-specific information and field reconnaissance. The information from the project-level analysis is included in a transportation planning report, which is incorporated by reference. It contains a road-by-road table elaborating on the disposition of each.

Table 4 above lists proposed transportation actions. Those treatments in the field would be accompanied by some database changes summarized in Table 5.

Table 5. Summary of Database Changes

Change	Miles
Change from Objective Maintenance Level 4 to 3	2.4
Change from Objective Maintenance Level 3 to 2	4.0
Change from Objective Maintenance Level 1 to 2	5.6
Change from Objective Maintenance Level 2 to 1[1]	0.2
Change Route Status from Existing to Decommissioned	7.0
Change Route Status from Existing to Converted to trail	1.2
Change Route Status from Converted to trail to Existing [2]	1.2

Maintenance Level 1 – roads that remain on the Forest's system of roads in a closed status. Most roads proposed for closure (Table 4) are already Objective Maintenance Level 1 in the database.

Maintenance Level 2 – roads that are maintained for high clearance vehicles.

Maintenance Level 3 – roads that are maintained for passenger cars but with no priority for user comfort or speed.

Maintenance Level 4 – roads that are maintained for passenger cars with a moderate degree of user comfort and speed.

[1] Objective Maintenance Levels would be changed when a final decision is made and Operational Maintenance Levels would be changed after the action is implemented in the field.

[2] The Forest OHV plan identified approximately 1.2 miles of Road 4610115/Trail 804 to be changed to a motorized trail. After further site-specific analysis, this road/trail was found to be periodically needed for timber management. The proposal is to return this to a system road and manage it for OHV use when not needed for timber haul.

2.2.2.4 Unauthorized OHV Management

The proposed action is to actively rehabilitate areas damaged by OHV use. The proposed action also includes preemptively blocking roads and skid trails created by logging that might otherwise become OHV routes. Methods generally include constructing blockages to motor vehicles, piling slash and root wads on routes, decompacting and stabilizing, using mechanized construction equipment such as excavators or backhoes. Root wads that are generated from road and landing construction would be hauled to staging areas and would be available for use to block unauthorized OHV routes where needed.

2.2.3 Aquatic/Riparian Habitat Enhancement

2.2.3.1 Stream Habitat Enhancement - Large Woody Debris

In the streams that lack desired levels of large wood, trees would be felled, pushed, or pulled over, or brought in with helicopters to create better quality fish habitat than currently exists. The exact stream reaches for large wood addition would be selected from areas where fish are present, wood is lacking, and access is feasible. Unit 43 is proposed to be thinned to achieve riparian objectives, and some of the trees removed

would be used as fish logs as needed. Large woody debris placement is proposed in the following streams to move them toward the desired condition (in priority order).

1. North Fork Clackamas River
2. Bedford Creek
3. Winslow Creek

Some stream reaches do not have the desired large conifers, or the potential to grow them, due to the presence of dense alder stands. The proposed action includes identifying young conifers adjacent to streams that are trying to grow up through a dense alder overstory and felling a few alders at each site to release individual conifers or small groups of conifers. The conifers would be released to grow larger and eventually provide desired riparian characteristics and woody debris to streams when they die. More detail is at PDC K.

2.2.3.2 Beaver Habitat and Wetland Restoration at Tumala Meadows

The proposed action includes installation of in-channel structures, or Beaver Dam Analogues (BDAs), to simulate beaver dams and to encourage beavers to build dams in incised channels and across potential floodplain surfaces. The dams are expected to entrain substrate, aggrade the bottom, and reconnect the stream to the floodplain. Protection of the culvert on road 4610 from flooding will occur using one of a variety of techniques of 'beaver baffles'. The relocation of beaver to Tumala Meadows in coordination with Oregon Department of Fish and Wildlife, may occur if they do not reestablish on their own.

2.2.4 Specific Project Design Criteria (PDC)

The list below contains project-specific detail that is unique to this project. In addition, there is a list of District Standard Project Design Criteria[8] dated 3/2019. These also apply to this project and are incorporated by reference. The list below uses a numbering convention that integrates the numbering system from the District Standard Project Design Criteria, using the same headings with numbering that adds to the last District Standard PDC in each category. These practices are included in the action alternatives and were developed to minimize or reduce effects to resources but do not necessarily eliminate all impact. The effects and benefits of these practices are included in the analyses of effects in section 3.

A. Stream-Protection Buffers

A3. The following are prescribed widths for perennial streams in specific units.

Table 6. Protection Buffers

Unit	Protection Buffer (feet)
4	125
6	111
50	89

National Core BMP Technical Guide – Plan 3 and Veg 3.

[8] http://www.fs.usda.gov/nfs/11558/www/nepa/105362_FSPLT3_4630798.pdf

C. Skidding, Yarding and Equipment Use

C15. PDC #C6 indicates that existing skid trails would be reused to the maximum extent possible. However, in Unit 118, windrowing of slash occurred which obscured the existing skid trails and made it difficult to find them. Since windrowing moved much productive top soil into rows, it is important to protect the productivity that remains. As much as possible, avoid skid trail placement on top of windrow residue areas. Skid trails can cross windrows where necessary in a manner that minimizes skid trail exposure to the windrow residue areas. Windrow deposits can be identified on old aerial photos, and on the ground by charcoal fragments, unburned debris, and a subtle rise in elevation. Areas between the windrows generally are devoid of duff and A horizon soils, so soil color is less dark than in the windrowed piles.

E. System Road Reconstruction and Maintenance

E9. Water needed for dust abatement, road maintenance, reconstruction or construction, or other uses, may be acquired off-Forest or may be acquired on-Forest if District Standard PDC E8 is met.

The following drafting sites are preapproved.
Road 4613 crossing of North Fork Clackamas River
Road 4610 crossing of Boyer Creek
National Core BMP Technical Guide – AqEco 2, Road 4, WatUses 3.

E10. Special road work is required to minimize road-related sedimentation where aggregate-surfaced haul roads cross the following streams: 4613 at Dry Creek; 4613 at North Fork Clackamas River; and 4610 at Boyer Creek. After pre-haul maintenance occurs and before haul, erosion control measures would be installed within 500 feet of crossings such as silt fences, straw bales, wattles, matting and/or mulch in ditches and roadsides. *National Core BMP Technical Guide – AqEco 2, Road 1, Road 3, Road 4, Road 6, Veg 2, and Veg 3.*

E11. Crushed aggregate or pit run rock would need to be applied to several roads to minimize road-related sedimentation. This applies to all or portions of 4610028, 4610040, 4612120, 4612140, 4613016, 4613017, 4613018, 4614120 and 4614125. *National Core BMP Technical Guide – AqEco 2, Road 1, Road 3, Road 4, Road 6, Veg 2, and Veg 3.*

H. Operations

H4. The use of large vehicles for log haul, rock haul, or equipment transport would be restricted on Road 4610 between Highway 224 and the North Fork Quarry and on Road 4611 between Road 4610 and Trail 805, to minimize impact to recreation users. On weekends and holidays, the use of these vehicles would not occur unless accompanied by a pilot car. The use of long lowboy vehicles, any time of year, on the first 2.2 miles of Road 4610 would require a short temporary closure of 4610 to minimize hazards.

J. Wildlife

J2. Northern Spotted Owl: There are restrictions during the breeding season for certain activities based on the type of activity and the distance to activity centers. Restrictions apply to the use of chainsaws and heavy equipment (393 yards) between March 1 and July 15 for a small portion of Unit 206. Chainsaw use would not occur in Units 208 & 210 between March 1 and July 15.

There is a restriction for the use of helicopters. Details on the restrictions and rationale are in the U.S. Fish and Wildlife Service's Letter of Concurrence. No helicopter units occur within the specified zones. Because helicopter restrictions apply both during yarding and transit to other sites, a wildlife biologist would be consulted to determine if any restrictions are needed after operators finalize landing locations, flight paths and proposed seasons of operation.

J3. Deer and Elk: No harvest operations, road construction, use of motorized equipment or blasting would be permitted in winter range areas between December 1 and March 31. The restriction may be waived if snow accumulation levels are less than 12 inches or if it is determined that the area is not being used by elk. All or portions of the following units are in winter range: 2 to 72, 84 to 106, 112, 140 to 202, 206, 210, 304 to 330, 346 and 350.

J4. Peregrine Falcon: No chainsaws or heavy equipment would be permitted from January 15th to August 15th. This applies to units 304, 306, 308 and 310. This restriction may be waived if the nest site is unoccupied or if nesting efforts fail and there is no possibility of re-nesting. Documentation of nesting failures can be finalized no earlier than June 30th due to the possibility of re-nesting.

J5. Red Tailed Hawk: No chainsaws or heavy equipment would be permitted between March 1 and July 31 in Units 84, 86, and 89. This restriction may be waived if the nest site is unoccupied or if nesting efforts fail and there is no possibility of re-nesting. There are no restrictions to haul or other road use activities along Road 4610.

J6. Red Tree Vole

Red tree vole surveys have been completed to protocol. However, there is the possibility that new red tree vole sites may be found, even after a decision is made for this project. As they are confirmed and validated, additional deletions or buffers would be incorporated where appropriate.

J7. Legacy Trees

Snags are addressed in PDC #J1. For this project, legacy trees are defined as large live trees that survived a stand-replacing wildfire. They are typically much larger and much older than the trees that grew up after the fire and they often have fire scars. Live legacy trees would be retained where safety permits. If legacy trees are determined to be a safety hazard or need to be removed for operational purposes, they would be felled and left on site. Live legacy trees would be retained and would typically be included in the leave tree spacing in thinning units or in the green-tree retention component of regeneration harvest units. They may be incorporated into skips.

L. Fuel Treatment

L5. Fuel breaks would be created along the Forest boundary and along Road 4610 to the east of the junction with 4613 continuing to the project area boundary. Slash and other woody debris between 1 inch and 6 inches in diameter at the large end and longer than 24 inches in length would be piled. Pieces that are too long to fit within the pile would be bucked. The goal in the fuel breaks is to reduce fuels smaller than 6 inches in diameter to approximately 7 tons per acre. Larger down logs may be retained and would not count toward this goal. Tonnage of fuels would be assessed by Forest Service using USDA Forest Service General Technical Report PNW-105, May 1980. PDCs L1-L4 address pile burning.

a. Roadside piling is prescribed within units adjacent to Road 4610 to the east of the junction with 4613. Activity fuels within 40 feet of the running surface of the road would be piled. If slash is moved into the unit farther than 40 feet to avoid piling, the final height of slash should not exceed 18 inches from mineral soil. If heavy equipment is used to accomplish roadside piling, equipment would stay on roads, landings and existing skid trails. Treatment inside units would be a required element of the contract.
b. Roadside treatments would also occur outside of units in areas adjacent to Road 4610 east of the junction with 4613. Within 40 feet of the running surface of the road, saplings would be cut with healthy live trees retained at a 12-foot spacing except where piles are placed. Brush would also be cut. Leave trees may be pruned where appropriate. These items and other fuels on the ground would be piled where they exceed 7 tons per acre. If the fuels are too scattered to make a pile of the minimum size, it may be lopped and scattered to within 18 inches of the ground. If heavy equipment is used to accomplish roadside piling, equipment would not leave the road. A masticating machine may be used if it can accomplish similar results while operating on the road. Treatments outside units would likely be accomplished with KV or other funding sources.
c. Slash piling is prescribed within units adjacent to the Forest boundary. Activity fuels within 66 feet of the boundary would be piled. If slash is moved into the unit farther than 66 feet to avoid piling, the final height of slash should not exceed 18 inches from mineral soil. Units that have ground-based logging may be grapple piled. Other units would be hand piled. Treatments inside units would be a required element of the contract.
d. Fuel treatments would also occur outside of units in areas adjacent to the Forest boundary. Within 66 feet of the boundary, saplings would be cut with healthy live trees retained at a 12-foot spacing except where piles are placed. Brush would also be cut. Leave trees may be pruned where appropriate. These items and other fuels on the ground would be piled where they exceed 7 tons per acre. If the fuels are too scattered to make a pile of the minimum size, it may be lopped and scattered to within 18 inches of the ground. Treatments outside units would likely be accomplished with KV or other funding sources.

N. Other Project Specific PDCs

N1. In Unit 138 adjacent to trail #507, the following measures would minimize impact to scenery: Thinning unit boundaries would be 100 feet or farther from the trail. Boundary signs and tree paint would face away from the trail to the extent practical. Trees to be cut in the unit would be directionally felled so they do not fall outside of units. Trees (including small understory trees) and shrubs between the trail and unit would be protected as a visual screen. No temporary roads or skid trails would cross the trail. Landings would be as far away from the trail as practical.

N2. Geology

a. Unstable areas are delineated at the bottom edge of Units 4 and 6. These unstable areas are incorporated into riparian reserves and are deleted from the units.

b. A feasible route for a new temporary road that extends from the end of Road 4613140 was identified to access Unit 174. This alignment is on a ridgetop above the head scarp of a dormant landslide and is likely the only feasible route

that protects the stability of the earthflow. Drainage on this ridgetop road should be directed to the north.

c. If any previously unknown unstable areas are discovered or suspected during project implementation, they would be reported to the Forest Geologist to determine if changes to project design are warranted.

2.3 Alternative 2 – Additional Regeneration Harvest

This alternative was developed as described in section 2.1.2.

It would be similar to the proposed action except that several unit or portions of units that were proposed for thinning would have regeneration harvest instead. These include Unit 76 at 18 acres, Unit 107 at 25 acres, Unit 133 at 12 acres, Unit 195 at 33 acres, and unit 201 at 28 acres. These 116 acres of regeneration harvest would be in addition to the 255 acres described in the proposed action. This would also result in 116 acres less thinning. All of the other descriptions of the proposed action including PDCs would also apply to this alternative.

2.4 Comparison of Alternatives

This section presents a comparative summary of principal activities and the environmental effects for the alternatives being considered in detail compared to no action. The summary is limited to the effects on the project's purpose and need, Forest Plan standards and guidelines, and other resources measurably affected and considered important for an informed decision.

Table 7. Comparison of Alternatives

Topic	No Action	Action Alternatives
Timber volume removed	No wood products provided to local and regional economies.	Provides up to approximately 45 million board feet of wood products with the proposed action and up to 50 million board feet with Alternative 2.
Acres of matrix treated	Future productivity reduced as mid-aged stands stagnate. Diseases continue to reduce productivity.	Improves stand conditions for future productivity on 3,722 acres.
Increase forest health and growth by thinning (s. 3.1)	Stands are beginning to stagnate and would eventually become more susceptible to insects and diseases.	Trees in thinned stands would have the space they need to grow and increase diameter and expand their crowns, becoming increasingly healthier.
Tree diameter in 50 years. Plantations with thinning	23.2 inches. Not meeting late-successional character.	24.9 inches. Achieves the minimum size where stands begin to function as late successional.
Tree diameter in 50 years. Fire-Origin Stands with thinning	19.0 inches. Not meeting late-successional character.	24.8 inches. Stands are developing late-successional character.
Diversity of vertical and horizontal structure by variable-density thinning (s. 3.1) Acres treated	Stands would remain relatively uniformly dense and overcrowded.	Variable-density thinning with skips, gaps, heavy thinning and forage openings would create greater structural diversity compared to no action. 4,592 acres with Alternative 1 and 4,476 acres with Alternative 2.
Change in other plants	Ground vegetation would remain unchanged. Shade would gradually increase.	More sunlight to forest floor would increase abundance of plants, including forage species.
Change in vertical canopy layers	Would primarily remain single story stands with small gaps created by natural disturbances.	Gaps and heavy thins would naturally regenerate and begin to grow young trees resulting in a two storied stand. Up to 10% gaps and up to 10% heavy thins.
Change in horizontal structure	Trees would remain uniformly dense.	A mix of gaps, skips, heavy thins, and variable-density thinning would result in diverse structure. Up to 10% gaps, up to 10% heavy thins, skips would be 5 to 10% plus riparian buffers.
Change to snags and down wood (s. 3.7.5)	High levels of small and medium sized snags and down wood in next few decades.	Lower levels of small snags and down wood compared to no action. Levels for larger sized snags and down wood are less compared to no action. Snags and down wood would be created.

Topic	No Action	Action Alternatives
Deer and elk habitat (s. 3.7.3.3) Acres treated	Forage for deer and elk would continue to decline across the landscape. No acres treated.	Forage for deer and elk would improve slightly across the landscape with regeneration harvest. 255 acres with the proposed action and 371 with Alternative 2. Plus gaps and heavy thins.
Acres treated to reduce fuels	No fuel reduction or fuel breaks.	Acres of fuels treated in regeneration harvest units, under burns in thinning units, and fuel breaks. Approximately 541 acres with the proposed action and 657 acres with Alternative 2. Breaking up stand and fuel continuity would make fires easier to contain at smaller sizes.
Transportation management (s. 3.2) Miles treated	Roads would continue to impact hydrologic function and water quality. No roads maintained, repaired, closed or decommissioned.	Active road decommissioning and road repair, maintenance and stormproofing would reduce chronic sediment delivery, restore hillslope hydrology and reduce sediment impacts associated with the potential catastrophic failure of stream crossings during storm events. 105 miles treated.
Aquatic/riparian management (s. 1.3.3)	Problem areas remain unchanged.	100 logs placed in three priority streams.
Water Quantity (s. 3.3.1)	No change	Considering the combined impacts of harvest and roads, a slight increase in impact area would not result in substantive peak-flow effects on channels. Forest Plan standards would be met.
Water Temperature (s. 3.3.2)	No change	No change
Sediment (s. 3.3.3)	Some problem areas continue to produce sediment, roads deteriorate.	Some minor short-term increase with long-term reduction from road repair, road closure, stormproofing and decommissioning.
Fisheries ESA Listed Fish Habitat (s. 3.4)	No Effect	No Effect
Aquatic Sensitive Species (s. 3.4)	No Impact	May impact individuals or habitat, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species
Aquatic Conservation Strategy (s. 3.4.7.1)	Would not enhance late-successional characteristics of Riparian Reserves, replace or repair culverts, or restore dispersed recreation impacts.	Meets ACS Objectives. Would enhance late-successional characteristics of Riparian Reserves.
Soil Erosion (s. 3.6.1)	Gradual continued recovery of existing soil conditions. Roads continue to be unrestored.	Very small risk for a very short period of time with PDCs. Reduced erosion as roads are rehabilitated, decommissioned and stormproofed.
Detrimental Soil Disturbance (s. 3.6.2)	Gradual recovery. Many stands currently exceed S&Gs.	Uses existing skid trails & landings. Temporary roads, landings and some skid trails would be restored. Exceptions to S&Gs are documented at s. 3.6.3.5.
Organic Matter (s. 3.6.3)	Gradual recovery as trees die and fall.	PDCs minimize alteration of duff and down wood. Some slash would be retained and would quickly decay.
Northern Spotted Owl (s. 3.7.1)	No effect. Some stands may never become suitable habitat without intervention.	Not Likely to Adversely Affect. Some stands accelerated toward suitable habitat.
Sensitive Species (s. 3.7.2, s. 3.10)	No impact	May impact individuals or their habitat, but would not likely contribute to a trend toward federal listing or loss of viability to the population or species.
Survey and Manage (s. 3.7.4)	No impact	No impact
Snags (s. 3.7.5)	No change in the short term, many small snags in the long term, greater number of large snags in the long term.	Slightly fewer in the short term due to felling of hazard snags. Some snags created. Fewer small snags in the long term. Sufficient number of large snags in the long term.
Deer and Elk (s. 3.7.3.2)	Declining populations due to lack of forage	Beneficial effect due to increases in forage
Scenery & Recreation (s. 3.8)	No change	Very little change. Inappropriate recreation is contained. Road closure reduces dispersed recreation.
Botany (s. 3.10)	No short-term change	May impact individuals or their habitat, but would not likely contribute to a trend toward federal listing or loss of viability to the population or species.
Invasive Species (s. 3.11)	No change. Several invasive plants are present	Some existing common invasive plants may spread somewhat, particularly along roads. PDCs would minimize spread of existing invasives and would minimize the introduction of new species.

3.0 Environmental Consequences

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

3.1 STAND PRODUCTIVITY, HEALTH AND DIVERSITY

The action alternatives comply with direction in the Forest Plan, as amended, and vegetation management actions are appropriate to move stands in the desired direction in terms of health, growth and productivity in both the short and long term while minimizing effects to other resources.

This section summarizes the Silviculture Specialist Report, which is incorporated by reference. The purpose and need statements at section 1.3 contain several elements that are covered by this report including stand health, growth, productivity, and diversity. The treatments have also been designed to improve forage conditions for early-seral dependent species, promote owl habitat and enhance huckleberry production.

Stand exams have been conducted to gather data for use by a certified Silviculturist to develop stand level prescriptions.

3.1.2 Existing Condition

Due to its fire history, the project area is relatively homogenous with the majority of stands in a mid-seral state. There are relatively few early seral or late-seral stands. Many stands have reached a stage in their development where tree growth is slowing due to overcrowding. Some stands were clearcut before when the land was privately owned and most have burned multiple times. These stands that have been logged before can be thought of as plantations; even though records are non-existent, stand exams show many to be approximately 70 years-of-age. Other stands that burned but were not logged can be thought of as fire-originated stands. They are approximately 100 years old and some contain live legacy trees that are much older.

3.1.3 Direct and Indirect Effects

3.1.3.1 No Action

Over time, trees would continue to grow in height to capture available sunlight with little diameter growth. The stands would remain dense except for small canopy gaps caused by mortality of individual or small groups of trees. When openings do occur, the adjacent trees are at an increased risk of windthrow due to a high height to diameter ratio. Growth rates would decrease and mortality rates would increase due to high density levels.

With the exception of high levels of small to medium size snags, diversity within these densely stocked forested stands would continue to be lacking for long periods. Structural diversity would continue to be maintained as a single-canopy layer with only one primary age class. Species diversity especially in the plantations would also continue to be lacking as they were primarily planted with Douglas-fir, and with a closed canopy due to high densities other tree species, herb, shrub and forb cover

would continue to not readily establish. These stands would continue to have low diversity in ground vegetation and overstory vegetation.

3.1.3.2 Action Alternatives

A variable-density thinning approach would be implemented. While enhancing health and growth, variable-density thinning with skips and gaps can increase spatial heterogeneity. Thinning provides growing space, which gives the trees with the best competitive advantage the opportunity to take advantage of this growing space for the longest practical time, fully utilizing the ability of the trees to expand their crowns into the growing room provided by the removal of neighboring trees. Trees with larger crowns have greater stem taper, that is, the base of the tree is relatively large compared with trees that have small short crowns. Thinning increases a tree's resistance to the wind by maintaining a larger crown and increasing stem taper. Trees with more taper are less likely to suffer stem breakage or wind damage. In general, thinning increases both stem and root strength. Thinning can also improve the resistance of some trees to some pathogens by manipulating the structure and species composition of a stand.

The regeneration harvest method would be used for promoting early-seral habitat and to change landscape scale structure. Some units were located to reduce the spread of western hemlock dwarf mistletoe and others to create quality forage conditions for deer and elk. Fifteen percent of each unit would be retained; 70% of the retained portion or 10.5% of the unit would be retained in patches of trees ranging from 1/2 acre to 2.5 acres or more. The rest would be individual trees and patches less than 1/2 acre. As part of site preparation for regeneration, grapple piling and burning of slash, and/or a light-intensity underburn is included to create a seed bed and reduce short-term competition to give an advantage to planted seedlings or natural regeneration. The units proposed for regeneration harvest would provide early-seral habitat for approximately 20 years: 255 acres with the proposed action and 371 acres with Alternative 2.

The proposed action would generate up to 45 million board feet of viable commercial timber products while Alternative 2 would generate approximately 5 million board feet more.

3.1.4 Cumulative Effects

The effects of thinning or regeneration harvest on stand growth and productivity are generally experienced or expressed within the stands; therefore the analysis area for cumulative effects would be the unit boundaries. The time scale for cumulative effects analysis is quite long: some impacts from 30 to 60 years ago when stands were clearcut or burned remain today, and alterations made during harvest have the potential to benefit health and growth many years into the future. The existing condition and the changes projected above include fires and past actions as they have affected growth including previous logging, precommercial thinning and recreational activities such as shooting and user-created OHV routes. There are no foreseeable future projects occurring inside the units to consider. While there may be future logging or other management within the units, there are no current proposals with sufficient site specificity to conduct an analysis. Because the impact on growth, productivity and diversity is a beneficial one, and there are no other additive impacts to consider, there would be no cumulative effects for either action alternative.

3.1.5 Forest Plan Standards and Guidelines

The action alternatives are consistent with the goals and standards and guidelines from the Forest Plan and Northwest Forest Plan. FW-306 indicates that timber stands should not be regeneration harvested until they have reached or surpassed 95 percent of culmination of mean annual increment measured in cubic feet. FW-307 explains that exceptions to this may be made where resource management objectives or special resource conditions require earlier harvest.

The action alternatives would require an exception for FW-306 because four units have not culminated. They are proposed for regeneration harvest to enhance forage where palatable browse plants are present, to reduce the spread of western hemlock dwarf mistletoe and reduce the stand's western hemlock component. The actions create early-seral conditions without impacting suitable spotted owl habitat.

3.1.6 Other Findings

The action alternatives are consistent with the National Forest Management Act regulations for vegetative management. There would be no regulated timber harvest on lands classified as unsuitable for timber production (36 CFR 219.14) and vegetation manipulation is in compliance with 36 CFR 219.27(b).

The action alternatives are consistent with the guidance for competing and unwanted vegetation because the prevention and correction strategies were considered and because the proposed treatments were found appropriate to reforest stands and to deal with slash.

3.2 TRANSPORTATION

The following sections show that the proposed road work and road management changes comply with direction in the Forest Plan, as amended, and that the road system would be managed appropriately to provide safe public access, access for project implementation and to minimize effects to resources. This section summarizes the transportation report which is incorporated by reference. The purpose and need statements at section 1.3 contain several elements that are covered by that report including system road reconstruction and maintenance needs, and changes to the road system.

In 2015, the Mt. Hood National Forest completed a transportation system analysis at the Forest scale, titled 2015 Travel Analysis Report (TAR) (USDA, 2015), which sought to outline a sustainable Forest Transportation System for the future. The TAR analysis categorized all system roads on the Forest as either "Likely Needed" or "Likely Not Needed" as part of the desired future transportation system. While not a decision document, the TAR set the stage for project-level decisions about whether to retain roads and maintain for public access use, close roads to public access but maintain for administrative use, place roads into storage for later use, or to decommission roads. This project-level analysis for this project takes the general information from the TAR and looks at the local roads with proposals that may differ from what was listed in the TAR based on more detailed and site-specific information.

3.2.1 Existing Condition

Lack of road maintenance throughout this project area has had measurable detrimental effects on the Forest's transportation resource. As deferred maintenance continues to

increase while annual road maintenance budgets decrease, the condition of system roads within the project area have continued to deteriorate.

3.2.2 Direct and Indirect Effects

3.2.2.1 No Action

Over time, unmet road maintenance needs are likely to become road reconstruction needs, resulting in hazardous conditions and increased cost to taxpayers. Forest access for travel, tourism, and recreation as well as safety for forest visitors are already negatively impacted and would continue in the absence of the road maintenance opportunity provided by forest management.

3.2.2.2 Action Alternatives

A detailed account of system roads in the project area is found in the North Clack Roads Table[9] which is incorporated by reference. The proposed actions related to roads are found at section 2.2.2.

The action alternatives are consistent with direction from the Mt. Hood Forest Plan, as amended, as well as all applicable laws and regulations. Of the 83 miles of system roads in the project area, approximately 63 miles would be maintained or reconstructed to facilitate safe haul. The Project Design Criteria (PDCs) for this project for road reconstruction and maintenance include sediment and erosion control as well as protection of natural resources. The proposed changes to Forest System Roads are appropriate and primarily consistent with the Travel Analysis Report (TAR) moving the road system toward the desired future condition. In the project area, the value of timber removed is the primary funding mechanism to accomplish road work, since timber operators are required to maintain and repair system roads.

3.2.3 Cumulative Effects

There would be no substantive cumulative effects to the road system because all projects that use roads also provide maintenance and repair commensurate with their use.

3.2.4 Forest Plan Standards and Guidelines

All proposed actions related to the Forest Transportation System are consistent with Forest-wide Transportation Standards and Guidelines; FW-407 through FW-437, FW-451, and FW-452, pages Four–95 through Four–97.

Standards and guidelines and the Project Design Criteria are specifically addressed and enforced through contract provisions included with each individual timber sale, stewardship project, or public works contract.

3.3 WATER QUANTITY and QUALITY

This section summarizes the water quality specialist's report and data in the analysis file which are incorporated by reference. There is additional discussion on related

[9] https://www.fs.usda.gov/nfs/11558/www/nepa/105362_FSPLT3_4630506.pdf

topics in the Fisheries (s. 3.4), Geologic Stability (s. 3.5) and Soil Productivity (s. 3.6) sections.

The action alternatives comply with direction in the Forest Plan, as amended, and actions provide appropriate protections and enhancements of water quantity and quality. Site-specific PDCs were developed for the control of nonpoint-source pollution. (s. 2.2.4). Cumulative effects were found to be minimal. Beneficial uses identified by the State of Oregon for waters in the project area include public domestic water supply and fish and aquatic life.

The project is located in the Clackamas River basin and in the Middle Clackamas watershed. It overlaps the North Fork Clackamas River, Helion Creek-Clackamas River and Roaring River subwatersheds. Most of the proposed actions and therefore most of the potential changes to water quality and quantity are in the North Fork Clackamas River subwatershed.

3.3.1 Water Quantity

Most of the project area is in the transient snow zone, where there is the potential for flood events when accumulated snow pack can melt quickly during a rain event. On a landscape scale, closed canopy stands can minimize this likelihood while open stands that accumulate more snow pack, can increase risk of flooding. The quantity of roads is also a factor since roadside ditches can more quickly route runoff toward streams.

3.3.1.1 Existing Condition

Some of the landscape has been impacted by past logging, wildfires and roads. There was a time in the early 1900s when most of the project area was dramatically impacted by large wildfires and by intensive logging that occurred when the land was privately owned. Since then, the National Forest lands have recovered hydrologically and are dominated by mid-seral stands. Portions of the North Fork Clackamas subwatershed are still privately owned and recent clearcuts dominate that portion of the landscape. The recent 36 Pit Fire has had an impact on the Helion Creek-Clackamas subwatershed. The assessment of hydrology in the 20 years since the inception of the Northwest Forest Plan found that the subwatersheds were properly functioning.

3.3.1.2 No Action

With no action, hydrologic recovery would gradually continue as plantations grow.

3.3.1.3 Direct and Indirect Effects

Since the impact of the action alternatives on Roaring River and Helion Creek-Clackamas subwatersheds is very minimal, the discussion focusses on the North Fork Clackamas subwatershed. The change in hydrologic recovery would be a reduction of approximately 4% with the action alternatives. Thinning results in stands modeled as partially recovered while regeneration harvests would set the stand back to zero. Afterward, hydrologic recovery would occur relatively quickly with thinned stands while regeneration harvest would take approximately 35 years. Since proposed new temporary roads would be outsloped with no ditches, and rehabilitated when completed, they would not contribute to an expansion of stream drainage network and would therefore not accelerate the delivery of water to streams.

3.3.1.4 Cumulative Effects

The action alternatives, when combined with the impacts that have occurred on private land, past actions on public lands including the Bureau of Land Management, recent wildfires and foreseeable future actions, result in a post-harvest weighted average of 22% impacted area. The roads in the area result in an approximate doubling of the effect of harvest alone based on ditches that provide a more direct routing of water to streams.

The private-land impacts occur primarily in the Bedford/Bee/Fall Creek drainage in the northern part of the North Fork Clackamas subwatershed. The weighted average impacted area for this drainage is currently about 41%. These streams enter the North Fork in its lower reach not far from where the river enters the North Fork Reservoir. The reservoir provides a buffering factor for any potential high-water events that would come from the private lands in the Bedford/Bee/Fall Creek drainage. The action alternatives would result in an increase of approximately 0.5% impact area in this drainage which is decreasing by approximately 1.5% each year based on the growth of plantations.

Considering the combined impacts of harvest and roads, the slight increase in impact area would not result in substantive peak-flow effects on channels.

3.3.1.5 Forest Plan Standards and Guidelines

With all of the alternatives, the three subwatersheds would be below the threshold of concern established by the Forest Plan, for direct, indirect and cumulative watershed effects and hydrologic recovery. Rain-on-snow events would not likely result in flood damage to stream channels because of the quantity of hydrologically recovered stands in the subwatersheds.

3.3.2 Stream Temperature

Stream temperatures in the project area are primarily driven by the quantity of riparian vegetation and shading.

3.3.2.1 Existing Condition

The Clackamas River, North Fork Clackamas River downstream of Bedford Creek, Bedford Creek and Winslow Creek are the areas where standards for stream temperature were not met.

3.3.2.2 No Action

Stream temperature would not change in the short term and may gradually get cooler over time as riparian vegetation grows.

3.3.2.3 Direct and Indirect Effects

Stream temperatures are anticipated to remain at current levels with the action alternatives. Protection buffers along streams provide sufficient shade.

3.3.2.4 Cumulative Effects

In the past, impact to stream temperature has come primarily from clearcutting on private lands. Since most stands in the North Fork Clackamas subwatershed on private

lands have already been clearcut, the quantity of additional private harvest is not expected to be substantial and the trend in the future will be a gradual recovery of stream temperature as growth occurs in riparian areas. Direct effects of the action alternatives would not be additive and no substantive cumulative effects were identified.

3.3.2.5 Forest Plan Standards and Guidelines

The action alternatives would not change temperature and would be consistent with Forest Plan standards and guidelines.

3.3.3 Sediment

For this analysis, sediment delivery associated with natural background levels from landslides and wildfires were examined. Management related impact comes primarily from roads. Since the impact and benefit of the action alternatives on Roaring River and Helion Creek-Clackamas subwatersheds are very minimal, the discussion focusses on the North Fork Clackamas subwatershed.

3.3.3.1 Existing Condition

The background level of sediment in the North Fork Clackamas subwatershed is approximately 876 tons per year from slides and other natural sources and 359 tons per year from the existing road and motorized trail network.

3.3.3.2 No Action

With no action, there would be increased sediment production from roads that continue to deteriorate from lack of maintenance, and the unauthorized OHV routes would remain and expand.

3.3.3.3 Direct and Indirect Effects

The action alternatives would create some sediment, primarily from road construction, reconstruction and haul. It would be temporary and there would gradual reduction after project completion as temporary roads are rehabilitated and as ground cover grows. The action alternatives would also result in reductions of sediment from restoration actions that include road decommissioning, road closure and stormproofing, road repair, adding rock surfacing to existing roads, and rehabilitating unauthorized OHV routes. Since most restoration work can occur immediately, there would be a reduction of sediment of 39 tons per year in the North Fork Clackamas subwatershed. While these restoration actions may result in a short-term pulse of sediment during the work or after the first rain event, they would result in long-term reductions as they begin to function as intended to minimize the impact of sediment sources. During project implementation there would be an increase of approximately 47 tons per year. These figures are modeled as if the actions occur all in one year, but it is very likely that the implementation would be spread out over several years. After the project is completed, with haul ended and temporary roads rehabilitated, there would be a net reduction of approximately 84 tons per year of sediment.

3.3.3.4 Cumulative Effects

There are foreseeable actions that could contribute to sediment; they relate to actions approved by the Forest's OHV plan that have not yet been implemented. There is one

approved trail that has not been built and one road that will eventually be converted to a motorized trail. These occur on relatively flat ground at LaDee Flat and they may contribute some sediment to streams. There are no other foreseeable federal actions. In the past, sediment has come from clearcutting and roads on private lands. Since most stands in the North Fork Clackamas subwatershed on private lands have already been clearcut, and the roads there have already been built, the quantity of additional private harvest and road construction is not expected to be substantial in terms of additional future sediment production above what has already been modeled. Since the direct effects of the action alternatives showed a net reduction in sediment, it is very unlikely that other actions when combined with past actions would result in substantive cumulative effects.

3.3.3.5 Forest Plan Standards and Guidelines

The action alternatives would result in a net reduction of sediment and would be consistent with Forest Plan standards and guidelines.

3.4 FISHERIES

This section summarizes a report titled "Fisheries and Aquatic Fauna Specialist Report and Biological Evaluation;" it is incorporated by reference. Aquatic issues such as sediment and water temperature are discussed in the water quality section (s. 3.3).

The action alternatives comply with direction in the Forest Plan, as amended, including the Aquatic Conservation Strategy. The project includes actions that provide appropriate protections of water quality and enhancements of impacted streams and riparian areas. PDCs were developed to detail how best management practices were tailored to site-specific circumstances (s. 2.2.4). Cumulative effects were found to be minimal.

3.4.1 Endangered Species Act Compliance

A waterfall on the lower reach of the North Fork Clackamas River limits the range of threatened fish including steelhead trout, chinook and coho salmon in the project area. For this reason and the protections provided by PDCs, the action alternatives would have no effect to federally-listed fish or their habitats. Consultation with the National Marine Fisheries Service was not necessary for this project.

3.4.2 Aquatic Sensitive Species and Survey and Manage Species

The Forest Service Region 6 sensitive species that are likely present in the project area include lamprey, Cope's giant salamander and cutthroat trout. Resident cutthroat trout are relatively widespread. The action alternatives may impact individuals or habitat, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species. The Columbia duskysnail would be protected by the PDCs for stream protection.

3.4.3 Stream Factors that Influence Key Aquatic Species

Fish and aquatic fauna can be affected by several habitat features including water temperature, sediment, large woody debris and pools. Temperature and sediment are analyzed in greater detail in section 3.3 and are only addressed here as they impact aquatic species.

3.4.4 Temperature

Section 3.3.2 shows that there would be no change to stream temperature with the action alternatives. However some of the stream reaches, including the Clackamas River have temperatures that are higher than appropriate for anadromous fish. Because of the shade provided by protection buffers, the action alternatives would result in stable temperatures and a trend toward cooler temperatures as disturbed riparian vegetation recovers. Aquatic organisms would not be affected with no action or either of the action alternatives.

3.4.5 Sediment

There are sources of sediment that would continue with no action. Section 3.3.3 shows that the action alternatives would result in a net reduction of sediment. Small sediment particles are harmful to many aquatic organisms when present at high levels. Most of the streams are properly functioning, but Bedford, Boyer and Winslow Creeks are functioning at risk. The protections provided by PDCs and the restoration actions included for roads and OHV routes would benefit fish and other aquatic organisms.

3.4.6 Large Woody Debris and Pools

Large woody debris (LWD) is important in streams because it creates pools, enhances deposition of spawning gravels, boosts trophic processes, and adds structural complexity. Pool habitat is a critical component of healthy stream habitat for salmonid populations.

3.4.6.1 Existing Condition

Much of the area was privately owned and was dramatically affected by logging and multiple wildfires. As a result, riparian areas do not have the desired large late-successional stands, but instead are dominated by second growth conifers and alder stands. For these reasons, there is less than the desired level of in-stream LWD and reduced potential for large woody debris recruitment because the stands are mostly mid-seral and do not have trees large enough to fall and create LWD. The project area does not have a sufficient number and quality of pools and is considered 'Functioning at Risk.'

3.4.6.2 No Action

Riparian stands would continue to grow at modest rates and natural processes of suppression would result in the smaller trees dying and eventually falling. Some may fall toward the stream while others do not.

3.4.6.3 Direct and Indirect Effects

The action alternatives include enhancing LWD in North Fork Clackamas River and in Bedford and Winslow Creeks. Some trees would be felled, pushed, or pulled over, or brought in with helicopters and placed into streams for habitat enhancement.

In addition to inserted LWD, stream protection buffers would provide a sustained source of small wood for the foreseeable future. In some units, the dry upland portion of the riparian reserve would have variable-density thinning. In these areas, there would likely be a slight reduction in the amount of large wood available for natural recruitment into streams for several decades. However there is the opportunity in

future decades to fell trees or place logs into rivers and streams to further enhance LWD and create pools.

3.4.7 Forest Plan Standards and Guidelines and Objectives

The Forest Plan has guidelines for water (FW 54-79), riparian (FW 80-136), fisheries (FW 137-147), and other areas (B7-28 to B7-39). The Northwest Forest Plan has Riparian Reserve Standards and Guidelines (pages C-31 to 38). The project is consistent with the standards and guidelines that address Best Management Practices FW-055 to 059. While some streams do not have the desired characteristics spelled out in these standards and guidelines, the propose action does not substantively harm aquatic resources and it enhances them in many ways described above. The proposed action is consistent with Forest Plan goals and these standards and guidelines. In the long term, the proposed action would enhance riparian areas, water quality, and aquatic species and habitat at both the project and watershed scale.

Northwest Forest Plan Standard and Guideline TM1 (Pages C-31-32) suggests the application of silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain the Aquatic Conservation Strategy. The project is consistent with this standard because Riparian Reserve treatments have only been designed to further the goals of the ACS objectives. While some short-term impacts have been disclosed, the following section explains in detail how the objectives would be met and why active management is proposed.

3.4.7.1 Aquatic Conservation Strategy

The Aquatic Conservation Strategy (ACS) of the Northwest Forest Plan (USDA USDI 1994) was developed to restore the health of watersheds and aquatic ecosystems. The ACS objectives are detailed on page B-11 of the Northwest Forest Plan. At B-10, the Northwest Forest Plan indicates that, to meet the intent of the ACS, management activities should either maintain the existing condition or lead to improved conditions in the long term.

The no-action alternative would maintain the current conditions in the short term, and would result in stands that are overstocked with relatively uniform trees with low levels of diversity. They do not currently have late-successional stand conditions but in the long term, stands would develop and change but at a slower rate compared to the action alternatives.

The Fisheries and Aquatic Fauna Specialist Report and Biological Evaluation contains a detailed discussion for each of the nine ACS objectives based on the analyses found elsewhere in this document, particularly in sections 3.3 and 3.4, which focus on key aquatic parameters or indicators.

While some short-term impacts to aquatic resources have been disclosed, the impact would be minimal and in most cases undetectable at the subwatershed scale. The project would lead to improved water quality and enhanced riparian and watershed conditions in the long term because of the following:

- Stream-protection buffers would provide sufficient stream shade, a source of woody debris recruitment to streams and would minimize the potential for sediment transport to streams.

- Variable-density thinning with skips would enhance structural diversity in Riparian Reserves.
- Thinning in Riparian Reserves would accelerate the development of late-successional conditions.
- Placing logs into streams would lead to improved conditions as pools develop.
- The decommissioning of system roads and rehabilitation of unauthorized OHV routes would lead to improved water quality.
- System road repairs and maintenance would allow for safe use while ameliorating water quality issues.

For these reasons, the objective of maintaining existing conditions or implementing actions that restore watershed and landscape-scale features in the long term would be met for this project. This project is consistent with the Aquatic Conservation Strategy Objectives.

3.4.8 Cumulative Effects

Cumulative effects for aquatic species incorporates the analysis discussed at section 3.3.2.4 and 3.3.3.4 for temperature and sediment. Since no change was found for temperature, and sediment would have a net reduction, there would be little or no effect to aquatic organisms.

Since the early 1990s, many factors have contributed to a trend of stable or improving stream habitat conditions on the Forest that relate to riparian vegetation, large wood and pools. Harvest levels since the Northwest Forest Plan have been well below the level projected. Recent projects have been designed using the standards and guidelines of the Northwest Forest Plan and its emphasis on restoration in key watersheds. As a result, recent vegetation management projects, road decommissioning, road maintenance, and recreation are not creating measureable impacts to streams or aquatic resources at the watershed or subwatershed scales. The action alternatives and other recent projects would improve stream and riparian conditions by moving the stands toward late-successional conditions.

The action alternatives would not have a substantive effect on aquatic resources, including stream temperature, sediment, large woody debris recruitment and riparian vegetation. The protections provided by project design criteria including stream-protection buffers would result in improved conditions in some areas. While there are likely some short-term cumulative effects to aquatic species, there would also be some cumulative benefits as Riparian Reserves are restored to late-successional conditions and as roads are repaired, stormproofed and decommissioned. For these reasons, cumulative effects would not be substantial.

3.5 GEOLOGIC STABILITY

The project complies with Forest Plan direction in terms of land stability. Areas of concern have been examined in the field by a stability specialist and their Geology Report is incorporated by reference.

The project area contains several areas with stability issues. Some areas are considered active landslides while other areas have dormant earthflows that are considered low risk for reactivation.

3.5.1 No Action

No vegetative manipulations would occur and stands would continue to grow. Some stands may experience health issues as they become overcrowded. If wildfire occurs on areas with stability concerns, there would be elevated risk of landslides.

3.5.2 Action Alternatives

Known unstable areas were deleted from harvest units. Where regeneration harvest intersects low-risk dormant earthflows, there would be a slightly elevated, but not substantial, risk of reactivation. The most sensitive parts of dormant earthflows in the project area are the toe zones and these areas are not included in a regeneration harvest unit. The actions are consistent with Forest Plan standards and guidelines for geologic stability.

3.5.3 Cumulative Effects

The project design criteria, the location of the proposed units and their prescription would result in minimal impact. No substantive cumulative effects were identified.

3.6 SOIL PRODUCTIVITY

This section summarizes the soil specialist report and data in the analysis file that are incorporated by reference. This section details potential effects to the soil resource for the proposed treatment units. Other sections cover related topics including geology (s. 3.5) and water quality (s. 3.3).

The action alternatives comply with direction in the Forest Plan, as amended. While PDCs were developed to minimize impacts to soils (s. 2.2.4), the existing condition of many stands from past clearcut logging exceeds the standards and guidelines for detrimental soil condition that we have today. Exceptions are discussed and the rationale for why cumulative effects would not be substantial.

The long-term sustainability of forest ecosystems depends on the productivity and hydrologic functioning of soils. Ground-disturbing management activities may adversely affect the natural capability of soils and their potential responses to use and management. Disturbances may reduce the soil's ability to supply nutrients, moisture, and air to support soil microorganisms and vegetation growth. The productivity and resilience of a soil is directly tied to the physical properties of the soil and the amount of fine organic matter and coarse woody debris retained or removed from the site. Forest soils are a non-renewable resource as measured by human lifespans, so maintenance and enhancement of soil productivity is an integral part of Forest management.

The analysis areas for soil resources for direct, indirect and cumulative effects are the boundaries of the stands proposed for harvest or burning, and decommissioned road locations, and other areas where heavy equipment would be used. These are appropriate boundaries because actions outside these areas would have little or no affect to soil productivity within the treatment areas, and the actions within and treatment areas would have little or no affect to soil productivity elsewhere. Forest Plan standards and guidelines also address soil productivity at the scale of the activity area rather than at a broader landscape scale (p. Four-49). In terms of the time scale, timber harvest and road construction that has occurred since the 1920s has created soil impacts that remain today.

3.6.1 Erosion

3.6.1.1 Existing Condition

In the project area, surface soil erosion potential varies from slight to moderate across the majority of the project area. Some areas on steep slopes are rated as moderated to severe. Subsoil erosion potential is moderate on gentle slopes and high on steep slopes. Ground cover can be used as an indication of erosion risk.

Erosion rates have not accelerated to a substantial degree as a result of past activity. Natural re-establishment of grasses, forbs, and brush, along with stand regeneration and reforestation, has provided effective ground cover. Existing surface erosion is mainly confined to exposed soil on some unpaved road surfaces, road cutbanks, road ditches, OHV trails and dispersed recreation areas. A few isolated occurrences of overland flow were observed within proposed treatment units (primarily associated with old skid trails or OHV trails on steeper slopes), but flows generally infiltrated into the ground within a short distance. Accelerated erosion is also occurring on certain sloped road segments where runoff is concentrated and drainage features are absent or not functioning properly. Occasional small gullies have formed or cut bank ravel is observable. In nearly every circumstance there is little risk of sediment delivery to a surface water feature.

3.6.1.2 No Action

Erosion rates within the analysis area would remain as they are in the short term. Over time, as bare areas become revegetated, erosion levels would decrease. If existing slides were to become more active, or if new landslides were to occur, an increased level of soil erosion would be expected in the exposed soil areas.

3.6.1.3 Direct and Indirect Effects of Action Alternatives

Soil erosion can directly affect soil productivity by reducing soil depth and volume, resulting in a loss of nutrients and water holding capacity. An indirect effect from soil erosion is runoff from bare areas carrying soil particles to water bodies where it becomes sediment (s. 3.3.3). Other negative effects occur such as decreased air quality from dust (silt size soil particles) carried in the atmosphere.

Actual resource damage (accelerated erosion or sedimentation) is dependent on ground cover and weather events that provide the energy to move soil material from one location to another. Soil erosion risk would increase with the proposed action because bare soil would be exposed during implementation of logging and fuel treatments. In order to diminish this risk while soils are exposed, certain erosion control techniques which limit the amount of soil exposure, or which re-establish ground cover after soil is exposed, are implemented to lessen erosive energies. Effective ground cover such as down logs, slash or mulch would dissipate energy from runoff and minimize erosion. Slash and mulch are considered effective in the short term as ground cover until vegetation in the form of grass, shrubs or trees become established either from direct reseeding, planting or through natural seeding.

The use of PDCs for stream protection buffers, designated skid trails, and establishing effective ground cover by applying logging slash or seed, fertilizer, and straw mulch on the disturbed soils reduce erosion features and disturbance, and result in a low potential for soil to be moved to streams and a low potential for substantive effects to soil productivity.

Road maintenance and repair and the rehabilitation of unauthorized OHV routes would reduce erosion and potential sources of sediment to streams. More detail can be found in section 3.3.3.

3.6.1.4 Cumulative Effects

In some areas, past ground disturbance including clearcut logging, and road and landing construction, ground cover was removed. Since then, the stands have regrown groundcover protecting the soil surface and erosion has decreased. Existing surface erosion is mainly confined to exposed soil on unpaved road surfaces, road cutbanks, ditches, with a few isolated occurrences on steep skid trail segments.

There are no foreseeable future actions that overlap proposed harvest units. The cumulative effects of the proposed actions when combined with past actions and foreseeable future actions would not be substantial and trees and other vegetation are expected to continue growing and developing at appropriate rates.

3.6.2 Organic Matter

Course woody debris retains moisture and moderates soil temperature. It also provides habitat for a diverse array of fungi and macro-/micro-invertebrates that improve soil structure and quality, cycle organic carbon, and facilitate nutrient cycling.

3.6.2.1 Existing Condition

Stands that have not been logged before typically have plentiful organic matter. In other stands, fuel treatments from initial clearcut harvests and wildfires have reduced duff levels and organic soil materials. In stands previously harvested, duff layers are relatively thin due to the past harvest and fuel treatment history, and range from 0.5 to 2 inches with an average of 1 inch. Some units have low levels of course woody debris on the forest floor.

In stands not previously harvested, duff and course woody debris levels are higher. Stands that originated after fire have high levels of course woody debris from killed trees.

3.6.2.2 No Action

Forest organic litter input, organic decomposition rates, duff layer development and soil fauna and microbe activity would be unchanged. Organic matter decomposition and nutrient cycling is influenced substantially by temperature and moisture, which would remain unchanged in the short term but would likely be influenced by climate change in the long term. Organic materials would be subject to disturbances such as wind damage or fire. As stands age, trees would die and fall (see snag and down wood analysis in s. 3.7.5). These stands would eventually produce large trees, which would be a source of future large decaying logs on the ground.

3.6.2.3 Direct and Indirect Effects of Action Alternatives

Logs existing on the forest floor would be retained. The harvesting operations would add small woody debris the size class of the cut trees. This would include the retention of cull logs, tree tops, branches, broken logs and any snags that would be felled for safety reasons. Snags or green trees that fall down after the harvest operation would

contribute to the down wood component of the future stand. Treatments to add additional snags and logs are discussed in section 2.2.1.7.

Duff disturbance would be minimized where full suspension yarding occurs in skyline and helicopter operations, where designated and existing skid trails are used in ground-based yarding operations, and where harvesters travel over slash mats when traveling away from designated skid trails. Soil microbial populations would likely be reduced initially in areas of exposed soils. Leaving branches and needles throughout the units where trees are felled should help maintain carbon and nutrient levels. Organic material would be displaced where soil is exposed during mechanical felling, yarding and temporary road construction and reconstruction operations.

3.6.2.4 Cumulative Effects

A sufficient tonnage of branches and down logs left after harvest is completed is expected to provide for organic matter input to the ecosystem. Based on previous experience with similar stands, approximately 27 tons per acre of debris would be retained in the plantation units, and a greater amount in fire-originated stands, which are sufficient levels in west side forests to maintain long-term productivity.

The cumulative effects of the proposed actions when combined with past actions and foreseeable future actions would not be substantial and trees and other vegetation are expected to continue growing and developing at appropriate rates.

3.6.3 Disturbance

Soil disturbance includes soil compaction, soil displacement and puddling, and severe burning.

3.6.3.1 Existing Condition

Prior to the 1980s, soil quality standards, best management practices (BMPs), and mitigation measures were less developed and not as effective at limiting and containing detrimental soil impacts as they are today. Management practices at that time did not restrict machine movement, skid trail density, removal of woody debris or intense burning, therefore existing detrimental impacts to soil are generally higher than allowed under the current Forest Plan standards and guidelines. Natural recovery from historic impacts has occurred to varying degrees depending on the inherent productivity and resilience of the sites, but residual impacts remain and are detectable in all of the previously harvested stands. Detrimental soil conditions most commonly associated with timber harvest and plantation establishment include heavy compaction, displacement of topsoil, excessive removal of organic materials, mixing of soil horizons, and a minor degree of severely burned soils.

Existing detrimental soil condition was calculated to range from 1% to 21% in the areas logged before with ground-based systems. In stands not previously harvested, the existing detrimental soil condition is very low.

3.6.3.2 No Action

Detrimental conditions in the units would remain. Existing road alignments and landings would not be restored, and would likely remain in a detrimental condition for the foreseeable future. In the long term, percent disturbed soil condition would slowly decline as compacted areas move toward recovery due to physical and biological

processes, but the rate would largely be dependent on root growth of vegetation, the resilience of the soil, and the intensity of the disturbance.

Detrimental soil conditions would get worse as unrestrained recreators continue to create roads and trails.

3.6.3.3 Direct and Indirect Effects of the Action Alternatives

To minimize new disturbance, old road alignments, closed roads, old landings, and old primary skid trails would be reused whenever feasible. Some units would have additional impact to soils where old landings and skid trail patterns would not be reused. Soils on old travel surfaces that are to be re-used would revert from a status of partial recovery back to a detrimental condition. New temporary roads would increase the extent of detrimental soil conditions and directly convert soils to a non-productive status for the life of their use.

A net increase in disturbed soil condition is predicted particularly where ground-based equipment is used such as mechanical tree fellers and where more skid trails, yarding corridors, landings and roads would be constructed than already exist.

On ground-based units the increase in detrimental soil condition is expected to stay below 8% due to spacing of designated skid trails at 150 feet apart. But on many units, where a large number of skid trails are existing from the original clearcut harvest, the increase may be approximately 3-4%. On skyline units, the increase in detrimental soil condition is estimated at 2-3%, and on helicopter units at 1%. An estimate of 2% is added for the impact of harvester machines, where allowed based on slope. Since regeneration harvest units would have decompaction of primary skid trails, detrimental soil condition would be lower.

The rehabilitation of skid trails in thinning units by deep soil tillage is not proposed because the roots of trees have penetrated into the skid trails, and that treatment would cause adverse impacts to tree roots that have penetrated into skid trails, leading to reduced growth, and increased root disease and tree mortality. The opportunity to mechanically rehabilitate skid trails in thinning units may come in the future if regeneration harvest occurs.

3.6.3.4 Cumulative Effects

Many of the proposed treatment units have been harvested previously. For this reason, the potential for cumulatively accruing detrimental soil conditions in many of the units planned for treatment is high. Not all ground disturbances in previously managed stands is detrimental; a proportion is low-level disturbance. Light and moderate levels of disturbance are detectable where ground-based operations have occurred in the past. Logging these sites again can exacerbate lower-level disturbance and push it to a detrimental soil condition. Units where the existing detrimental soil conditions are currently high are especially at risk of cumulative effects, where without restoration activities, inherent soil quality and productivity could be diminished.

There are no foreseeable future actions that overlap proposed harvest units.

The cumulative effects of the action alternatives when added to existing conditions would result in detrimental soil conditions that would range from 8% in stands that have not been logged before to 28% where ground-based logging has occurred before

and is proposed again. In regeneration harvest units, the impact would range from 10 to 27% even after the proposed decompaction of primary skid trails.

3.6.3.5 Forest Plan Standards and Guidelines

The action alternatives would be consistent with the Forest Plan. Exceptions are needed for should standards and guidelines identified below that relate to cumulative soil impacts.

Exceptions to Forest Plan standards and guidelines FW-022 and FW-028 are proposed. These relate to soil productivity, which is defined in the Forest Plan as the capacity of a soil to produce a specified crop such as fiber or forage under defined levels of management. Productivity is generally dependent on available soil moisture and nutrients, and length of growing season (Forest Plan Glossary p. 30). The soils report contains a detailed explanation of the rationale for the exceptions.

FW-022

The combined cumulated detrimental impacts, occurring from both past and planned activities, of detrimental soil compaction, puddling, displacement, erosion or severely burned soil should not exceed 15% of the activity area.

FW-028

Following completion of project activities, if more than 15% of the activity area remains in an impaired (e.g. compacted, puddled, displaced or eroded) soil condition, rehabilitative techniques should be used to restore the soil resource to a level of less than 15% impaired.

Many proposed harvest units already exceed 15%. The proposed action would increase it somewhat in some units while reducing it in other areas depending on site-specific factors.

There was no standard and guideline for limiting the extent of detrimental soil impacts when the original clearcuts were logged prior to the Forest Plan and in some cases before the land was obtained by the Forest Service. Back then, ground-based logging was less restricted and operators were not required to limit their skid-trail system, landings, and temporary roads to a specified extent.

The Forest will continue to manage soil resources with the goal of maintaining or enhancing its productivity. The proposed action has been designed to minimize additional detrimental soil impacts. The project design criteria and contractual specifications would be employed that aim to contain the extent of detrimental soil conditions.

The objective of maintaining long-term site productivity would still be met. The Soils Report describes that site productivity has not been substantially impaired. The silviculture report also indicates that stands are growing well and that they would grow even better after thinning. The cumulative effects of the proposed actions would not be substantial and trees and other vegetation are expected to continue growing and developing at appropriate rates.

One technique used in the past to partially restore soils is to use deep soil tillage equipment on skid trails. This has been done before in regeneration harvests where a winged subsoiler pulled by a tractor was used to decompacted soils on skid trails. This

technique is recommended by another guideline (FW-030) which suggests that all logging skid trails should be considered for rehabilitation through deep soil tillage techniques as a means to achieve the goals of FW-028. This technique is appropriate in some circumstances such as directly after a regeneration harvest but is not appropriate in other circumstances such as thinning where tillage would damage tree roots. This guideline was not a requirement at the time of the initial clearcutting.

Deep soil tillage is being proposed for the primary skid trails (and existing road alignments and landings) on several units. Even with deep soil tillage on skid trails, road alignments and landings, some units would not likely get below 15% because a portion of the detrimental impact comes from past site preparation which displaced topsoil and duff; tillage would not repair that damage. Tillage would provide some benefit but is not likely to fully restore soils.

For the reasons described above, the cumulative effects of the proposed actions when combined with past actions and foreseeable future actions would not be substantial and trees and other vegetation are expected to continue growing and developing at appropriate rates.

3.7 WILDLIFE

This section summarizes analysis in a document titled "Wildlife Report and Biological Evaluation," which is incorporated by reference.

3.7.1 Northern Spotted Owl

The project includes actions in the Late-Successional Reserve (LSR). The project area is covered by the North Willamette Late-Successional Reserve Assessment (USDA, USDI 1998). The purpose of the Assessment is to document current conditions and functions of the LSRs and present sideboards for management activities in the LSR to meet the objectives in the Standards and Guidelines of the Northwest Forest Plan. LSRs are the primary habitat for spotted owls as designated under the Northwest Forest Plan. Approximately 191 acres of plantation thinning is included in LSR. All of the stands in the LSR are younger than age 80. Forest plan standards and guidelines for owls including those for LSRs would be met.

3.7.1.1 Endangered Species Act

The effects of the project are considered and analyzed in a Biological Assessment (USDA USDI 2017). Informal consultation with U.S. Fish & Wildlife Service has been completed for this project. A Letter of Concurrence dated September 26, 2017 (FWS Reference Number 01EOFW00-2017-I-0667) (USDI 2017). These documents are incorporated by reference and summarized in the wildlife report.

3.7.1.2 Existing Condition

The project area does not contain Critical Habitat for spotted owls. Due to a past history of logging and wildfires, the project area contains vast areas of dispersal habitat and relatively low quantities of suitable habitat. One historic nest site is in the project area and three other home ranges cross into the project area.

3.7.1.3 No Action

With no action, the stands would gradually grow and many areas providing dispersal habitat now would grow into low quality suitable habitat in the next 50-70 years. At approximately 200 years of age, these stands would function in a similar fashion to a thinned stand but may have a larger amount of snags and down wood.

3.7.1.4 Direct and Indirect Effects of the Action Alternatives

There are no proposed habitat removing or degrading treatments within suitable owl habitat. There are four historic owl home ranges present, but none would be substantially affected.

Proposed treatments include the removal of dispersal habitat through regeneration harvest: approximately 255 acres with the proposed action and 371 acres with Alternative 2. Thinning treatments would maintain dispersal habitat. Dispersal habitat is not a limiting factor in the project area. There would likely be some short-term impact to prey species including flying squirrels and red tree voles. Some thinning prescriptions are specifically designed to enhance diversity and to accelerate the transition of dispersal habitat to suitable habitat.

Seasonal restrictions are included to minimize disturbance to spotted owls. Even with seasonal restrictions, there would be some disturbances that **May Affect, but are Not Likely to Adversely Affect**, nesting spotted owls.

3.7.1.5 Cumulative Effects

In terms of cumulative effects, the anticipated impacts when added to other past, ongoing and foreseeable actions, would be negligible and would not impact northern spotted owl survival, reproduction, feeding, or care of young. The USFWS determined that the cumulative effects of the project **May Affect, but are Not Likely to Adversely Affect** the northern spotted owl (USDI 2017).

3.7.2 Sensitive Species

The sensitive species that are likely present in the project area include peregrine falcon, bald eagle, Johnson's hairstreak butterfly, and western bumblebee. The proposed actions may adversely impact individuals, but are not likely to result in a loss of viability in the project area, nor cause a trend toward federal listing.

3.7.3 Deer and Elk

The project area contains inventoried winter range and summer range.

3.7.3.1 No Action

With no action, the high level of open-road density and unauthorized Off-Highway Vehicle (OHV) routes would continue to result in disturbance to deer and elk. There would continue to be a lack of quality forage.

3.7.3.2 Direct and Indirect Effects of Disturbance

The action alternatives would close roads and rehabilitate unauthorized OHV routes. Open-road density is one way to measure disturbance to deer and elk. OHV trails are included in the analysis because they create impacts similar to open roads. The action

alternatives would close a total of 28.5 miles of open roads and reduce open-road densities in both summer and winter range. Summer range open road density would be reduced from 2.7 to 1.4 miles per square mile which is well below the 2.5 miles per square mile in Forest Plan standard FW-208. The LaDee Flat OHV area is entirely within winter range and affects the ability to manage for solitude in the project area. In winter range, the combined open road/OHV trail density would be reduced from 2.9 to 2.1 miles per square mile which is above the 2.0 miles per square mile in Forest Plan standard FW-208.

An exception is needed for this standard because no additional roads were identified that were suitable for closure. Open roads in the winter range area include Highway 224, and other primary routes such as Roads 4610, 4611, 4612 and 4613 that provide access to the broader landscape including trail heads. Additionally, the OHV plan made a commitment to locating the OHV area in winter range and identified the impacts of doing so (USDA 2010).

3.7.3.3 Direct and Indirect Effects to Habitat

The action alternatives would alter deer and elk habitat. The overall effect of the project would be beneficial for deer and elk. Some early-seral habitats and forage would be created with regeneration harvest, gaps, forage openings, and heavy thins. The current population trend for deer and elk on the Forest is decreasing due to the incremental reduction in early-seral habitat across the Forest. The action alternatives would increase forage production and improve conditions for deer and elk and would contribute to a positive trend in viability on the Forest.

3.7.4 Survey and Manage Species

Surveys were conducted where needed, for mollusks and red tree voles. The only species detected was red tree vole, resulting in dropping approximately 94 acres of proposed treatments. This reduction is an incremental change to the action alternatives based on new information acquired during surveys. There is the possibility that new red tree vole sites may be found, even after a decision is made for this project. As they are confirmed and validated, additional deletions or buffers would be incorporated where appropriate.

3.7.5 Snags and Down Wood

At the landscape scale, there are fewer snags compared to reference conditions. Large down wood quantities are similar to reference conditions.

3.7.5.1 No Action

There would be an abundance of snags and down wood over time as stands become crowded and trees die from competition.

3.7.5.2 Direct and Indirect Effects of Action Alternatives

The action alternatives would have fewer snags and less down wood, compared to no action. However, there would be sufficient quantities in units and across the landscape to provide for the needs of dependent species over time. Standards and guidelines for snags and down wood would be met. Cumulative effects were not found to be substantial.

3.7.6 Other

The wildlife report also contains information about other species such as pileated woodpecker, American marten, and migratory birds. The project would not likely result in a loss of viability, nor cause a trend toward federal listing.

3.8 SCENERY AND RECREATION

The following sections show that the action alternatives comply with direction in the Forest Plan, as amended. The primary recreational experience of the area is Off-Highway Vehicle (OHV) use on the designated OHV routes in the LaDee Flat OHV area. Some proposed actions are designed to ameliorate the effects of unauthorized OHV use on user-created trails. The effects of the project on scenery and authorized recreation were found to be minimal. This section summarizes the Scenery and Recreation Report, which is incorporated by reference.

3.8.1 Scenery

The key viewer position is the North Fork Clackamas River which is an eligible scenic river. The area also includes several hiking trails.

3.8.1.1 No Action

Over time, the scenery in the project area would gradually change as trees grow. The uniformity of the stands in the area would continue. The unsightly aspects of unauthorized OHV user-created routes such as bare dirt, ruts and mud holes, would continue to exist and over time would continue to expand.

3.8.1.2 Action Alternatives

The proposed vegetative treatments would change the uniformity that exists in parts of the project area. The action alternatives would meet Forest Plan standards and guidelines by being consistent with the visual quality objectives associated with key viewer positions due to vegetative and topographic screening. The banks of the North Fork Clackamas River represent a key viewer position that would be visited by fishers. The vegetation along the river banks is so dense that views of the adjacent hillsides would be blocked. Because there are no other foreseeable actions that would occur in the viewshed, cumulative effects would be minimal.

3.8.2 Recreation

The primary recreational activity in the project area is Off-Highway Vehicle (OHV) riding/driving. The only designated OHV area on the west side of the Forest is at LaDee Flat, which is entirely within the North Clack project area.

While OHV recreation is a legitimate activity at LaDee Flat on designated routes; unmanaged and inappropriate OHV use is a potential threat to ecosystem sustainability. In the project area, there are unauthorized routes that are being used. Some OHV use is encroaching into the Roaring River Wilderness. The action alternatives involve intensively closing unauthorized routes by covering them with deep layers of slash, debris, root wads and boulders to reduce erosion and to discourage continued use.

Some OHV users want more OHV trails and more variety of trail types to satisfy the demand for use by various vehicle types and various skill levels. Some have advocated to adopt some of the routes that are currently unauthorized into the trail system. They maintain that having a more varied system would keep users coming to the authorized OHV area and would reduce impacts elsewhere on the Forest. At this time, the currently authorized trail system has not yet been fully developed. A future 1.6 mile trail has yet to be constructed which would enhance loop trail opportunities, and Trail #802/Road 4610113 has not yet been developed. Until the OHV plan is fully realized, it is premature to expand the network of trails particularly when it is challenging to maintain the trails already authorized.

3.8.2.1 No Action

With no action, the roads needed for recreation access would not be repaired. The roads that are currently accessible to the public would remain accessible, at least in the short term. They may soon reach the point where they would need to be closed to the public because they would become unsafe. Road 4610 would continue to deteriorate as a dual-use route.

3.8.2.2 Action Alternatives

Some proposed actions are specifically designed to constrain OHV user-created impacts. The benefits of this are described in other sections including Soils, Fisheries, and Water Quality. The action alternatives would convert a portion of Road 4611 to a non-motorized trail, with a small parking area and vehicle turn-around. This conversion would reduce motorized incursions into the Roaring River Wilderness and connect to the Huxley Lake Trail #521 and the Grouse Point Trail #517. No mechanized treatments would occur within the Wilderness.

Several roads including 4610 and 4613 were not designed to handle the intensity of use they currently receive. The action alternatives include some reconstruction of problem road sections to include features such as rolling dips and redesigned ditches and culverts so that the roads can hold up better between maintenance efforts.

Impacts to designated OHV routes would be minimal and would include temporary closures where log trucks cross OHV trails.

The action alternatives would meet Forest Plan standards and guidelines related to recreation. Other foreseeable actions include the completion of trail construction and conversion of road-to-trail authorized by the OHV Plan. Providing better loop opportunities for OHV users may result in reduced unauthorized use. For these reasons, cumulative effects would be minimal.

3.9 ECONOMICS – FINANCIAL ANALYSIS

The following sections show that the action alternatives comply with direction in the Forest Plan, as amended. A quantitative analysis of economics was not conducted for this project nor is there a separate specialist report. A qualitative assessment, that considered stand-exam data and silvicultural prescriptions, indicates that the project is likely to be viable and receive bids. Based on past experience with similar stands with similar prescriptions, it is likely that there would be sufficient value of timber removed to accomplish vegetation management and to also fund many of the other project elements included in the action alternatives.

3.9.1 Introduction

Wood is used to make many important products needed by society. The value of wood drives rural economies as logs are removed from the forest and processed into a myriad of eventual products. Much of the wood from this project would be used to make houses. Every 10 million board feet of timber is sufficient build several thousand houses. Other products that would come from the removed trees include chips for paper manufacturing and firewood.

Even though timber harvest from federal lands has declined in the past two decades, the forest products industry in Oregon remains an important component of rural economies and provides approximately 25,000 living wage jobs in forest management and manufacturing. Locally, approximately 4,400 of these jobs are in Clackamas County. The annual incremental contribution of each 10 million board feet of timber is approximately 83 jobs (Oregon 2012). Jobs include woods workers who cut and remove the timber, equipment operators who repair and maintain roads, mechanics who service equipment, mill workers who process the raw materials, and craftsmen who assemble wood products into their final usable form. The Northwest Forest Plan (p. 3&4-297) contains an in-depth analysis of employment in the timber industry and the ripple effect that wood products have throughout local and regional economies.

3.9.2 Direct, Indirect and Cumulative Effects

3.9.2.1 No Action

No action would not provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future. It would not provide the employment associated with proposed actions such as road repair or road decommissioning.

3.9.2.2 Action Alternatives

The project has the potential to generate more than the Forest's goal for one year, though it is likely that the timber from this project would be harvested over multiple years. Alternative 1 is estimated at 45 million board feet and Alternative 2 would provide approximately 5 million board feet more. For the State of Oregon, the project represents about 1% of the state's annual timber production (Oregon 2012). In terms of one local sawmill in rural Clackamas County, this volume represents a fraction of their annual needs.

In addition to covering the cost of logging, the value of the wood also covers the cost of road repair, road maintenance, road rehabilitation and road decommissioning. The value of the wood also provides a source of funding for other proposed elements such as disease treatments and replacing culvert that block fish passage.

Cost effectiveness is considered in the design of vegetation management and in the road treatments proposed. While future logging is likely in this area, there are no proposals at this time with sufficient site specificity to analyze. Therefore cumulative effects would be minimal.

3.9.3 Forest Plan Standards and Guidelines

The action alternatives are consistent with Forest Plan goal to efficiently provide forest products.

3.10 BOTANY

This section addresses special status/sensitive species including fungi, bryophytes, lichens and vascular plants on the Regional Forester's Special Status/Sensitive Species list and survey and manage species. Invasive species are discussed in s. 3.11.

A combined biological evaluation and botany specialist report has been prepared by an agency botanist to address the potential effect of activities on special status/sensitive species and survey and manage species; it is incorporated by reference and summarized below.

The action alternatives comply with direction in the Forest Plan, as amended. No species would have a trend toward federal listing. Intuitive-controlled field surveys were conducted to protocol for botanical species during the summers of 2017 and 2018.

No federally listed endangered or threatened botanical species, or species proposed for federal listing, are known to occur on the Forest. One species, water howellia, is suspected to occur on the Forest but has never been found.

The sensitive species cold water corydalis was found, however since it lives in streams, it would be adequately protected by PDCs including streamside protection buffers.

Surveys to detect the presence of most fungi species are not considered practical because of the variability in fruiting-body production from year to year. These fungi and many other species that have habitat in the project area may be present even though they were not detected during surveys. The effects determination for the action alternatives for 60 botanical species is, "May impact individuals or their habitat, but would not likely contribute to a trend toward federal listing or loss of viability to the population or species."

Since there would be little negative direct or indirect effect to rare botanical species such as sensitive species and survey and manage species with the action alternatives including the connected actions, there would be no measurable incremental impact and no substantial cumulative effect.

3.11 INVASIVE SPECIES

This section addresses invasive plants. A combined Biological Evaluation and botanist report has been developed by a botanist to address the potential effect of activities on invasive species; it is incorporated by reference and summarized below. Invasive plants are sometimes called noxious weeds.

The action alternatives comply with direction in the Forest Plan, as amended. Invasive plant species would be managed appropriately to minimize their spread.

The Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision (USDA 2005) amended the Forest Plan. The Site-Specific Invasive Plant Treatments for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon Record of Decision (USDA 2008) also amended the Forest Plan. The invasive plant risk assessment for the proposed project is tiered to the analysis in the 2005 and 2008 Final Environmental Impact Statements. The new standards and guidelines are expected to result in decreased rates of spread of invasive plants while protecting human health and the environment from the adverse effects of invasive plant treatment. The 2008 plan indicates where integrated invasive plant

management methods (e.g., manual, mechanical, chemical, biological, and/or cultural treatments) would occur based on known locations at the time; authorizes the use of 10 herbicides; and provides for an early detection/rapid response (ED/RR) program. The goal of ED/RR is to identify and treat invasive plant populations early when they are still small since treatment and control become more difficult as populations get larger. The design criteria in section 2.2.4 related to invasive species were developed from the recommendations of these plans.

3.11.1 Risk Assessment

The following species are present in the project area.

Species Name	Common Name
Brachypodium sylvaticum	false brome
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Cytisus scoparius	Scotch broom
Digitalis purpurea	foxglove
Geranium lucidum	shiny leaf geranium
Geranium robertianum	herb Robert
Hypericum perforatum	St. John's-wort
Hypochaeris radicata	hairy cat's-ear
Leucanthemum vulgare	oxeye daisy
Mycelis muralis	wall lettuce
Rubus armeniacus	Himalayan blackberry
Senecio jacobea	tansy ragwort

Some species (e.g., Canada thistle, bull thistle, Himalayan blackberry, oxeye daisy, Scotch broom, St. John's-wort, tansy ragwort) are widely established regionally and management objectives are to control infestations on a case-by-case basis. Others species including false brome are considered "ecosystem-altering" species because of their ability to quickly overrun and alter natural habitats and negatively affect ecosystem functions. Other ecosystem-altering species of concern that were not found in the project area but could occur or spread here include garlic mustard, European hawkweed, orange hawkweed, meadow hawkweed, spotted knapweed, and diffuse knapweed. These are not at all widely established on the west side of the Forest; so early detection followed by rapid response (implementation of control measures) is recommended to check the spread of these species.

3.11.2 Direct and Indirect Effects

3.11.2.1 No Action

With no action, there would be less potential for the spread of invasive species, including noxious weeds; however, they may continue to spread even with no action, because vehicles traveling on open roads and trails may spreading seeds.

3.11.2.2 Action Alternatives

With the action alternatives, vehicles and heavy equipment can be a major vector for the spread of invasive plants along roads and from roads into forest and forest

openings. Other elements would reduce the potential spread of invasive plants including road closures and road decommissioning.

The project design criteria at PDC I1 to 5 would reduce the spread of invasive plants by minimizing soil disturbance and erosion, requiring the use of weed-free erosion control methods, and requiring the cleaning of equipment and other practices to minimize the spread of weeds. These PDCs implement the standards and guidelines of the Region 6 Record of Decision for Preventing and Managing Invasive Plants (USDA 2005). That document rates the effectiveness of these practices and explains the rationale for the effectiveness ranking. The use of native plant materials (particularly locally collected seed, cuttings, and divisions, and nursery-grown seedlings propagated from them) in revegetation of bare soils and the utilization of certified straw and mulch are considered highly effective. The cleaning of off-road equipment and the use of gravel from weed-free sources are ranked as moderately effective.

3.11.3 Cumulative Effects

The cumulative effects analysis areas for assessing invasive plant risk and management are the treatment areas and other connected actions, the areas directly adjacent to them, and the roads leading to the project. The time scale for cumulative effects analysis is quite long: some impacts from 30 to 60 years ago when roads were constructed and the stands were clearcut persist today, and activities, particularly along roads, have the potential to affect the spread of invasive plant species that could persist for many years into the future.

The 2005 Record of Decision and FEIS for Preventing and Managing Invasive Plants and the 2008 Record of Decision and FEIS for Site-Specific Invasive Plant Treatments for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area provide additional cumulative effects discussion across a broader landscape.

There are adjacent private lands with invasive plants that can spread to the Forest. Foreseeable actions include treatment of invasive plants as authorized by the 2008 Record of Decision. The 2008 plan did not identify any potential herbicide treatment areas in or directly adjacent to proposed actions, however some invasive plants have since been discovered, including false brome, which has been treated and will likely be treated annually until the plant has been controlled. The Oregon Department of Agriculture treats populations of Japanese knotweed, spotted and diffuse knapweed, herb Robert, and Canada thistle that are scattered in the Clackamas River Ranger District annually or biennially, depending on the species and population persistence. A number of these populations are located along Highway 224.

Another action that is likely to occur is herbicide treatment of false brome, Scotch broom, and other invasive plants that are known to occur in the project area and have the potential to spread from roadsides into the forest. Herbicide treatment is authorized by the 2008 Record of Decision.

The action alternatives would result in contracts that include provisions to minimize the likelihood of spreading existing species or introducing new invasive species from outside the project area. Practices such as the washing of equipment and the use of certified weed-free straw for erosion control and the use of certified weed-free seed for revegetation have been found to be effective in reducing the introduction, establishment, and spread of unwanted species. Ongoing actions of early detection and rapid response to identify and treat weeds of concern also contribute toward a

landscape where invasive plants are contained to the degree identified in the 2008 Record of Decision.

Since invasive plant spread would be minimized with the implementation of PDCs, and since foreseeable invasive plant treatments would deal with a number of issues, there would be no measurable negative incremental impact and no substantial cumulative effect.

3.12 FUELS AND FIRE HAZARD

This section summarizes the fuels specialist report, which is incorporated by reference and summarized below. The following sections show that the action alternatives comply with direction in the Forest Plan, as amended, and that activity fuels would be managed appropriately to minimize fire hazard while also minimizing effects to resources. Fuel treatments include machine piling, under burning, crushing branches and tree tops, lop and scatter, and mastication. In addition to treating activity fuels, the project would create fuel breaks along part of Road 4610 and along the Forest boundary. Smoke created by burning would be managed to minimize air quality impacts.

3.12.1 Background

Most of the project area has been burned before and the area is predominantly covered with relatively uniform stands of second-growth timber. The story map described at s. 1.1.1 contains interactive maps that show the various historical fires. The more recent 36 Pit Fire demonstrated that the area can and does burn with intensity. However, the crown fire dropped to a low-intensity ground fire when it encountered thinned stands treated within two years prior to the fire. The thinning units reduced the fire behavior and fire spread due to the lack of fuel continuity and limited ladder fuels. The thinning units provided locations for fire-suppression forces to establish firelines.

3.12.2 Direct and Indirect Effects

3.12.2.1 No Action

No treatments would occur to create slash or to alter stands. With no action, the modeled flame lengths would exceed 4 feet in some areas. These flame lengths pose a hazard to suppression resources and increase the likelihood of large fire growth. Increased fire intensity would impact resources and air quality. With no action, there would be no activity fuels to treat.

3.12.2.2 Action Alternatives

The proposed vegetation treatments would compartmentalize the landscape into blocks that are spatially separated and adds fuel breaks along Road 4610 and the Forest boundary. This facilitates fire suppression and reduces associated costs and has the potential to moderate fire behavior by reducing flame lengths to less than 4 feet on treated portions of the landscape and limit the potential for surface fires to transition to crown fires. These treatments would provide suppression forces places to anchor their fire attack. The proposed action would involve 541 acres of burning and fuel break creation while Alternative 2 would have 657 acres. In the short term (1-2 years), there would be increased surface and ground fuels due to logging slash. Once the slash

piles are burned and as the decomposition of fine fuels occurs, fire hazard for this area would be reduced.

3.12.3 Cumulative Effects

In terms of air quality, the cumulative effects of the action alternatives when added to other fuel reduction projects and the impacts of wildfire and of fire-suppression tactics would not be substantial, and the effects would be lower compared to no action.

3.13 CLIMATE CHANGE

This section summarizes the Climate Change Report which is incorporated by reference.

Public comments received suggested a project-specific quantitative carbon analysis. A quantitative carbon analysis was not conducted for this project because it would not likely lead to changes to the proposed action or to the creation of other alternatives that achieve the purpose and need. The Climate Change Report qualitatively addresses aspects of the project that may affect carbon emission or sequestration and how the project may help or hinder the forest's ability to deal with climate change.

3.13.1 Direct and Indirect Effects

3.13.1.1 No Action

With no action, the project area would continue to sequester carbon on site.

3.13.1.2 Action Alternatives

The proposed treatments would result in some carbon emissions and some carbon sequestration. The benefits to forest health and resiliency with the action alternatives would allow stands to adapt to the future climate. The Forest Plan, as amended, does not contain direction related to climate change.

3.13.3 Cumulative Effects

The contribution to cumulative effects on global greenhouse gasses and climate change would be negligible.

3.14 OTHER REQUIRED DISCLOSURES

3.14.1 Heritage Resources

Section 106 of the National Historic Preservation Act of 1966 requires documentation of a determination of whether each undertaking would affect historic properties. The Forest operates under a programmatic agreement between the Oregon State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation for consultation on project determination. Consultation with SHPO was completed for this project.

Surveys have been conducted for this project and are discussed in heritage report number 2018-060605-001. The report found that the project would have no effect on archaeological resources.

Contracts would contain provisions for the protection of sites found during project activities. Based on the proposed protective measures, the project meets the criteria in

the Programmatic Agreement for "Historic Properties Avoided" determination (Stipulation III (B) 2).

This action is consistent with Forest Plan goal to protect important cultural and historic resources.

3.14.2 Consumers, Civil Rights, Minority Groups, Women, and Environmental Justice

Executive Order 12898 directs agencies to identify and address disproportionately high and adverse human health or environmental effects of projects on certain populations. This includes Asian Americans, African Americans, Hispanics, American Indians, low-income populations and subsistence uses. The Civil Rights Act of 1964 prohibits discrimination in program delivery and employment. There are communities with minorities and low-income populations that may be affected by the project. The town of Estacada (the nearest community) is approximately 20 miles away. Even farther away, but potentially affected are the American Indian communities of Warm Springs and Grande Ronde. There are no known areas of religious significance in the area. There are no known special places for minority or low-income communities in the area. Individuals may work, recreate, gather forest products or have other interests in the area. Neither the impacts nor benefits of this project would fall disproportionately on minorities or low-income populations.

No disproportionate impacts to consumers, civil rights, minority groups, and women are expected from this project. Vegetation management and other work would be implemented by contracts with private businesses. Contracting for the project's activities would use approved management direction to protect the rights of these private companies. No adverse civil rights impacts were identified. There would be no meaningful or measurable direct, indirect or cumulative effects to environmental justice or civil rights.

3.14.3 Floodplains and Wetlands

The Clean Water Act of 1977 and subsequent amendments established the basic structure of regulating discharges of pollutants into waters of the United States. The Environmental Protection Agency (EPA) has the authority to implement pollution control programs and to set water quality standards for all contaminants in surface waters. The EPA delegated implementation of the CWA to the states; the State of Oregon recognizes the Forest Service as the Designated Management Agency for meeting CWA requirements on National Forest System lands. The action alternatives are in compliance with the Clean Water Act as described in s. 3.3.

There would be very limited impacts to floodplains or wetlands from this project. Due to the steepness of the topography, small stream size and confined nature of streams in this area, floodplain width is fairly limited. The impacts to wetland and floodplains are discussed in section 3.3. Due to the PDCs and BMPs, which are aimed at minimizing the impacts to wetlands and floodplains, there would be minimal direct and indirect effects. A beaver enhancement project would benefit wetlands at Tumala Meadow.

3.14.4 Wild and Scenic Rivers

The project has no actions in the adjacent Roaring River or Clackamas River wild and scenic river corridors. Actions are proposed near the North Fork Clackamas River which

is listed as an eligible scenic river in the Forest Plan. Compliance is addressed in section 3.8 and the Scenery and Recreation Report.

3.14.5 Air Quality

The Clean Air Act as amended in 1977 addresses the air quality in Wilderness areas. All planned ignitions are conducted according to the Operational Guidance for the Oregon Smoke Management Program (OSMP). The Operational Guidance contains the direction for meeting the terms of the OSMP. The Environmental Protection Agency has approved the OSMP as meeting the requirements of the Clean Air Act, as amended. The OSMP, which is administered by the Oregon State Forester, regulates the amount of forestry related burning that could be done at any one time. To comply with the Clean Air Act, the Forest Service is operating under the Oregon Administrative Rule (OAR) 629-43-043. Actions would be in compliance with the Clean Air Act as described in s. 3.12.

3.14.6 National Forest Management Act

The National Forest Management Act (NFMA) of 1976 requires that the Agency develop land management plans. It also requires the Forest to determine the suitability of a specific land area for timber management and contains other requirements that are built into Forest Plan standards and guidelines. The actions proposed were developed to be in full compliance with NFMA via compliance with the Forest Plan, as amended. This document contains numerous references as to how this project complies with Forest Plan, as amended, and the Silvicultural Prescription in the Analysis File contains a discussion of compliance with NFMA's requirement to identify lands unsuited for management.

3.14.7 Treaty Resources and Reserved Indian Rights

No impacts on American Indian social, economic, or subsistence rights are anticipated. No impacts are anticipated related to the American Indian Religious Freedom Act. The Confederated Tribe of Warm Springs and the Confederated Tribes of Grand Ronde were contacted in reference to this proposal.

3.14.8 Inventoried Roadless Areas, Unroaded and Potential Wilderness Areas

The project area includes an Inventoried Roadless Area but there are no proposed actions in it. There are no other areas that meet Forest Service criteria for Potential Wilderness.

3.14.9 Prime Farmlands, Rangelands, and Forestlands

None of the alternatives would have an adverse impact to the productivity of farmland, rangeland, or forestland. No reductions in long-term productivity are expected. See section 3.6.

3.14.10 Potential or Unusual Expenditures of Energy

There are no proposals that would result in any unusual expenditure of fuel (s. 3.13).

3.14.11 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that are forever lost and cannot be reversed. Irretrievable commitments of resources are considered those that are lost for a period of time and, in time, can be replaced. The use of rock for road surfacing is an irreversible resource commitment; however, rock quarries have sufficient capacity to provide for the long-term needs for road surfacing rock.

3.14.12 Conflicts with Plans, Policies, or Other Jurisdictions

NEPA at 40 CRF 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with . . . other environmental review lands and executive orders."

The actions would not conflict with the plans or policies of other jurisdictions, including the Tribes. It would not conflict with any other policies and regulations or laws, including the Clean Water Act, Clean Air Act, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, or National Historic Preservation Act. Refer to the following sections for discussions regarding these laws.

- Section 3.3 – Clean Water Act
- Section 3.4 and 3.7 – Endangered Species Act
- Section 3.4 - Magnuson-Stevens Fishery Conservation and Management Act, Essential Fish Habitat is discussed in the Fisheries Report at s. 6.1.2 and Table 1.
- Section 3.14.1 – National Historic Preservation Act
- Section 3.12 – Clean Air Act

4.0 Consultation and Coordination

The Forest Service consulted the following federal, state, and local agencies and tribes during the development of this assessment:

4.1 FEDERAL, STATE, AND LOCAL AGENCIES

U.S. Fish and Wildlife Service
National Marine Fisheries Service
Oregon Historic Preservation Office
Portland General Electric
South Fork Water Board
Clackamas River Water
Mt. Scott Water District
Oak Lodge Water Board
City of Gladstone
Bureau of Land Management
City of West Linn
Clackamas River Basin Council
City of Estacada
Oregon Department of Fish and Wildlife
City of Lake Oswego
Clackamas County
City of Oregon City
Environmental Protection Agency

Consultation with the U.S. Fish and Wildlife Service is documented in section 3.7.1.1.

Consultation with the National Marine Fisheries Service is documented in section 3.4.1.

Consultation with the Oregon Historic Preservation Office is documented in section 3.14.1.

4.2 TRIBES

Confederated Tribes of Warm Springs
Confederated Tribes of Grand Ronde

4.3 REFERENCES

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USDA Forest Service. 1988. Final Environmental Impact Statement on Managing Competing and Unwanted Vegetation and the Record of Decision and the Mediated Agreement. Pacific Northwest Region.

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USDA Forest Service. 2005. Record of Decision for Preventing and Managing Invasive Plants, October 11, 2005.

USDA Forest Service. 2008. Record of Decision for Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon, including Forest Plan Amendment #16. February 2008.

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USDA Forest Service and USDI Bureau of Land Management. 1994b. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl; Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest related Species within the Range of the Northern Spotted Owl (Northwest Forest Plan). Portland, Oregon.

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USDA-Forest Service and USDI Bureau of Land Management. 2017. Biological Assessment for Routine Land Management Activities with a Potential to Modify Habitat which are Not Likely to Adversely Affect Federally Listed Species within the Willamette Planning Province of Oregon. September 7, 2017.

USDI Fish and Wildlife Service. 2017. Routine Land Management Activities within the Willamette Planning Province of Oregon with a Potential to Modify Habitat, which are Not Likely to Adversely Affect Federally Listed Species. September 26, 2017.