United States Department of Agriculture
Forest Service

Forest Plans Amendment

Forest Management Direction for Large Diameter Trees in Eastern Oregon

Environmental Assessment-Preliminary

Pacific Northwest Region (R6) Oregon and Washington

August 2020

Photo Credit: Mark Penninger, U.S. Fish & Wildlife, La Grande, OR Field Office

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1.0 INTRODUCTION

1.1 FOREST SERVICE PLANNING FRAMEWORK

National forests and grasslands are required to have a Land and Resource Management Plan (LRMP). Those plans inform the overall management of each unit and all projects on each unit must be in conformance with the associated LRMP. When plan components (desired conditions, goals, standards, and/or guidelines) need to be changed for any reason the planning unit must complete a plan amendment (36 CFR 219). The amendment process is intended to help keep plans current and responsive as conditions change or updated science changes our understanding.

The Eastside Screens were adopted in 1994-95 (see below) and amended the underlying forest plans which were published in either 1989 or 1990, depending on the forest. They consisted of three components for screening proposed timber sales: riparian screen, ecosystem screen, and the wildlife screen. The Inland Native Fish Strategy (INFISH) and Pacific Anadromous Fish Strategy (PACFISH) now operate in place of the riparian screen. Under the ecosystem screen, the Forest Service compares current conditions of a proposed timber sale area with the historical range of variability (HRV). Under the wildlife screen, the Forest Service imposes certain harvesting restrictions according to whether or not the condition of a sale area is within the HRV for late and old structure (LOS) forest[1].

Subsection 2 of the Wildlife Screen's Scenario A stipulates that:

> *Outside of LOS, many types of timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components in stands subject to timber harvest as much as possible, by adhering to the following standards:*
>
> *a) Maintain all remnant late and old seral and/or structural live trees ≥ 21-inch dbh[2] that currently exist within stands proposed for harvest activities.*

The amendment analyzed in this document specifically addresses this portion of subsection two and a portion of subsection four (see Appendix B). These portions are commonly referred to as "the 21" standard." The amendment would not change any other

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[1] Late and Old Structure (LOS) forest is described in the ecosystem standard of the Eastside Screens. No changes are proposed to the ecosystem standard. LOS is described in detail in the vegetation section.

[2] Diameter at breast height is a common forestry term used to express the diameter of the trunk or bole of a standing tree. Tree trunks are measured at the height of an adult's breast which in the U.S. is 4.5 feet above the ground on the highest side of the tree.

plan components in the individual forest plans. All management areas, timber requirements, MIS, and other standards and guidelines remain unchanged.

1.2 History of the Eastside Screens

The Forest Service developed the Eastside Screens in the 1990s in response to concerns about old trees on the eastside of the Cascades. House Speaker Tom Foley (Washington) and Senator Mark Hatfield (Oregon) requested that Agricultural Secretary Edward Madigan form an interagency panel to complete a scientific evaluation of the effects of Forest Service management practices on the sustainability of eastern Oregon and Washington forests. The panel was to address seven key questions defined by Speaker Foley and Senator Hatfield (Everett et al. 1994). The panel produced the Eastside Forests Ecosystem Health Assessment (EFEHA) or the "Everett Report."

EFEHA concluded that there was a loss of large trees and old forests, fragmented landscapes caused by small harvest units, and conditions were ripe for large and severe insect, disease, and wildfire disturbances due to large increases in forested area, density, and shade-tolerant forest cover. The panel did not address social or economic concerns, but acknowledged their importance for ecosystem sustainability and identified the need for more information about social values and expectations for management of eastside forests.

During the same timeframe, Natural Resources Defense Council (NRDC) petitioned the courts to suspend old tree harvest on eastside forests. Regional Forester (RF) John Lowe asked the EFEHA team to develop interim policies that could be applied to vegetation management and timber sale projects. This team developed the Eastside Screens in part to keep existing large and old trees and manage national forests to promote an increase in the number of large and old trees. They recommended replacing it within 12–18 months with more formal landscape evaluations that responded to their key findings. A lower-end size limit of 21 inches was negotiated with the plaintiffs included in the NRDC petition. On June 12, 1995 RF Lowe signed the Decision Notice for the "Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales" (Regional Forester's Forest Plan Amendment #2), which slightly modified the initial screens.

During the last three decades there have been multiple interpretations and guidance documents issued on how to implement the screens. Some guidance documents encouraged forests to complete project specific plan amendments to cut trees over 21 inches while others outlined direction that trees greater than 21 inches could be cut under certain conditions. Due to changing and conflicting guidance national forests have taken different approaches to addressing this issue on the ground. Some national forests in eastern Oregon have completed multiple project specific forest plan amendments that alter the 21-inch standard in some way. Other forests have avoided the harvest of trees over 21-inches to avoid project specific forest plan amendments. Still others have started amendments and not finished; for example, in 2014 the Snow Basin lawsuit led the Wallowa-Whitman National Forest to pull a proposed amendment to the Eastside Screens because the court found that the Forest Service could not use a site-specific amendment to address a forest-wide problem. In total since 2003, there have been 21 amendments to forest plans related to the 21-inch standard. Amendments generally focused on removing young grand fir or white fir in dry ponderosa pine forests but some also addressed removal of lodgepole, Douglas fir, and ponderosa pine. Project level analyses have shown no significant adverse impacts to resources as a result of the amendments and in fact the analyses have demonstrated positive impacts in terms of restoring stand and landscape resilience.

The limitations of the 21-inch standard have become increasingly apparent in recent years as the Forest Service has intensified its focus on restoring forest resistance and resilience to disturbance and as public and agency interest in creating forests better able to withstand and recover from disturbances like drought and wildfire has grown. At the same time, scientific knowledge about frequent-disturbance environments like those in eastern Oregon has grown. The need for new approaches to forest management has become even more urgent given ongoing changes such as an increase in the length of fire season and the area burned by wildfires. Managers often do not have the flexibility to take advantage of opportunities to protect and enhance large and old trees by removing fast-growing shade tolerant species that compete with old pines and larch for resources or to thin fast-growing pine stands to develop more disturbance-resistant conditions. Restoring and adapting forests and reducing mortality of old trees from large disturbances like wildfire, drought, and insect outbreaks requires a more strategic approach than the 21-inch standard allows.

1.3 Public Input

Pre-NEPA engagement activities were conducted to help develop: 1) an ecologically, socially, and politically durable amendment, 2) coordinated and timely communications and engagement, 3) public access to and understanding of the process, and 4) relationship focused involvement.

In order to gather feedback early in the process (pre-NEPA), we reached out to likely interested individuals and organizations during the COVID-19 pandemic. To comply with social distancing policies, we were unable to convene in-person public meetings. Instead, we used a variety of alternative methods to make project information accessible including through phone calls, mailings, posting information to the website, and holding our workshops virtually. The Forest Service hosted three virtual workshops that included 171 participants. The workshops included:

- A **Science Forum** (May 11, 2020) where ten scientists from the PNW Research Station, universities, and non-profit groups shared science related to eastern Oregon forest management and set the stage for a discussion of the science and values underlying the 21-inch standard.

- **An Intergovernmental Technical Workshop** (May 13, 2020) with the **Eastern Oregon Counties Association** and a **Partner Technical Workshop** (May 15, 2020). Both technical workshop formats were identical and included: project background, review of 2012 Planning Rule, brief summary of a rapid science review by the Pacific Northwest Research Station, case study, and small breakout groups led by ID Team members and line officers to gather feedback.

Meeting recordings and all materials from the early engagement events are posted on our project website: https://go.usa.gov/xvV4X

1.4 Purpose and Need for Action

The purpose of this assessment is to analyze a durable, science-based alternative to the 21-inch standard in the Eastside Screens. Adapting the standard to incorporate science and 25 years of learning would enable managers to more effectively restore forestlands in eastern Oregon.

1.5 Need for Change

Scientific research, ongoing monitoring of restoration treatments and natural disturbances, and practical experience implementing the 21-inch standard demonstrate a need to change policy to better conserve large and old trees and to adapt stands to future climate and disturbance regimes. Adapting the 21-inch standard to respond to science findings and experience restoring eastern Oregon forests can better protect old trees and better provide for resilience of forest stands to future climate and disturbance stressors.

Old trees provide critical habitat functions and form the foundation for stands that are resilient to future change because they have persisted through past climatic and disturbance variability (Marcot et al. 2018, Hessburg et al. 2015, Vosick et al. 2007, Bull et al. 1997). Achieving more effective conservation of old trees in eastern Oregon is of critical importance to tribes, recreationists and other forests users, local communities that depend on ecosystem services from national forests, and the general public because of the critical functions they provide and because older trees are in steep decline throughout the American West (Lindenmayer et al. 2012, Lutz et al. 2009, van Mantgem et al. 2009). As discussed in the current conditions discussion below, old trees in eastern Oregon are declining at an alarming rate.

Although the 21-inch standard protects large trees from logging, it does not protect old trees that are smaller than 21 inches. And implementation of the 21-inch standard often prevents restoration treatments from achieving conditions necessary for old trees to persist. Old trees are at elevated risk of mortality when young trees compete with old trees for light and water (Bradford and Bell 2017, Millar and Stephenson 2015, Fettig et al. 2007, Kolb et al. 2007, Waring and Law 2001, Kolb et al. 1998). Competition is particularly acute when trees are large and young because larger trees have greater leaf area and use more resources (Johnston et al. 2019, Gersonde and O’Hara 2005).

Increases in stand basal area since frequent fire was excluded from eastern Oregon forests are largely attributable to growth and establishment of relatively large, fast growing, shade tolerant species like grand fir and Douglas-fir (Johnston 2017, Merschel et al. 2014, Hagmann et al. 2014). Increases in stand basal area have significant reduced drought resistance of old trees (Voelker et al. 2019). Restoring historical competition dynamics characterized by low basal area, low stand density, and a relatively higher proportion of shade intolerant species increases the resistance of stands to drought, insects, and fire disturbance effects associated with a warming climate (e.g., Tepley and Hood 2020, Zhang et al. 2019, Vernon et al. 2018, Sohn et al. 2016). A variety of empirical studies and science syntheses demonstrate that protection of all trees greater than 21 inches prevents restoration of historical conditions and conditions that are likely to maintain old trees into the future (Johnston in review, Lindsay and Johnston 2020, Merschel et al. 2019, Johnston et al. 2018, Johnston 2017, Stine et al. 2014).

Although the 21-inch standard protects large trees from logging, it does not protect large trees from mortality from fire, insects, and drought. Many large trees will be lost to mortality as these disturbance processes become more extensive in the coming decades (Kerns et al. 2018, Littell et al. 2018, Mote and Salathe 2010). Although replacing the 21-inch standard with different conservation policies may result in more large trees being cut, better providing for stand and landscape scale resilience to disturbance has the potential to optimize provision of large trees over time (Spies et al. 2018, Bradford and Bell 2017, Sohn et al. 2016, McDowell and Allen 2015, Millar and Stephenson 2015).

1.6 Goals

The goal of this proposed amendment is synonymous with the purpose and need for the original screens, which is the "…need to maintain the abundance and distribution of old forest structure." The original 1994 EA explains, "The purpose is to preserve those components of the landscape -- old forest abundance, wildlife habitat in late and old structural stages, and riparian areas -- which new information suggests is vitally important to certain species of wildlife and fish and to the overall vegetative structure of the forest."

Given new science and our evolving understanding of landscape ecology, a standard that prohibits logging of all trees larger than or equal to 21 inches diameter at breast height (dbh) is no longer adequate to support landscape restoration and resiliency efforts, nor conserve the remnant old and late seral and/or structural live trees it was meant to protect.

This proposed amendment is narrowly focused on Scenario A of the wildlife standard of the Eastside Screens. This means that in project level application and NEPA analysis, the ecosystem screen is still applied first, and this proposed amendment would only affect project areas where LOS forest is found to be below HRV for one or more biophysical environments.

1.7 Decision to be Made

The Region 6 (Pacific Northwest Region) Regional Forester, Glenn Cassamassa, has designated the Forest Supervisor of the Ochoco National Forest as the Decision Maker for this analysis. When the analysis is completed, he will decide which alternative to select. He will compare each alternative's ability to meet the purpose and need and weigh the effects of each alternative as presented in the environmental analysis.

2 Proposed Action and Alternatives

Through the means described in section 1.3, and through written communications, individuals, groups, organizations and county governments have provided feedback to the interdisciplinary team. Some support the effort in concept, and some are conceptually opposed to it.

The discussions and suggestions made during our early engagement activities helped inform the development of the alternatives and the key issues addressed in this assessment. Eight important themes emerged in our early engagement work: trust and collaboration; monitoring and adaptive management; social and economic issues; diameter limits and species composition; large trees vs. old trees; scale and flexibility issues; climate change and wildfire; and, wildlife, snags and down wood.

- In response to concerns related to trust, collaboration, monitoring, and adaptive management, the alternatives integrate an adaptive management component to ensure accountability through targeted monitoring of impacts to large and old trees. The alternatives also encourage the use of multi-party monitoring to support a meaningful way for citizens to be involved in the monitoring.
- Social concerns about the amendment being driven by economic factors (i.e. to get the cut out) and by concerns about the economic impacts of the Eastside Screens were addressed by using a science-based approach to focus on the ecological need for change and by incorporating a social and economic assessment in the analysis.
- The differences between large old and large young trees are directly addressed in our analysis, and alternatives were developed to enable managers to base decisions on these differences while recognizing both large and old trees as ecologically valuable. Likewise, the concern about diameter limits as it relates to species composition is directly addressed by our range of alternatives. Expected changes in species composition is addressed in our analysis.
- Concerns about scale were addressed in the development of alternatives, and flexibility was addressed directly in the range of alternatives.
- All action alternatives directly address concerns about climate change and wildfire as these alternatives allow for management strategies that increase resilience to future climate and disturbance regimes.
- In response to concerns about wildlife, the amendment retains the original intent of the Eastside Screens to protect and promote LOS for wildlife habitat and incorporates an approach grounded in wildlife science to revise of the snag and green-tree retention portion of the standard.

2.1 Current Management Alternative

Currently, implementation of the Eastside Screens is inconsistent across the region. Scenario A of the wildlife standard requires no net loss of LOS from each biophysical environment. In practice, the interpretation of no net loss of LOS has varied from Forest to Forest and through time. Sub-section 1 of Scenario A stipulates that:

> *Some timber sale activities can occur within LOS stages that are within or above HRV in a manner to maintain or enhance LOS with-in that biophysical environment. It is allowable to manipulate one type of LOS to move stands into the LOS stage that is deficit if this meets historical conditions.*

No restriction on the harvest size of trees is stipulated. In practice many Forests and projects have applied a restriction to the harvest of trees larger than or equal to 21 inches dbh to the management of all LOS.

Subsection 2 of Scenario A stipulates that:

> *Outside of LOS, many types of timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components in stands subject to timber harvest as much as possible, by adhering to the following standards: a) Maintain all remnant late and old seral and/or structural live trees ≥ 21-inch dbh that currently exist within stands proposed for harvest activities …*

This standard has been applied as written across Forests and through time.

Subsection 4 of Scenario A stipulates that:

> *All sale activities (including intermediate and regeneration harvest in both even-age and uneven-age systems, and salvage) will maintain snags and green replacement trees of >21 inches dbh (or whatever is the representative dbh of the overstory layer if it is less than 21 inches), at 100% potential population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current snag models or other documented procedures. NOTE: for Scenario A, the live remnant trees (< 21" dbh) left can be considered for part of the green replacement tree requirement.*

The Current Management Alternative represents continued implementation of the Eastside Screens 21-inch dbh harvest restriction as described above.

2.2 Old Tree and Large Tree Guideline with Adaptive Management (Proposed Action)

The Proposed Action is to replace the 21-inch **standard** with a **guideline** that emphasizes recruitment of old trees and large trees. Old trees are defined as ≥ 150 years of age. Large trees are defined as grand fir, white fir, or Douglas-fir ≥ 30" dbh or trees of any other species ≥ 21 inches dbh. This alternative would also include adaptive management.

The current standard says:

> *Outside of LOS, many types of timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components in stands subject to timber harvest as much as possible, by adhering to the following standards: a) Maintain all remnant late and old seral and/or structural live trees ≥ 21-inch dbh that currently exist within stands proposed for harvest activities …*

The new guideline would say:

> *Outside of LOS, many types of timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components in stands subject to timber harvest as much as possible, by adhering to the following plan components: a) Managers*

should retain and generally emphasize recruitment of old trees and large trees. Management activities should first prioritize old trees for retention and recruitment. If there are no old trees, the largest trees should be retained. Old trees are defined as having visual characteristics that suggest an age ≥ 150 years. Large trees are defined as grand fir, white fir, or Douglas-fir ≥ 30" dbh or trees of any other species ≥ 21 inch dbh. Old and large trees will be identified through best available science. Management activities should consider species composition and spatial arrangement within stands and across the landscape …

Exclusive of the snag and green tree retention change described below, all other standards would be maintained as they currently exist.

The adaptive management approach would include both implementation and effectiveness monitoring. Effectiveness monitoring would focus on answering the following questions:

- How does the mortality level of 1) old trees and 2) all trees differ between managed stands and unmanaged stands?
- How does mortality of old trees differ based on species, biophysical setting, and/or management and disturbance history?
- Does the type of management or the combination of management actions prior to disturbance influence mortality of old trees?

Multi-party site visits would also be encouraged to consider ways to make treatments more effective at preserving and maintaining old and large trees across the landscape.

If restoration treatments prove ineffective at conserving old trees relative to passive management of unmanaged stands, a dbh limit will be re-imposed. The dbh limit that would be imposed would prohibit harvest of grand fir, white fir and Douglas-fir trees ≥ 30 inches and prohibit the harvest of all other tree species ≥ 21 inches. This standard is not suggested specifically by the scientific literature but rather is a recognition of trust issues deeply embedded in management activities involving old trees in the Northwest. The dbh limit would not necessarily be reimposed across the whole landscape but rather by Potential Natural Vegetation groups (PNV) where restoration has proven ineffective based on an analysis conducted every five years by the Pacific Northwest Regional Office. See Vegetation section for a more detailed description of PNV.

See Appendix B for a comparison of plan language for each alternative.

2.3 Old Tree Standard Alternative

This alternative replaces the size prohibition with an age prohibition.

The new standard would say:

Outside of LOS, many types of timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components in stands subject to timber harvest as much as possible, by adhering to the following plan components: a) Trees estimate to be old (> 150 years) shall not be removed. Forests may use best

> *available scientific information to estimate the age of old trees based on physical characteristics. Management activities should retain and emphasize the recruitment of large trees of the appropriate (dependent on the site) species composition and spatial arrangement within stands and across the landscape …*

Exclusive of the snag and green tree retention change described below, all other standards would be maintained as they currently exist.

See Appendix B for a comparison of plan language for each alternative.

2.4 Adaptive Management Alternative

In this alternative, the 21-inch standard would be removed. Management activities would not include a size or age requirement. Exclusive of the snag and green tree retention change described below, all other standards would be maintained as they currently exist, including moving the stand toward the desired condition of LOS.

This alternative would include the same adaptive management approach described in the proposed action.

See Appendix B for a comparison of plan language for each alternative.

2.5 Alternatives Considered but Not Fully Analyzed

Lower diameter limit

Some participants in the public engagement sessions suggested we lower the diameter limit to 16 inches dbh. This alternative would not allow us to reduce competition and associated mortality in old trees across the landscape by removing some young but large shade tolerant trees. Please see need for change section for additional detail.

Basal area alternative

This alternative would have allowed activities to occur within and outside of LOS if harvest activities would increase the basal area-weighted age of stands, and there would be no net loss of LOS. Exceptions would have been permitted by the following process:

- If a forest wants to manage an area in such a way that basal-area weighted age of the stands will not increase, it may do if it uses a collaborative process with a representative range of stakeholders to engage the public and the project is being proposed to:
    - Meet or maintain desired conditions for species composition by removing shade tolerant species in favor of shade-intolerant species,
    - Meet or maintain desired conditions for low density stand conditions in appropriate biophysical settings where removal of smaller trees alone cannot achieve desired conditions,
    - Control or limit the spread of insect or disease infestation, or
    - To favor aspen, cottonwood, whitebark pine, or special plant habitats.
- Projects brought forth through the exception process must include multi-party monitoring.

This alternative was eliminated from detailed analysis because it was difficult for many people to understand and would create the need for the Forest Service and partners to develop entirely new approaches to management. It would also require data that is often not readily accessible at the project level.

All trees over 21 inches that are cut would remain on site

In pre-NEPA public meetings and discussions, an option was suggested that would allow for cutting of trees as needed with all cut trees greater than 21 inches dbh left onsite. This option is currently available to managers without completing a forest plan amendment because the Eastside Screens only apply to subset of management activities, and the 21-inch standard does not apply to this kind of “drop and leave” scenario. Regardless, the drop and leave option is not always feasible or desirable because it could create fuel loads that make forests susceptible to uncharacteristic fire severity. Drop and leave scenarios may also conflict with existing Land and Resource Management Plan (Forest Plan) direction to maintain lower fuel loads post –treatment than created by drop and leave scenarios.

Combined age and diameter limit standard

This alternative would have given managers the ability to choose either age or size in implementing projects. That is, managers would either be required to protect all trees over 21 inches (30 inches for shade tolerant species) or managers would be required to protect all trees over 150 years of age. While similar to the preferred alternative, this option is a standard rather than a guideline. Other alternatives more directly and reliably met the purpose and need in a way that was simpler and easier for managers and interested publics to understand.

2.6 Change Common to All Action Alternatives

Snag and Green Tree Retention Change

Rather than existing language at 4.a.1 of the Eastside Screens, forests would have a choice: Maintain all snags > 20" (or whatever is the representative DBH of the overstory layer if it is less than 20") or complete a snag analysis using the best available science on snag-dependent species ecological requirements as applied through current snag tools, models, or other documented procedures to maintain or increase habitat for a diverse composition of wildlife species.

For green tree retention, forests will retain and recruit large trees of the appropriate species and spatial arrangements to meet LOS objectives and wildlife tree objectives using best available science. Forests are encouraged to use natural decay processes and agents to recruit snags from green trees.

See Appendix B for detailed plan language including guidelines referred to above.

2.7 Compliance with NFMA-Substantive Requirements

When proposing a Forest Plan amendment, the 2012 Planning Rule (36 CFR 219), as amended, requires the responsible official to identify the substantive requirements of the rule that are likely to be directly related to the amendment (36 CFR 219.13(b)(5)). The substantive requirements that are likely to be directly related to the proposed amendment are: 1) 36 CFR 219.8(a)(1)(iv) System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of terrestrial and aquatic ecosystems on the plan area to adapt to change; 2) 36 CFR 219.8(a)(1)(v) Wildland fire and opportunities to restore fire adapted ecosystems; and 3) 219.9(b)(1) The responsible official shall determine whether or not the plan components required by paragraph (a) of this section provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern (SCC) within the plan area. If the responsible official determines that the plan components required in paragraph (a) are insufficient to provide such ecological conditions, then additional species-specific plan components, including standards or guidelines, must be included in the plan to provide such ecological conditions in the plan area.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION AND ALTERNATIVES

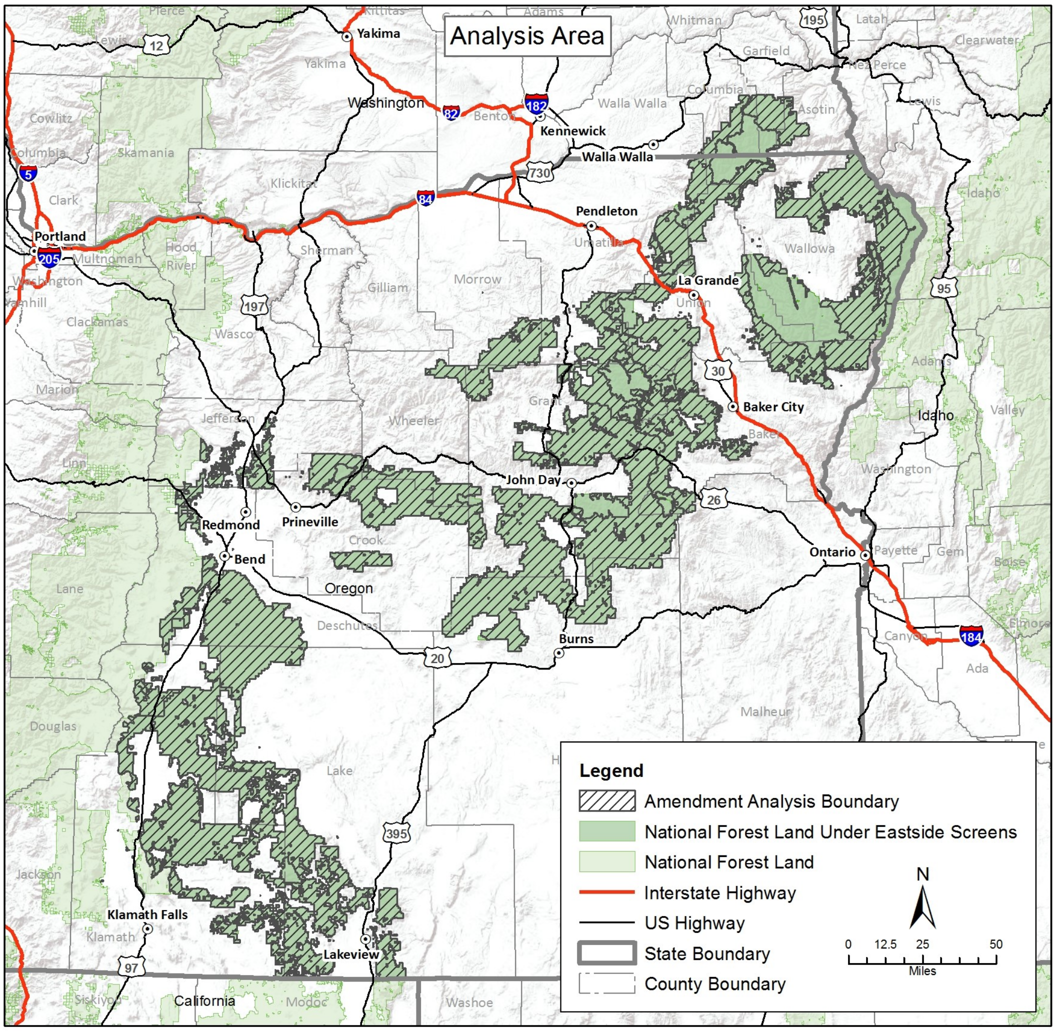

Figure 1. Map of the Analysis Area. Western boundary is defined by the area of the Northwest Forest Plan.

3.1 VEGETATION

3.1.1 Introduction

One of the primary goals of the Eastside Screens was to conserve and promote old forest including the components of “remnant old and late seral and/or structural live trees”. This was originally defined as trees greater than 21 inches in diameter at breast height (dbh).

Although the purpose and need of the Eastside Screens has not changed, new science and our evolving understanding of landscape ecology in eastern Oregon has demonstrated that this original definition is no longer complete or adequate to support landscape restoration and resiliency efforts (Merschel et al. 2019, Johnston et al. 2018, Johnston 2017, Spies et al. 2018, Stine et al. 2014).

The goal of this vegetation analysis is to assess the effects of changing the 21-inch dbh harvest restriction on forest structure, including old trees and large trees, and species composition across the landscape. Describing and measuring the effects on these indicators is done several ways in this analysis, and our analysis methods are described below.

3.1.2 Effects Analysis Scale and Applicability

This is a programmatic rather than site specific analysis so does not authorize any activities on the ground. Project level NEPA analysis will be required to authorize site specific management and evaluate site-specific environmental effects.

This analysis is narrowly focused on Scenario A of the Eastside Screens wildlife standard, i.e. in areas that are considered below and outside of LOS forest as classified during project specific historical range of variability (HRV) analysis. HRV analyses will continue to occur at the forest or project level as part of the Eastside Screens ecosystem standard, which we do not address or propose to change with this analysis.

3.1.3 Analysis Methods

We use two methods to evaluate the effects of each alternative. First, we simulate typical timber harvest in the Forest Vegetation Simulator (FVS) using Forest Inventory and Analysis plot data to help establish a baseline understanding of different alternatives' effects within stands. We also use a qualitative assessment based on the disturbance, succession and management assumptions outlined below. Both methods use a 25-year analysis window. Both quantitative and qualitative assessments are based on best available science, field experience, and professional judgement and expertise.

3.1.3.1 Indicators and Measures

Indicators and measures were developed based on the scientific literature and early public and internal Forest Service engagement. Indicators used in this analysis include: 1) forest species composition, and 2) forest structure, including large and old trees. These terms are defined for this analysis as:

- **Species Composition** – Species composition is described as the absolute (count) or relative proportions (percentage) of species present in a stand. In this analysis we use Society of American Foresters cover types (Eyre 1980) to represent the species compositions across the landscape as calculated by the Forest Inventory and Monitoring protocols (Arner et al. 2001). Cover types are named after the primary dominant tree species within a forest or stand by abundance. The effect analyses of each alternative also use the relative proportion of fire tolerant species as an indicator. Primary species considered fire tolerant are ponderosa pine, western larch and Douglas-fir.

- **Forest Structure** – Stands have been defined and measured based on a combination of tree size and canopy layers and placed into structural categories including: Late Open, Late Closed, Mid Open, Mid Closed, and Early. Late and Old Structure (LOS) forest as described in the Eastside Screens ecosystem standard and includes both Old Forest Multi-Strata/Late Closed and Old Forest Single Strata/Late Open (O' Hara 1996). This analysis has cross walked the original O'Hara descriptions to the measurable structural classifications used here including open and closed LOS. Our structure indicator includes old trees, large trees, and canopy cover. We assess old trees and large separately as well.

- **Large Trees** – Individual trees that are 21 inches diameter at breast height (dbh) or larger. This is based on the pre-existing criteria within the Eastside Screens wildlife standard.

- **Old Trees** – Old trees exhibit morphological characteristics that develop through age and survival through natural processes and disturbances. These characteristics can include deep fissured bark, lack of visible knots, mature epicormic branches, a significant proportion of heartwood, and/or complex crowns (Franklin et al. 2013, Henjum et al. 1994). For this analysis we use 150 years and older to define old trees (Henjum et al. 1994, Van Pelt 2008, Hessburg et al. 2020). The Eastside Forests Scientific Society Panel (1994) defined late-successional and old-growth forests as more than 150 years old or greater than 21 inches in diameter.

3.1.3.1.1 Forest Species Composition Indicator

Tree species can be categorized as being tolerant of various disturbances like fire, meaning they are resistant to specific impacts based on individual physiological characteristics. The term 'shade tolerance' is also used to describe how various tree species respond to limitations on sunlight used for growth (Powell 2014a, b, Hessburg et al. 2020). Species that are fire tolerant, like ponderosa pine, are generally not tolerant of light limited growing conditions, so are referred to as shade intolerant. Conversely, species that are intolerant of fire are generally shade tolerant and are capable of growing under the canopy of shade intolerant species and competing with them for water and other resources. We use fire tolerant species (rather than shade intolerant) as our indicator and use this term to refer to species that grow best in open stands.

Across eastern Oregon basal area of fire intolerant species, like grand fir and white fir, is increasing (Johnston 2017, Hagmann et al. 2014, Merschel et al. 2014), creating dense forests less resistant to the effects of fire and other disturbances (i.e. more vulnerable to mortality) (Hessburg et al. 2020, Tepley and Hood 2020, Voelker et al. 2019). This analysis also addresses species that are resistant to disturbances other than fire (e.g. insects, disease, drought, changing water tables, etc.), which we refer to as disturbance resistant. The desired trajectory for forest species composition in both dry and moist forest is for increases in biophysically appropriate fire tolerant species.

3.1.3.1.2 Forest Structure Indicator

Our structure indicator includes measures of tree size and canopy cover relative to site potential and natural disturbance regimes. For this analysis, we assess old and large trees separately. In order to measure forest structure for this analysis, we cross walked the forest structures described by O'Hara (1996) to more measurable vegetation-canopy classes. The rule set applied for defining forest structure (DeMeo et al. 2020) has evolved from the history of Region 6 efforts to define forest structure at the landscape scale for planning purposes, including the Northwest Forest Plan of 1994, the 1996 Interim Old Growth Standards (USDA Forest Service 1996) and the 2004 Regional Vegetation Mapping Standards (USDA Forest Service 2004). The 2004 Regional standard diameter class definitions were heavily influenced by (Johnson and O'Neil 2001). For this analysis the classic "5 Box Model" of FRCC (Barrett et al. 2010) is used. The methodology for creating the structural class layer involves two major steps, beginning with definition of tree size classes associated with different potential vegetation types (PVTs). A lookup table is then used to relate tree size class, canopy cover, and biophysical setting to a final structural class.

More LOS forest is desired under Scenario A of the wildlife standard. More open forest structure is desired both in LOS forest and mid seral forest.

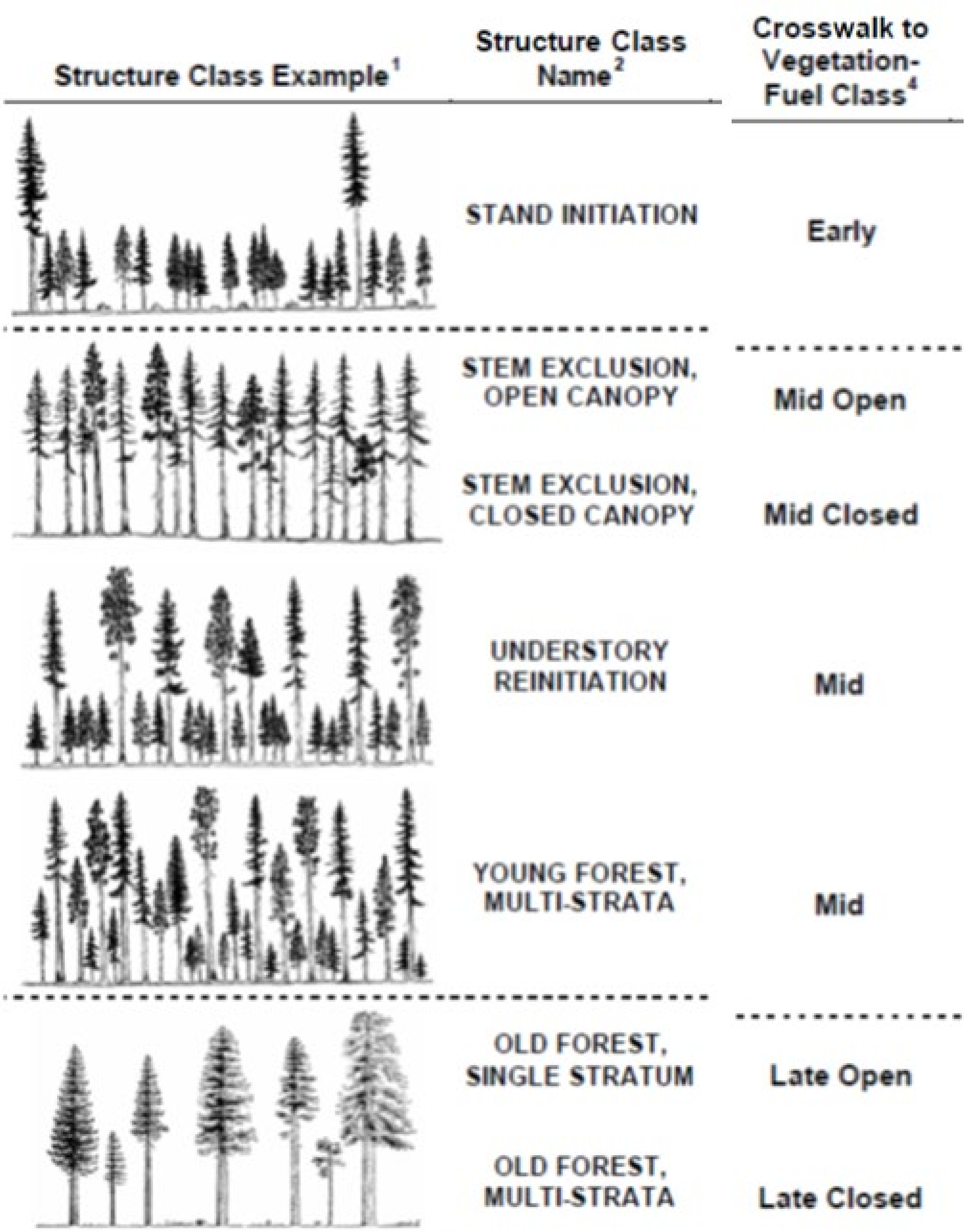

Figure 2. Forest structural class graphic example comparing eastside screen structural class names (O'Hara et al. 1996) to the vegetation-fuel classic "five box" model of Fire Regime Condition Class (Barrett et al. 2010) including early, mid-seral closed, mid-seral open, late seral open, and late seral closed seral stages. Old Forest Single Structure (Late Open) and Old Forest Multi Strata (Late Closed) are consider Late and Old Structure (LOS) forest under the Eastside Screens ecosystem standard. The ecosystem standard then informs the wildlife standard scenario (A: below HRV and B: within or above HRV) and application of the 21-inch dbh harvest limit.

3.1.3.1.3 Large and Old Trees Indicators

As defined above, old trees are at least 150 years of age. Age was estimated within Forest Inventory and Analysis (FIA) plots, a systematic sampling effort of forest conditions across the country (see FIA description for more detail). Old trees play a valuable role in forests by maintaining a legacy of species genetics and providing ecosystem value through long-lived structure and demonstrated resistance to disturbance (Franklin and Johnson 2018, Marcot et al. 2018, Hessburg et al. 2016, Agee and Skinner 2005).

Maintaining or increasing the abundance of large trees, particularly where old trees may be lacking, can be an important element of providing ecological function. While some trees may be both old and large, not all old trees are large, and not all large trees are old (Van Pelt 2008, Hagmann et al. 2018, Johnston et al. 2018, Merschel et al. 2019).

The Eastside Forests Scientific Society Panel (Everett et al. 1994) documents the lack of old forest across the landscape and its importance for ecological function and wildlife habitat. While it's been over 25 years since the Panel's report, old trees naturally take a long time to grow. Trees have gotten larger across the landscape, but old trees are still lacking compared to historic levels. Large trees can substitute for some of the ecological function in the short-term. The desired trajectory for large and old trees is an increase in both across the landscape where these elements are currently lacking. FIA data show that large trees are already increasing across the landscape, but old trees are declining.

3.1.3.2 Landscape Stratification

For our analysis, we stratify the analysis area into dry and moist forest based on Potential Natural Vegetation (PNV) zones. Dry forest consists of ponderosa pine, Douglas-fir, and pinyon juniper PNVs. Moist forest includes white fir and grand fir PNVs. Wet/cold/other forest vegetation zones include other PNV zones such as mountain hemlock, lodgepole, hardwood, subalpine fir, and parklands and shrublands (Table 1).

Table 1. Summary of Vegetation Indicators, landscape stratification and correlated potential vegetation zones.

Landscape Stratification	Potential Natural Vegetation Zones
Dry forest	Ponderosa pine Douglas-fir Pinyon juniper
Moist forest	Grand fir White fir
Wet/ cold/ other	Shrub Lodgepole Hardwood Red fir Mountain hemlock Subalpine fir Parkland

3.1.3.3 FIA Data

The Forest Inventory and Analysis (FIA) data that were used in this report are part of a nationally consistent network of forest inventory plots that are located on forested lands of all ownerships (www.fia.fs.fed.us). The FIA plots were located systemically to allow for landscape-scale inference. On federal lands there is approximately 1 plot per 6,000 acres. On Forest Service lands in this analysis area, additional plots are maintained which increases the plot density to approximately 1 plot per 2,000 acres. The FIA plots were created with a systematic sample that allows for landscape-scale inference. Any particular plot in the FIA dataset is sampled every 10 years.

The FIA data used for this analysis area are composed of the plots that have been visited twice and represent changes across the past 20 years (2001 – 2017). The data are accessible in the FIADB 8.0 Phase 2 and were summarized with the assistance of the ecologists and biometricians within the Forest Inventory and Analysis group. These data were used to describe the existing conditions as well as trends and change over time. In addition, the plot level data that met a minimum area threshold (0.25 acres) were also used to populate the Forest Service's Forest Vegetation Simulator (see below) in order to estimate stand level and landscape level effects of the alternatives.

3.1.3.4 Forest Vegetation Simulator Analysis

Forest Vegetation Simulator (FVS) modeling was conducted to complement and support the analysis. The purpose of the FVS simulations is not to mimic all potential alternative treatments, effects of those treatments, or all disturbances and succession dynamics. That type of analysis is deferred to project-level analysis. The purpose of FVS modeling is to describe: 1) the range of different outcomes between the alternatives across the landscape, 2) limitations that may make management more or less constrained in applying the alternatives, and 3) how the alternatives could accomplish the desired objective(s) of promoting old forest characteristics (large trees, old trees, or fire tolerant species compositions) with stand level application of one generalized silviculture prescription. We used a prescription focused primarily on density reduction, which is a common landscape and stand level objective in eastern Oregon restoration projects.

The Forest Vegetation Simulator (FVS) is an individual tree, distance independent, forest growth and yield model (Dixon 2015). FVS is useful for simulating growth and yield with and without simulated prescriptions of forest conditions based on site information. FVS provides a modeling framework to support decision making based on expert knowledge of forest planning and implementation and is consistently used by the Forest Service for vegetation project planning and analysis (Keyser 2019, Keyser and Dixon 2019).

We applied a typical prescription designed to increase growing space for trees that remain on site, decrease competition and ecological stress (limited availability of water or light), and favor fire tolerant species. Because we used thousands of plots across a varied landscape, we did not tailor our prescriptions to individual sites, other than using a relative density residual target (percent maximum Stand Density Index). While tailored prescriptions are important at the project scale, for a programmatic analysis looking at the general direction of change and differences between alternatives it is not needed. The

FVS analysis assumed that growing conditions, tree physiology, and silvicultural rules would not change during the 25-year analysis window.

For our analysis, when the stand density index (SDI) exceeded 55% of the maximum SDI, we modeled a forest thinning starting with the smallest size classes and increasing in the size of trees removed until the SDI of the forest remaining reached 30% of maximum. However, in the Adaptive Management Alternative, we thinned across age and size classes with less emphasis on removing the smallest trees in order to more fully mimic the potential application of uneven aged management that would be possible without an age or size standard. In all modeling scenarios, fire tolerant species were preferred for retention, meaning that a fire tolerant species would need to be significantly smaller (5-10") before it would be removed instead of a fire intolerant species.

The FVS modeling was carried out consistent with the following assumptions for all alternatives (except where noted):

- Any stand with 2,000 bd/ft/acre of merchantable volume that exceeds 55% of maximum stand density index (SDI) for the site would be reduced to a condition as close to 30% maximum SDI as possible given constraints unique to each alternative.
- Each simulation had constraints consistent with the alternatives:
    - Current Management: No removal of 21-inch dbh and larger trees.
    - Old and Large Tree Guideline: No removal of trees older than 250 years.
    - Old Tree Standard: No removal of trees older than 150 years.
    - Adaptive Management: No age or size restrictions.
- Any stand could be treated at any (or all) of three possible points in time, 2020, 2030, and 2040.
- Effects were assessed in 2045.
- None of the scenarios simulated understory regeneration or changes in climate. Changes in climate (e.g. longer fire seasons and increased drought stress) were considered in the qualitative effects.
- Tracking the age of individual trees is not possible in FVS so modeling reports effects on trees >150yrs in age at the time of plot sampling (2001 – 2017). It is expected that additional trees that were between 106 – 122 years of age at the beginning of the 25-year analysis window would provide more ‘old’ trees in 2045.
- Simulations did not incorporate management constraints associated with planning, capacity, operational feasibility, or cost of treatments.

3.1.4 Assumptions

The following assumptions guided our analysis. The assumptions cover: disturbance, forest succession (how forests grow over the next 25 years), and management actions. Current management trends guide assumptions around the methods and extent of future management.

3.1.4.1 Disturbance Assumptions: All Alternatives

Disturbances in eastern Oregon landscapes help maintain ecosystem function and promote small and large-scale change in vegetation and processes. Eastern Oregon landscapes have frequent disturbances like wildfire and insect outbreaks which result in dynamic landscape characteristics. Forest structures and species compositions change through time in response to disturbances, but the hallmarks of the ecosystem survive in the form of legacy trees that influence subsequent stand development (Marcot 2018, Hessburg 2016, Belote et al. 2015). The complex interactions of succession and disturbance result in vegetation that shifts in location, quantity, and maturation, a characteristic of frequent-disturbance landscapes necessary for sustainable ecosystem function (Johnston et al. 2016, Peterson 2002, Hemstrom 2001, Spies and Turner 1999).

Climate change will increase the extent of disturbance including fire, insects, disease, and drought. Fires will increase in size, and potentially severity (i.e. mortality) (Kolden et al. 2015b, Hamilton et al. 2016, Westerling 2016, Kerns et al. 2018, Parks et al. 2018). Large-scale insect and disease outbreaks and mortality will likely increase, especially where trees are already stressed for resources (Kerns et al. 2018, Irwin et al. 2018, Pureswaran 2018, Littell et al. 2018, Mote and Salathe 2010). In addition to direct climate impacts such as moisture availability, warmer temperatures and longer fire seasons, the associated interactions between abiotic environmental stressors and biotic processes are expected to have compounding effects into the future (Fettig et al. 2019, vanMantgem et al. 2013, Sturrock et al. 2011, Hankin et al. 2019, Kemp et al. 2019, Korb et al. 2019).

3.1.4.2 Forest Succession Assumptions: All Alternatives

Species composition will continue to shift toward fire intolerant species like grand fir and white fir. Less fire tolerant trees like white fir and grand fir will be the most abundant young trees as they can flourish in shady understories in the absence of periodic fire. Large fires with uncharacteristically large patch sizes will favor species with light windborne seeds that are capable of reseeding areas much farther away from reproducing survivors instead of the fire adapted species with heavy seeds (e.g. ponderosa pine) which do not travel far from the reproducing individual (Kemp et al. 2016, Westerling 2016, Owen et al. 2017, Coop et al. 2019, Downing et al. 2019, Hessburg et al. 2019). The increasing representation of these fire intolerant trees in dry and moist forest landscapes creates a feedback loop that perpetuates conditions more conducive to severe large-scale disturbances with increased risk of a future altered or unique vegetation conditions (Walker et al. 2018, Davis et al. 2019).

The current trend toward closed, dense forest structure will continue. Relatively closed, mid-aged (50-150 years) stands are the most abundant forest on the landscape due to a combination of fire history and past harvest (Johnston 2017, Hagmann et al. 2014, Merschel et al. 2014, Quigley and Arbelbide 1997, Haynes et al. 1996, Quigley et al. 1996). Repetitive cycles of fire (and some other disturbances) that would have historically created open forests by reducing density are not occurring at a rate that will substantially alter this trend. Furthermore, rates of mechanical treatment that open forest and reduce density are not occurring and are not projected to occur at rates that outpace current regeneration and succession (Haugo et al. 2015).

Growth of shade tolerant trees will continue to outpace growth of other species. Increasingly, large trees across the landscape will be comprised of less fire tolerant species because of their current abundance (Johnston et al. 2017, Johnson 2017). Large trees of fire tolerant species like ponderosa pine and western larch will experience increasing stress from competition, insects and disease (Voelker et al. 2019, Bottero et al 2017). Shade tolerant trees are also able to grow more quickly than shade intolerant trees when site conditions are equally favorable for both categories (Johnson et al. 2019).

Trees will become increasingly vulnerable to mortality. Tree mortality will be driven by compounding stressors including inter-tree competition, insects and disease, and climate change and past management including fire exclusion and landscape scale alteration of structure (Fettig et al. 2019, McMahon et al. 2019, Anderegg et al. 2015, Battles et al. 2008, Raffa et al. 2008).

3.1.4.3 Management Assumptions: All Alternatives

Current management trends will continue at a similar rate as observed over the past decade. This includes commercial thinning (Figure 3) and timber harvest levels (Figure 4). Similar silvicultural treatments that have been implemented over the past decade will continue. This has been about 34,000 acres of commercial treatment per year for the past decade in the analysis area. FVS simulations were not limited by management constraints other than forest plan management direction. This allowed us to model an average of 100,000 acres of treatment per year, which is much higher than is assumed from recent management trends. Restoration treatment priorities will continue to emphasize restoring fire adapted landscapes under the framework of shared stewardship and cross boundary collaboration.

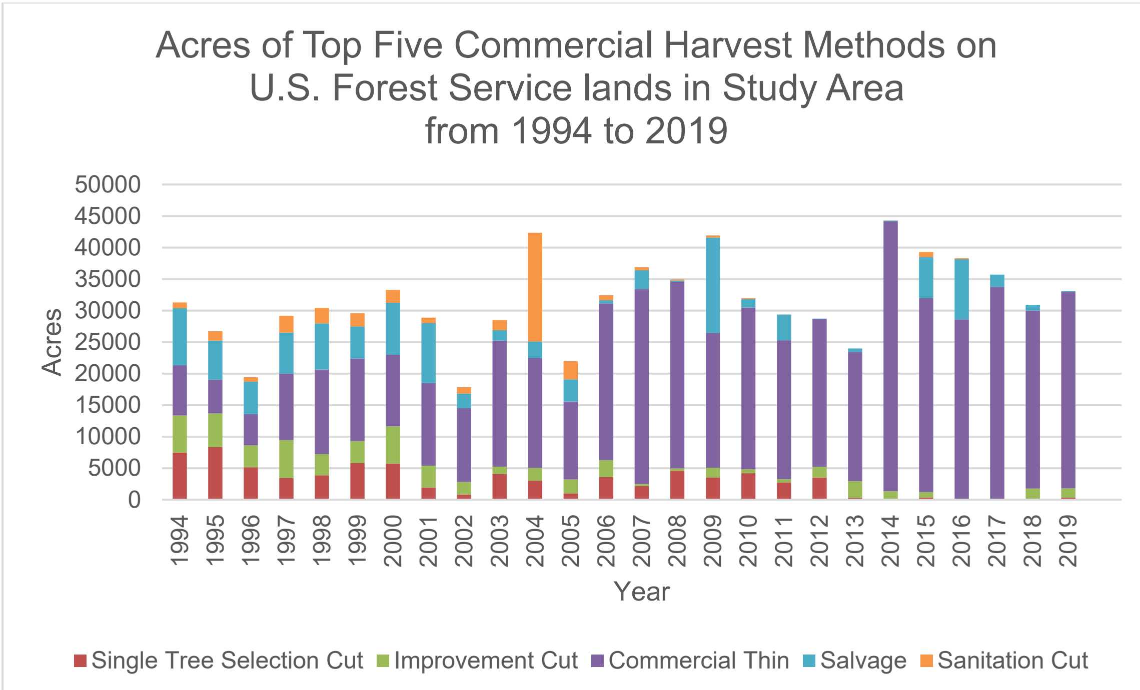

Figure 3. Acres of harvest by type within the analysis area since 1994 to 2019. Commercial thinning dominates harvest methods in eastern Oregon.

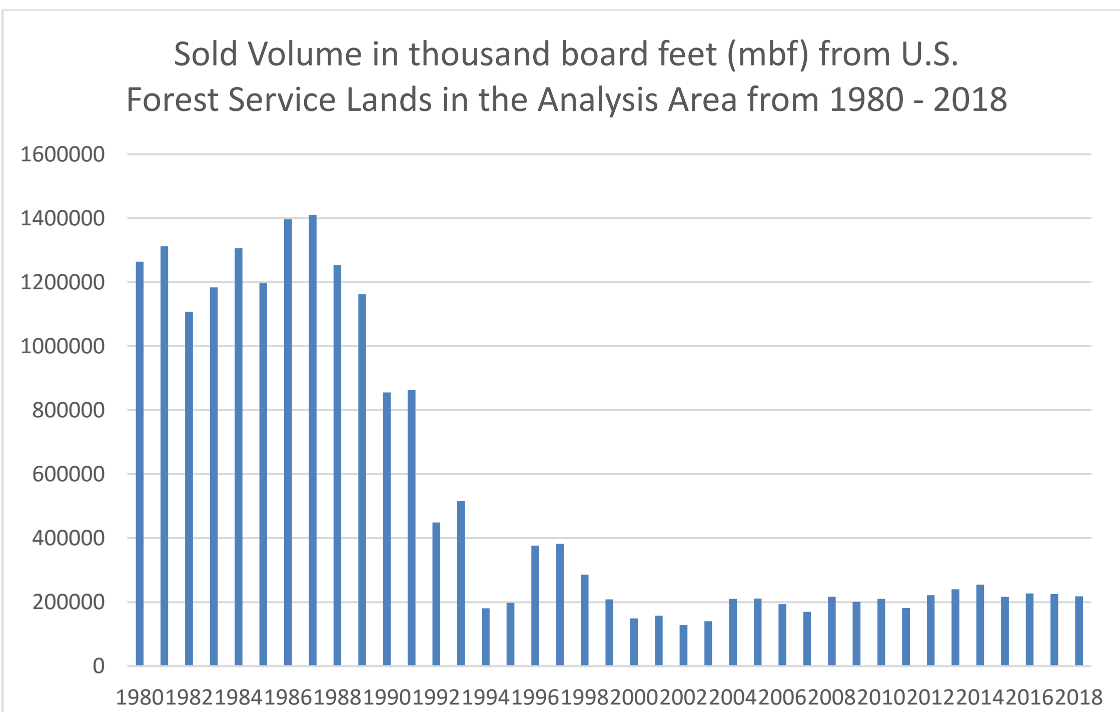

Figure 4. Timber volume sold from Forest Service lands within the analysis area from 1980 to 2018. Average timber harvest levels over the last 10 years are assumed to continue with an approximate average harvest of 200 million board feet per year.

Wildfire will continue to be suppressed at current rates (about 98%). We assume that fire seasons will become longer and extreme weather conditions will become more frequent (Hessburg et al. 2020, Keyser and Westerling 2019, Littell et al. 2009, Westerling et al. 2003). We assume that the vulnerability of eastern Oregon forests due to fire exclusion and past use has created homogenous forest conditions consisting of dense forests, less fire tolerant species, and reduced variability in vertical and horizontal canopy structure which creates uncharacteristic potential for fires with higher mortality levels in many areas throughout the landscape (Littell et al. 2018, Mote and Salath 2010). We assume that the successful suppression of fires during moderate fire weather conditions reduces the potential positive benefits of fires on the landscape (Davis et al. 2019), such as a reduction in surface fuels and ladder fuels, which creates landscape heterogeneity, and promotes fire tolerant species composition (Parks et al. 2014, North et al. 2015, North et al. 2012).

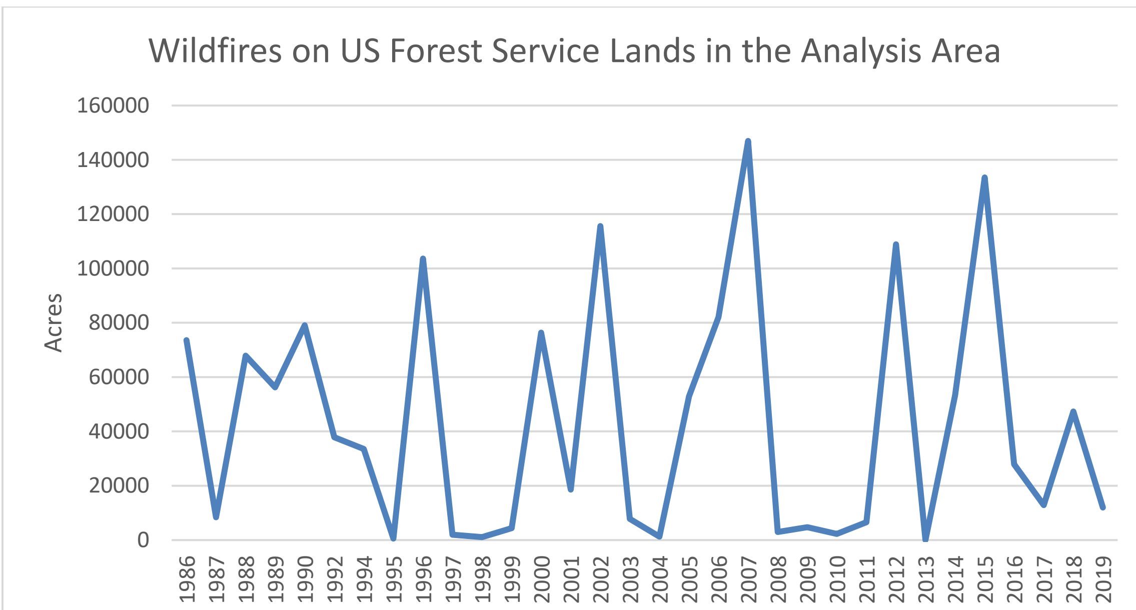

Figure 5. Acres of wildfire within the analysis area since 1986 to 2019. Years are highly variable, but area affected by wildfire is an average of about 60,000 acres per year.

Stand level silvicultural and prescribed fire treatments will be consistent with the Eastside Screens goal of maintaining the abundance and distribution of LOS forest. Management activities will preserve those components of the landscape and aim to cultivate old and large trees in a manner that also creates ecologically appropriate LOS forest and wildlife habitat.

The area affected by timber harvest under all alternatives will remain stable while the prescriptions within treated stands will likely change to some extent. This proposed amendment would not expand the area available for timber harvest because harvest levels are more influenced by factors including road systems, logging systems, capacity, budget and individual forest plan direction.

3.1.4.4 Additional Management Assumptions

Under the Old Tree Standard Alternative, we assume that some old trees will be cut and some trees younger than 150 will be retained because implementation of the standard relies on visual characteristics rather than direct measurement of age. The harvest of some old trees and retention of some younger trees would be negligible at both the project and landscape scale.

Under the Current Management Alternative, we assume there will be no change in the common practice of forests applying sub-part 2(a) to subpart 1 of Scenario A of the wildlife standard. This means that when projects are under Scenario A of the wildlife standard, trees equal to or greater than 21 inches dbh would not be harvested.

Under all action alternatives, we assume that subpart 1 of Scenario A is not interpreted as having a 21-inch dbh tree harvest prohibition as long as the intent of the ecosystem standard and Scenario A wildlife standard are met including not net loss of LOS from respective biophysical environments. When LOS (single- or multi-strata) is within or above HRV for a biophysical setting, timber sale activities that accomplish either 1) the maintenance or improvement of LOS conditions or 2) the manipulation of multi-strata LOS to single strata LOS consistent with the historical ranges of variation is acceptable as long as there is no net loss of LOS.

3.1.5 Affected Environment

3.1.5.1 Species Composition

Species composition of forests in eastern Oregon, including the dynamic interactions between species composition and forest structure, is integral to managing for landscape resilience to disturbance (Hessburg et al. 2013, Hessburg et al. 2016, Johnston 2017, Johnston et al. 2018, Hessburg et al. 2019). In this analysis area, conifer species can generally be divided into two major groups: **fire tolerant**/shade intolerant or **less fire tolerant** /shade tolerant. Trees fall into these groups based on tolerances to environmental factors like disturbance, light, and water limitations. Fire tolerant species are those species that tend to regenerate best under open conditions and have physiological characteristics, such as thick bark, that increase the likelihood the tree will survive low to moderate severity wildfire. In this analysis area ponderosa pine and western larch are considered fire tolerant species. Species that are more shade tolerant than ponderosa pine and western larch can regenerate in the understory of other trees. Grand fir and white fir are more shade tolerant and less resistant to fire in this analysis area. Douglas-fir, although a fire tolerant species, is less fire tolerant than ponderosa pine and western larch (Keane et al. 1990).

FIA data and empirical research show that grand fir/white fir have become more dominant cover types across the landscape, with negative consequences for stand and landscape resilience (Hagmann et al. 2014, Merschel et al. 2014, Johnston 2017, Johnston et al. 2018). Grand fir and white fir cover types are increasing at a faster rate than other cover types across the landscape as a whole. In addition, non-forested conditions (less than 10% tree cover) have increased by 33%, due mostly to fire though these non-forested conditions are often transitory.

Shifting species composition and the exclusion of wildfire has resulted in forests with considerably higher densities and different structure compared with historical forests (Johnston et al. 2018, Hagmann et al. 2014, Merschel et al. 2014, Johnson et al. 1994). In addition, grand fir and white fir often make up the bulk of the youngest trees, setting stands on a trajectory at times maladapted to the biophysical environment.

Shifting species composition affects a wide range of ecosystem functions. The same basal area of grand fir or white fir uses more water than shade intolerant species like ponderosa pine (Johnston et al. 2019, Gersonde and O'Hara 2005). Moreover, ponderosa pine are more drought tolerant than shade tolerant species (Lopushinsky and Klock 1974). Not surprisingly then, the shift in species composition and associated increase in stand basal area over the last century has reduced drought resistance in eastern Oregon (Voelker et al. 2019). Drought stress can be compounded by additional disturbances. For example, vanMantgem et al. (2013) found higher mortality rates in drought-stressed trees following wildfire.

Species composition is also critical when considering disturbances such as insects and disease. Species composition, in concert with forest density and structure, is a key driver of forest mortality from insects and disease. Species like Douglas-fir, grand fir and white fir have moved into areas where their densities were historically lower in predominately ponderosa pine systems (Hagmann et al. 2013, Heyerdahl et al. 2019a). FIA data also show that disturbance impacts species differently. For example, the mortality rate of ponderosa pine over the last 10 years was 6%, with 59% of mortality attributed to insects and disease. Grand fir and white fir had a mortality rate of 11%, with 68% of that mortality attributed to insects and disease.

The combined effect of increased density and altered species composition will increasingly push mixed conifer forests across a threshold that makes them less resistant to drought and less resilient to bark beetle outbreaks and wildfire (Millar and Stephenson 2015, Fettig et al. 2007).

Desired Trajectory

Species composition is an important basis for individual tree, stand, and landscape level resistance and resilience of the forest. For dry and moist forests, the desired path is toward forests with a relatively greater proportion of fire tolerant species.

3.1.5.2 Forest Structure

For all six national forests, late and old structure (LOS) has increased since 1995. This is an absolute increase, with most of the LOS gain in closed canopy forest. Open canopy forest has also increased since 1995. Closed LOS has increased more than open LOS primarily because of ingrowth (regeneration) and growth of trees into larger size classes over time. This growth has also made forests more dense. Overall the increase in closed canopy forests indicates a departure from historical conditions across much of the analysis area, as documented in other assessments across eastern Oregon (DeMeo et al. 2018, Haugo et al. 2015, Johnson et al. 1994).

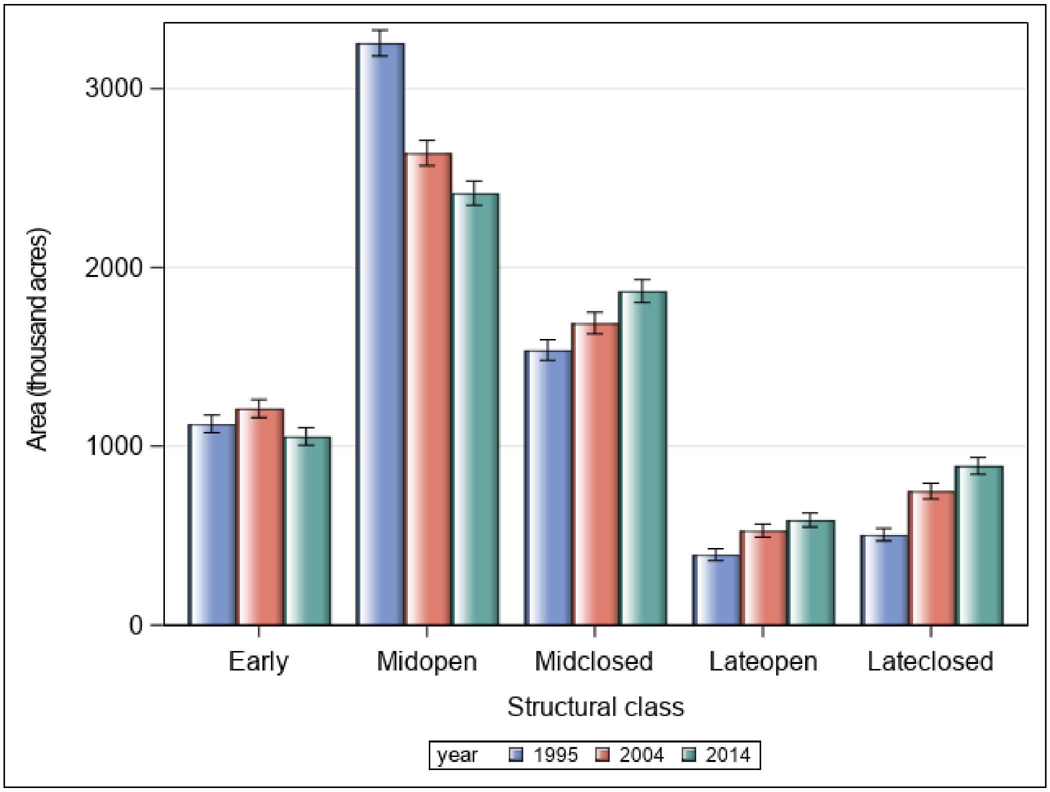

Figure 6. Forest structural classes across the analysis area in three time periods: 1995, 2004, and 2014 for all forest types within the analysis area. All closed structures (mid and late closed forest) have increased since 1995. Mid open forest has decreased through time while late open has increased. Early seral forest has remained relatively stable or is slightly decreasing. Source: Forest Inventory and Analysis data classified using methods outlined in DeMeo et al. (2020).

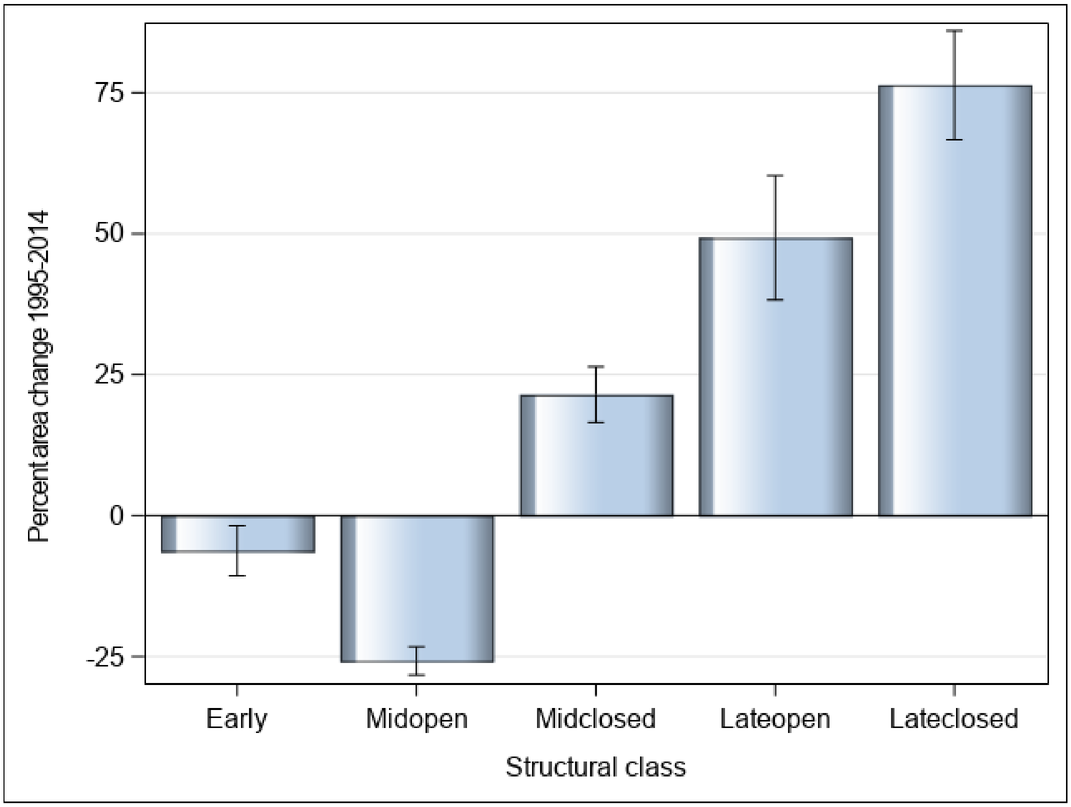

Figure 7. Percent change in structural classes across the analysis area between 1995 and 2014 for all forest types within the analysis area. All closed structures (mid and late closed forest) have increased since 1995. Late open structures increased (about 50%) while mid open structure have decreased (about 25%) through time. Early seral forest has remained stable or slightly decreasing. Source: Forest Inventory and Analysis data classified using methods outlined in DeMeo et al. (2020).

In dry forest, changes in structural class are slightly different than for the landscape as a whole. There is a greater percent increase in dry forest for LOS forest including both late open and late closed forest than compared with moist forest. The biggest difference is that in dry forest late closed forest has increased about 125% whereas in moist forest it has increased just over 50%. One reason for this difference could be that in dry forest, the definition of closed canopy can be lower than in moist sites because the low natural productivity of dry sites.

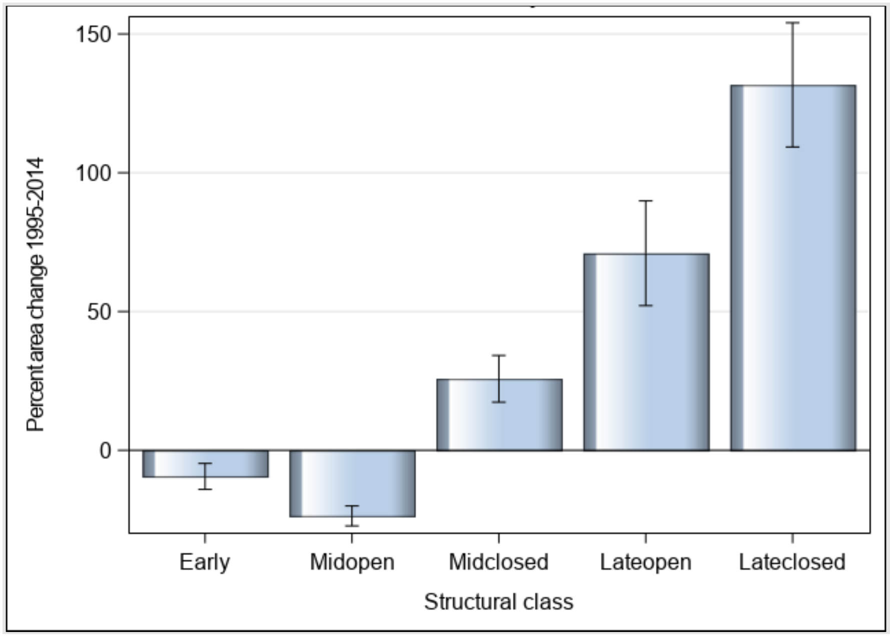

Figure 8. Dry Forest percent change in structural classes across the analysis area between 1995 and 2014 within the analysis area. All closed structures (mid and late closed forest) have increased since 1995 with late closed increasing about 125%. Late open structures increased (about 60%) while mid open structure have decreased slightly. Early seral forest has remained stable or is slightly decreasing. Source: Forest Inventory and Analysis data classified using methods outlined in DeMeo et al (2020).

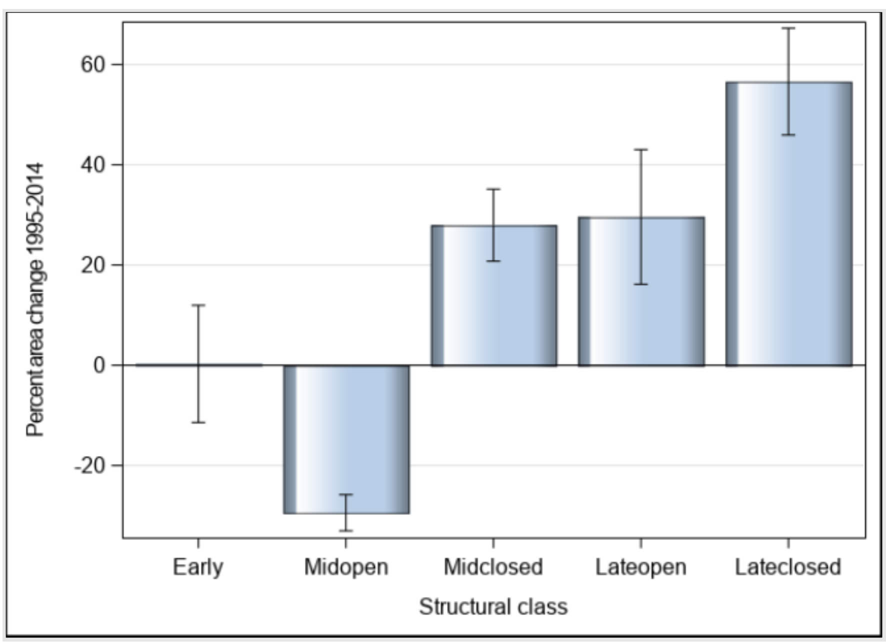

Figure 9. Moist Forest percent change in structural classes across the analysis area between 1995 and 2014 within the analysis area. All closed structures (mid and late closed forest) have increased since 1995 with late closed increasing just under 60%. Late open structures increased (about 50%) while mid open structure have decreased about 25%. Early seral forest has remained stable. Source: Forest Inventory and Analysis data classified using methods outlined in DeMeo et al. (2020).

Desired Trajectory

The Eastside Screens intended to maintain or increase LOS forest until it was within historical levels and that no net loss of LOS from a particular biophysical environment should occur. For this analysis, if an alternative's effects are to maintain or increase the abundance of ecologically appropriate LOS forest, that alternative would be moving toward eastside screen goals. The increased amount of open LOS forest in both the dry and moist forest groups is an indicator that we are moving toward eastside screen goals. Historically frequent fire kept the canopy of both dry and moist forests open in various sized patches across the landscape. Openings create heterogeneity that can help limit the size and spread of wildfire, reduce competition, and create openings in the forest canopy needed for fire tolerant species to regenerate (Churchill et al. 2013, Larson and Churchill 2012).

3.1.5.3 Old Trees

Old trees are declining across the eastern Oregon landscape. Trees older than 150 years in age have decreased by approximately 8% between 2001 and 2017. Old trees have decreased in the project area by 5% over the last decade alone.

Old trees in all but two cover types[3] have decreased by 10 to 100 percent of their original inventoried area since 2001. For example, area of old ponderosa pine has transitioned across nearly 24,000 acres (~11%) to another species combination or to non-forested conditions. This condition may be dominated by herbaceous plants such as grasses or shrubs, or it may be more of a woodland.

Old Douglas-fir and western larch trees have decreased by 14 % and 29%, respectively. On the other hand, old grand/white fir and western juniper trees have increased by 5% and 8%, respectively. Approximately 8,900 acres of old trees dominated by hardwood cover type has also disappeared. Across all age classes, transitions of forested to non-forested conditions represents the biggest proportion of change, representing a 34% increase.

3.1.5.4 Large Trees

In the past decade fire has contributed more to the loss of large trees and old trees than mechanical treatments. Increased density and observed shifts in species compositions have likely made fire more harmful to the large trees on the landscape through the development of ladder fuels and by creating more competition for resources which makes individuals more susceptible to the primary and secondary effects of fire (Fettig et al. 2019, Stephens et al. 2018, vanMantgem et al. 2013). Of total large tree mortality, 63%

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[3] Cover types describe naturally occurring species combinations and are named after the predominant species that are present on the site (Eyre 1980). Cover types have inherent processes associated with them and changes in cover types imply a change in ecosystem function.

was caused by insects and disease, 24% by fire, and the remaining 13% by other disturbances like weather and drought.

There are an estimated 41.7 million trees larger than 20.9 inches throughout the eastern Oregon landscape, which is an average of about 6 trees per acre within the analysis area. This population of large trees is comprised mostly of ponderosa pine (48%), grand fir/white fir (23%), and Douglas-fir (15%). There are about 43.5 million trees in the next smaller size class (17-20.9") with similar relative proportion of species. The distribution of species within size class distributions would historically be filtered early in stand development by naturally occurring processes like fire. This would free growing resources for the fire tolerant surviving trees allowing them to become established as the dominant individuals that would exert influence on the within stand processes.

The change in large trees in managed forests is different than in forests that only experienced natural disturbance. The number of large trees increased by 13% in forests that have only been mechanically treated, 11% in forests that have had no disturbance, and 10% in forests with insect and disease impacts. Conversely, where fire (wildland or prescribed) alone occurred on the landscape there was a 20% reduction in large trees[4]. Where mechanical treatments and fire co-occurred, there was a 17% decrease in large trees.

The rate of large tree development across the landscape varies by species, with some species showing an increase, and others a decrease between 2001 and 2017 (Table 2).

Table 2. Rate of large tree development by species (2001-2017) (FIA data).

Species	Rate (%)
Subalpine fir	-55
Lodgepole pine	-53
Incense cedar	-25
Western white pine	-2
Sugar pine	+53
White fir and grand fir	+20
Western juniper	+17
Douglas-fir	+14
Western Larch	+12
Ponderosa pine	+8
Englemann spruce	+6
Mountain hemlock	+5

[4] This number differs from the fire caused 24% mortality mentioned above because this number does not include fire-killed trees in areas where fire and cutting co-occurred, or fire damage happened in the past, or fire was highly localized in the stand (e.g., lightning strike).

In unmanaged forest, the number of large trees has increased by 8.5% in the past decade. In comparison, managed forests have seen an increase of 12.9% in the number of large trees on the landscape. Individual large trees in non-managed forests are competing with more numerous and smaller trees for light and water resources. In these stands, trees of all sizes more easily succumb to the primary mortality effects of insect attacks, disease, drought, and fire. Even when they survive the primary effects of these disturbances they may succumb to secondary effects (or disturbances) because the trees are unable to recover from the initial deficit imposed by inter-tree competition. Importantly, within stands of increasing density and competition, individual trees direct their limited growth resources to develop roots and canopy in attempt to maximize a competitive edge, thus the amount of diameter (or radial) growth is limited and large trees are slower to develop.

The proportional basal area of large trees is 9% in young (less than 50 years old) forest. In mid age and old forest, old trees represent 25% and 48% of basal area, respectively (Table 3). In size classes greater than 15 inches dbh all species have seen an increase in basal area over the past two decades.

Table 3. Large Trees in the Project Area.

Stand Age	Proportion of large trees (>20.9 inches dbh) in the analysis area*	Percent basal area (ft^2/acre) of large trees
<50 years	3%	9%
50-150 years	68%	25%
>150 years	29%	48%

*There are 41.7 million trees larger than 20.9 inches dbh in the project area

3.1.6 Environmental Effects

3.1.6.1 Species Composition

3.1.6.1.1 Dry and Moist Forest with Fire Tolerant Species

3.1.6.1.1.1 *Modeling Results*

Direction of change and magnitude of difference between alternatives: FVS indicates an overall slight increase from present condition in the dominance of fire tolerant species like ponderosa pine, western larch, and Douglas-fir. The Old and Large Tree Guideline and the Old Tree Standard Alternatives would result in about 1.5% increase in fire tolerant species basal area compared to the Current Management Alternative. The Adaptive Management alternative results in about 5% decrease in basal area of fire tolerant species relative to current management. The Adaptive Management Alternative allows for the greatest choice in selecting trees to meet management objectives. This modeling exercise focused on density reduction. Modeling did not constrain acres treated based on planning, access or logging systems. In the qualitative analysis below, we assumed that managers could strategically focus on particular areas and more effectively promote desired species.

3.1.6.1.1.2 *Current Management Alternative*

- Old ponderosa pine and larch trees will **continue to decrease** in relative abundance to shade tolerant species like white fir/grand fir because shade tolerant species establish at a higher rate and grow faster. Thinning from wildfire and management will continue to lag behind the rate of growth and regeneration. In dry and moist forests, this will lead to forests more vulnerable to uncharacteristic disturbance mortality.

3.1.6.1.1.3 *Old and Large Tree Guideline Alternative*

- While individual old fire tolerant trees will increase slightly in abundance relative to the Current Management Alternative, succession will continue to promote shade tolerant species like white fir/grand fir while the relative dominance of fire tolerant species **continues to decline**. Thinning from wildfire and management will continue to lag behind the rate of growth and regeneration, particularly of the large class of middle age forest.
- Management adaptability to site specific and future conditions to develop ecologically appropriate species composition is greater in this alternative than in the Current Management Alternative and Old Tree Standard Alternative because species preference could be implemented more fully.

3.1.6.1.1.4 *Old Tree Standard Alternative*

- While individual old fire tolerant trees will increase slightly in abundance relative to the Current Management Alternative, succession will continue to promote shade tolerant species like white fir/grand fir while the relative dominance of fire tolerant species **continues to decline**. Thinning from wildfire and management will continue to lag behind the rate of growth and regeneration, particularly of the large class of middle age forest.

- Managers' ability to adapt treatments for site specific and future conditions in order to maintain and develop disturbance resistant species compositions would be greater compared to current management but less than under the Old and Large Tree Guideline Alternative.

3.1.6.1.1.5 *Adaptive Management Alternative*

- While managers will have increased ability to protect individual old fire tolerant trees, succession will continue to promote shade tolerant species like white fir/grand fir because thinning from wildfire and management will continue to lag behind the rate of growth and regeneration, particularly of the large class of middle age forest.
- This alternative confers the greatest flexibility to managers to shift species composition based on site conditions or desired future conditions. Managers would have greatly increased ability to create diverse post-treatment spatial pattern because there would be no constraints on size or age of trees for removal.

3.1.6.1.2 Wet, Cold, or Other Forest Types with Dominance of Disturbance Resistant Species

No difference between any alternative is expected.

3.1.6.2 Late and Old Structure Forest

Based on the forest disturbance, succession and management assumptions, the current trend of increasing LOS forest will continue for all alternatives. The increase in LOS would create both more late open and late closed forest. Closed canopies will continue to increase because tree growth and regeneration will outpace thinning effects from both wildfire and management. Future treatments would need to increase the removal of small and mid-sized trees from closed canopy forests in order to change this trajectory, and that activity is outside the scope of this proposed amendment.

3.1.6.2.1.1 *Open Conditions in Dry and Moist Forests Inside of LOS*

3.1.6.2.1.1.1 Modeling Results

Direction of Change and Magnitude of Difference between Alternatives: FVS indicates an overall increase in open forest conditions within LOS for all alternatives, including current management. Modeling indicates less than 2.8% difference between alternatives in the amount of open LOS forest that will be created over the analysis period. The modeling results are not constrained by planning, access or logging systems considerations. The qualitative analysis below does include consideration of these constraints.

3.1.6.2.1.1.2 Current Management Alternative

- The extent of late open LOS will continue to increase across the landscape at a **low rate** because creating more open forest conditions is limited to trees less than 21 inches dbh.

- Managers' ability to adapt treatments to site specific conditions in order to maintain and develop disturbance resistant LOS forest will be limited.

3.1.6.2.1.1.3 Old and Large Tree Guideline Alternative

- A somewhat greater extent of closed LOS could be converted to open LOS compared to the Current Management Alternative because slightly more large trees could be cut. The ability to create open LOS conditions would be constrained by tree age and size.
- Management adaptability to project and site-specific conditions in order to maintain and develop more open LOS would be somewhat greater than the Current Management or the Old Tree Standard Alternative. This is because both old and large trees could be considered for retention or harvest to help move stands and landscapes toward desired conditions.

3.1.6.2.1.1.4 Old Tree Standard Alternative

- A somewhat greater extent of closed LOS could be converted to open LOS compared to the Current Management Alternative because large, young trees could be cut. The ability to create open LOS conditions would be constrained by tree age.
- Managers would be more able to adapt treatments to site specific conditions in order to maintain and develop LOS compared to current management.

3.1.6.2.1.1.5 Adaptive Management Alternative

- A greater extent of closed LOS could be converted to open LOS compared to the Current Management Alternative because of the considerable flexibility managers would have to create open conditions. Development of LOS conditions would still be guided by desired conditions.
- Management adaptability to project and site-specific conditions in order to maintain and develop more open LOS will be greater than all other alternatives because tree selection would be based on project and site-specific desired conditions.

3.1.6.2.1.2 *Open Conditions in Dry and Moist Forests Outside of LOS*

3.1.6.2.1.2.1 Modeling Results

Direction of change and magnitude of difference between alternatives: FVS indicates an overall increase in open canopy conditions outside of LOS for all alternatives. Currently, median canopy closure of stands analyzed is 46%. All alternatives decrease canopy cover outside of LOS by about 15%, with difference between alternatives within 0.2%. Results across alternatives are similar because stands outside of LOS have few old or large trees that would be managed differently between alternatives. Instead each alternative achieves the minimum modeled target of 30% maximum SDI. Modeling results are not constrained by planning, access or logging system considerations. For example, current commercial timber harvest over the last ten years had averaged about

34,000 acres. If this rate continues, about 850,000 acres would be managed over the next 25 years as compared to the modeled 1.3-1.5 million acres of non-LOS.

3.1.6.2.1.2.2 Current Management Alternative

- Mid seral open forest structures will continue to decrease because of the prohibition on harvesting trees over 21 inches dbh and the large amount of closed non-LOS forest currently on the landscape.

3.1.6.2.1.2.3 Old and Large Tree Guideline Alternative

- Mid seral open forest structures will decrease at a slightly lower rate compared to the Current Management Alternative because trees over 21 inches dbh and old trees could be removed to help create more open conditions, although the majority of trees that need to be removed to achieve open conditions are less than 21 inches.
- There would be somewhat greater management adaptability to project and site-specific conditions in order to maintain and develop more open conditions than the Current Management Alternative and Old Tree Standard Alternative because both old and large trees could be considered for retention or harvest to help move stands and landscapes toward desired conditions.

3.1.6.2.1.2.4 Old Tree Standard Alternative

- Mid seral open forest structures will decrease at a slightly lower rate compared to the Current Management Alternative because trees over 21 inches dbh could be removed to help create more open conditions, although the majority of trees that need to be removed to achieve open conditions are less than 21 inches.
- Managers would, to some extent, be more able to adapt treatments for site specific conditions in order to maintain and develop open/single-strata conditions compared to current management.

3.1.6.2.1.2.5 Adaptive Management Alternative

- Mid seral open forest structures will decrease at a lower rate compared to the Current Management Alternative because managers would have considerable flexibility to create open conditions outside of LOS. More effective reduction of closed mid seral forest could be supported by this alternative, although the bulk of trees needing to be removed would still be trees under 21 inches dbh.
- Management adaptability to project and site-specific conditions in order to maintain and develop more open conditions would increase more than all other alternatives because tree selection would be based on project and site-specific desired conditions.

3.1.6.2.1.3 *Structural Change in Wet, Cold, or Other Forest*

No difference between any alternative is expected.

3.1.6.3 Large and Old Trees

3.1.6.3.1 Large Trees in Dry and Moist Forests

3.1.6.3.1.1 *Modeling Results*

Direction of change and magnitude of difference between alternatives: Modeling with FVS indicates that continued implementation of the Current Management Alternative will result in an average of 8.8 large trees per acre remaining following thinning over the 25-year analysis period. The Large and Old Tree Guideline will result in an average of 8.5 large trees per acre remaining following thinning over the analysis period (a 3.4% decrease from current management). The Old Tree Standard will result in an average of 8.6 large trees per acre remaining following thinning (a 2.3% decrease from current management), and the Adaptive Management Alternative will result in an average of 7.9 large trees per acre left following thinning (a 10.2% decrease from current management). Because thinning is expected to occur on a relatively small portion of the total landscape, and because thinning, fire, and other disturbance that kills trees is not expected to outpace growth and establishment of trees, FVS modeling indicates that the number of large trees on the landscape will increase over time under all alternatives from the current baseline of 7.6 large trees per acre.

The relatively small difference in large trees remaining following thinning under the Current Management, Large and Old Tree Guideline and Old Tree Standard Alternatives results from application of a the thin from below prescription to all alternatives. The thin-across-age-classes prescription for the Adaptive Management Alternative allows both large (and old) trees to be cut at a higher rate than other action alternatives. The qualitative assessment below describes differences in ecological outcomes that would likely result from the different alternatives.

3.1.6.3.1.2 *Current Management Alternative*

Large trees over 21 inches dbh will **continue to increase**. This helps move the landscape toward desired conditions in structure but not necessarily other desired forest characteristics such as species composition. This will contribute to a landscape increase in large trees, but many of these trees will be less resistant to fire, drought, insect and other disturbances than older fire tolerant species. Failing to remove larger grand fir and Douglas fir likely increases the vulnerability of old ponderosa pine, western larch and other early seral shade intolerant species.

3.1.6.3.1.3 *Old and Large Tree Guideline Alternative*

Large trees over 21 inches dbh **would continue to increase across the landscape but at a slightly slower rate** than under the Current Management Alternative. There would be a decrease in the number of large grand fir/white fir in order to promote more fire tolerant species composition over time.

3.1.6.3.1.4 *Old Tree Standard Alternative*

Large trees over 21 inches dbh would continue to **increase across the landscape but at a slower rate** than under the Current Management Alternative. There would be a decrease in the number of large grand fir/white fire since a portion of these trees less than 150 years of age could be harvested. This would help move the landscape toward desired trajectories in other forest attributes like species composition.

3.1.6.3.1.5 *Adaptive Management Alternative*
As with the other action alternatives, large trees over 21 inches dbh **would continue to increase across the landscape but at a slower rate** than under the Current Management Alternative. There would be a decrease in the number of large grand fir/white fir in order to promote more disturbance resistant species compositions over time. This alternative retains the fewest large trees per acre though the difference between alternatives is relatively small. Adaptive management would ensure LOS is increasing across the landscape and enable a change in management if needed.

3.1.6.3.1.6 *Changes in Large Trees in Wet, Cold, or Other Forest*
No difference between any alternative is expected.

3.1.6.3.2 Old Trees in Dry and Moist Forests

3.1.6.3.2.1 *Modeling Results*
Direction of change and magnitude of difference between alternatives: Modeling with FVS indicates that continued implementation of the Current Management Alternative will result in an average of 7.0 old trees per acre following thinning. The Old and Large Tree Guideline will result in an average of 7.4 old trees per acre following thinning (a 5.7% increase over current management). The Old Tree Standard Alternative will result in an average of 8.9 old trees per acre following thinning (a 27.1% increase over current management), and the Adaptive Management Alternative will result in an average of 5.7 old trees per acre following thinning (an 18.6 decrease from current management). Because thinning is expected to occur on a relatively small portion of the total landscape, and because fire, insect attack, and other disturbance that kills old tree at a high rate in untreated forests will continue, modeling indicates that the number of old trees will decrease across the landscape over the analysis period.

Modeling of the current management, old and large tree guideline, and old tree guideline applied a thin from below prescription. The Adaptive Management Alternative thinned across age classes and included removal of large and old trees.

3.1.6.3.2.2 *Current Management Alternative*
The Current Management Alternative would protect all old trees that are >21 inches, although many old trees would remain vulnerable to competition from large grand fir and other shade tolerant species that cannot be removed under current management. The current management alternative would also allow harvest of old trees that are less than 21 inches dbh. The current high rate of decline of old trees is expected to continue.

3.1.6.3.2.3 *Old and Large Tree Guideline Alternative*
This alternative would provide flexibility to remove large but young trees from around old trees, while maintaining large tree cover consistent with the objective of conserving old trees. This would reduce competition and support old tree persistence on the landscape. This alternative would provide greater protection for old but small trees.

3.1.6.3.2.4 *Old Tree Standard Alternative*
This alternative would maximize protection for all old trees within a stand, although there would be somewhat less flexibility than the old and large tree guideline to create desired species composition and density.

3.1.6.3.2.5 *Adaptive Management Alternative*
The Adaptive Management Alternative allows for the broadest suite of considerations in choosing trees to retain to meet management objectives.

3.1.6.3.3 Changes in Old Trees in Wet, Cold, or Other Forest
No difference between any alternative is expected.

3.1.7 Vegetation Effects Summary

Table 4. Vegetation effects summary.

Alternative	Current Management (CM)	Old and Large Tree Guideline	Old Tree Standard	Adaptive Management
Dominance of fire tolerant species	Continued decrease	1.5% increase relative to CM	1.5% increase relative to CM	Decrease – wide potential range
LOS	Continued increase	Increase	Increase	Increase
Open conditions within LOS	Continued slow rate of increase	Increase slightly more than CM	Increase slightly more than CM	Increase slightly more than CM
Open conditions outside of LOS	Continued decrease at high rate	Decrease less than CM	Decrease less than CM	Decrease less than CM
Large Trees	Continued increase	Increase 3.4% less than CM	Increase 2.3% less than CM	Increase – wide potential range
Old Trees	Continued decrease	Decrease less than CM	Decrease less than CM	Decrease – wide potential range

Disturbance Regimes – Current density and species composition in dry and moist mixed conifer forests creates forests more vulnerable to mortality from single disturbances or a combination of disturbances (e.g. drought stress and then a wildfire) (Fettig et al. 2019, Stephens et al. 2018, Young et al. 2017, vanMantgem et al. 2013, Breshears et al. 2005, Hemstrom 2001). All of the action alternatives would enable managers to more effectively address density, structure, and species composition in mid and late stands which would enhance ecosystem function (Johnson et al. 1994). Managers' ability to reduce competition between trees would mitigate drought stress and reduce old tree vulnerability to some insect and disease outbreaks (Tepley and Hood 2020, Zhang et al. 2019, Bradford and Bell 2017, Kalies and Kent 2016, Vaillant et al. 2015, Prichard et al. 2010, Ritchie et al. 2008). In addition, the ability to more effectively reduce densities and shift species composition would enable managers to reduce the vulnerability of forests, including old trees, to mortality from wildfire (Stephens et al. 2020, Martinson and Omi 2013, Safford et al. 2012, Stephens et al. 2009) and a changing climate (Halofsky et al. 2014).

3.2 Social and Economic Resources

3.2.1 Introduction

The programmatic management changes to the Eastside Screens has the potential to affect local communities. People in these communities are the direct or indirect beneficiaries of their Forest ecosystems, visitation patterns, scenery, natural resources and other valued experiences associated with adjacent forestlands. Supply of natural resources as well as visitation, grazing and other special uses from the Forests involved with the Eastside Screens generate employment and income in the surrounding communities and counties and generate revenues that help improve ecosystem and infrastructure conditions, as well as returning revenues to the U.S. Treasury.

The proposed Land and Resource Plan Amendment represents a potential change to programmatic management of the associated Forests that may alter the delivery of benefits to people in nearby communities, as well as other non-local users of the Forest. The proposed change is solely focused on relieving the Forests of the variable challenges of guiding and implementing the 21-inch dbh standard, which has been implemented differently across each Forest and has been partially amended project specifically many times since 1994. This amendment is proposed as an overarching solution to the existing challenges with the 21-inch standard of the Eastside Screens.

This section of the environmental assessment presents concepts and methods used to qualitatively analyze the potential and significance of any financial, economic or social impacts that may result across decision alternatives. The section will cover communities that may be sensitive to social or economic changes, as well as information and analysis that reflects on these programmatic changes and any connection they may have to communities, economies, and beneficiaries of the Forests.

3.2.2 Analysis Area

This economic and social analysis is applicable to all proposed affected areas described for programmatic changes to the Eastside Screens. This includes the eastern National Forests (Umatilla, Malheur, Wallowa-Whitman, Ochoco, Deschutes, Fremont-Winema) and surrounding counties and tribes and tribal land in Oregon, Washington, and limited parts of Idaho and Northern California. County administrative areas to not represent the full extent of potential social and economic influence from the proposed programmatic changes, but those counties highlighted (Figure 10) yield information most critical to the proposal and populations within the associated geography. Methods for determining the county selection for these Forests are described further (METI, 2010).

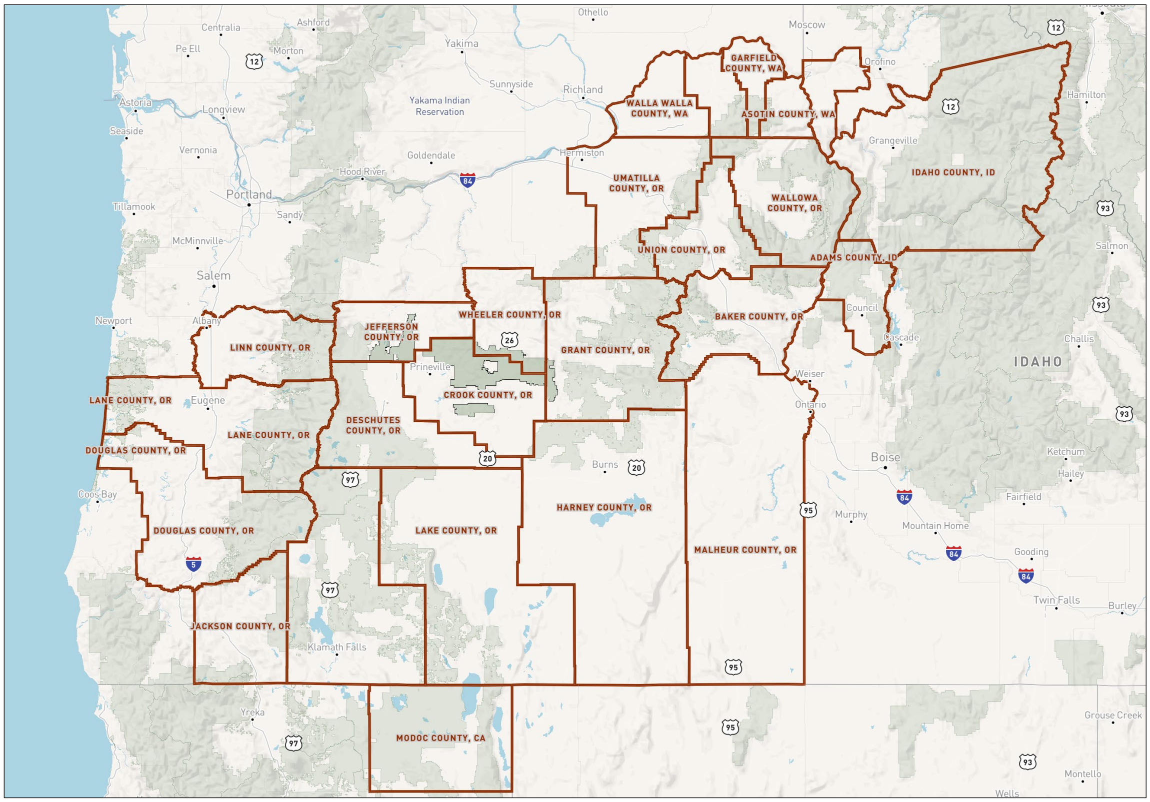

Figure 10. Map of the County Economic Analysis Area. Source: Screen captured via Headwaters Economics, Economic Profile System (2020).

3.2.3 Affected Environment

The combination of small towns and rural settings, along with people from a wide variety of backgrounds, provides a diverse social environment for the geographical region around these six National Forests. Local residents pursue a wide variety of lifestyles, but many share a common theme—an orientation to the outdoors and natural resources. This is reflected in both vocational and recreational pursuits including employment in logging and milling operations, outfitter and guide businesses, hiking, hunting, fishing, camping, and many other recreational activities.

Timber, tourism, and agricultural industries are important to the economy of local areas. Despite the common concern for, and dependence on, natural resources within the local communities, social attitudes vary widely with respect to their management. Residents hold a broad spectrum of perspectives and preferences ranging from complete preservation to maximum development and utilization of natural resources.

Socioeconomic measures used to describe the affected environment were obtained from the Headwaters Economics Economic Profile System (EPS 2020), which compiles and summarizes primary population and economic data from a variety of government sources into a report. Key measures used in this report include land ownership, population, income, and natural resource commodity dependency. These measures and additional social and economic information from the EPS reports are included in the project file.

3.2.3.1 Land Ownership and Federal Land Payments

Decisions made by public land managers may influence the local economy and lifestyles of residents, particularly if public lands represent a large portion of the land base. Agency management actions that affect water quality, access to recreation, scenery (as well as other quality of life amenities), and the extent and type of resource extraction are particularly important in areas where much of the land is managed by public agencies.

Similarly, Federal land activities generate direct revenues for state and county governments in the form of Federal Land Payments. Some of these revenues are directly attributed to timber sale activities on the National Forest System. As shown (Table 5) all counties in the analysis area receive some form of Federal Land Payments, ranging from over $19 million in Lane County, Oregon, down to $39 thousand in Walla-Walla County in Washington. These revenues help facilitate additional public services provided by state and county governments, and fluctuations in these revenues due to change in Federal activities can have an impact on funding for local public services as a result.

Across the greater multi-county analysis area, Forest Service specific payments totaled over $48 million in 2019.

Table 5. 2019 Federal Land Payments to Analysis Area Counties. Source: Data Sources: U.S. Department of Interior. 2020. Payments in Lieu of Taxes (PILT), Washington, D.C.; U.S. Department of Agriculture. 2020. Forest Service, , Washington, D.C.

Analysis Counties	Total Federal Land Payments	PILT	Forest Service Payments
Combined Counties	*$109,231,257*	*$32,608,542*	*$48,715,846*
Lane County, OR	$19,140,046	$2,167,517	$8,001,291
Douglas County, OR	$19,016,922	$2,544,849	$6,872,806
Klamath County, OR	$10,684,429	$3,204,149	$6,169,938
Idaho County, ID	$8,813,832	$1,762,493	$6,486,887
Jackson County, OR	$8,488,301	$1,828,066	$1,536,749
Linn County, OR	$4,856,077	$1,007,652	$3,052,146
Grant County, OR	$4,683,978	$924,601	$3,747,315
Deschutes County, OR	$4,356,473	$3,172,684	$1,113,146
Lake County, OR	$3,786,344	$1,220,427	$2,411,778
Crook County, OR	$3,546,147	$2,210,867	$1,299,156
Malheur County, OR	$3,221,380	$2,718,439	$679
Harney County, OR	$3,171,833	$1,150,621	$1,658,179
Baker County, OR	$2,647,244	$1,656,951	$844,740
Union County, OR	$2,394,531	$1,628,872	$764,795

Wallowa County, OR	$2,107,507	$1,074,053	$1,031,685
Modoc County, CA	$1,959,988	$675,836	$1,229,782
Jefferson County, OR	$1,290,471	$741,988	$546,973
Adams County, ID	$1,233,060	$339,794	$713,483
Umatilla County, OR	$1,193,554	$1,074,251	$118,245
Wheeler County, OR	$761,092	$215,244	$539,831
Morrow County, OR	$618,940	$384,555	$230,458
Columbia County, WA	$545,497	$385,583	$159,061
Garfield County, WA	$354,651	$234,090	$120,527
Asotin County, WA	$230,822	$168,566	$60,953
Nez Perce County, ID	$89,065	$86,503	$2,516
Walla Walla County, WA	$39,073	$29,891	$2,727

3.2.3.2 Population, Employment, and Income

One measure of economic and social environment is whether a geography is growing or declining. Standard measures of growth and decline are population, employment, and real personal income.

The information in this section helps to understand whether geographies are growing or declining at different rates and makes it easy to see if there are discrepancies between changes in population, employment, and real personal income. If population and employment are growing faster than real personal income, for example, it may be worthwhile to do further research on whether this is because growth has been in low-wage industries and occupations. Alternatively, if personal income is growing faster than employment, it may be because of growth in high-wage industries and occupations and/or non-labor income sources.

Overall, 2018 population across counties in the analysis area varied substantially, with most counties in considerable rural levels. Of the group, Lane and Wheeler County had the highest and lowest population with 379 thousand and 1.3 thousand people, respectively. The total area had an approximate estimate of 1.5 million people residing.

From 1970 to 2018, the population in the impact area (combined area) grew by 85 percent, led by 522 percent population growth in Deschutes County. Wheeler County had the highest population decline, at negative 26 percent over the period. Over the same geographic extent, employment and personal income changed by 145% and 246%, in the same 48 year period; higher than U.S. averages. Employment growth across the counties ranges from a striking 859% in Deschutes County down to a negative 34% in Garfield County, a sparsely populated county similar to Wheeler.

Additional economic performance measures for employment and income are provided below (Table 6). Labor income and total personal income are often used as proxies for standard of living. To understand the data on earnings and income, it is important to understand the different types of income. Earnings per job (or average earnings) is the sum of wage and salary disbursements plus other labor and proprietors' income for the area of interest (county or aggregation of counties), divided by total full-time and part-time employment for the area of interest. Average earnings per job is an indicator of the quality of local employment, with a higher average earnings per job indicating that there are relatively more high-wage occupations.

Per capita income is the sum of total personal income for the area of interest divided by the sum of total population in the area. Per capita income is considered one of the most important measures of economic well-being. However, this measure can be misleading. Because total personal income includes non-labor income sources (dividends, interest, rent and transfer payments), it is possible for per capita income to be relatively high due to the presence of retirees and people with investment income. Additionally, because per capita income is calculated using total population as the denominator and not the labor force as in average earnings per job, it is possible for per capita income to be relatively low when there are a disproportionate number of children and/or elderly people in the population.

From 1970-2016, real (adjusted for inflation) personal income in the analysis area grew 246 percent, a trend led by a 1213 percent increase in Deschutes County and bottomed with a negative 7 percent in Garfield County.

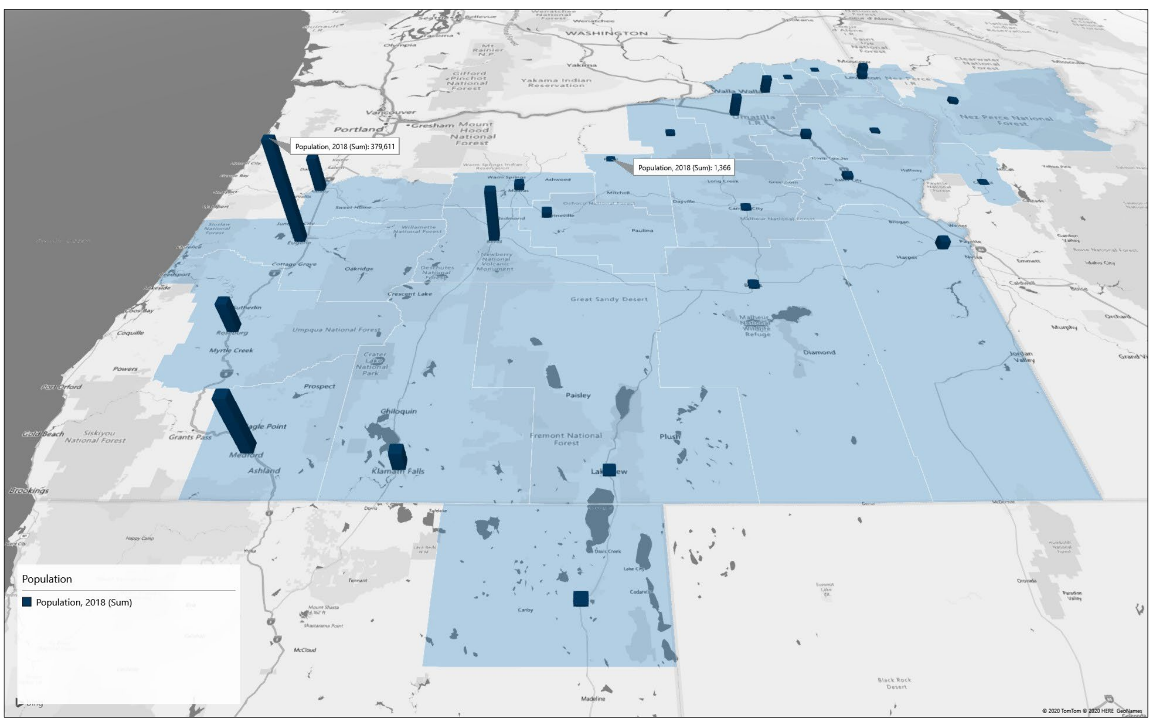

Figure 11. Map of the Analysis Area County Populations (2018). Source: Multiple Federal sources including County Business Patterns data, and multiple agencies. Accessed via Headwaters Economics EPS, https://headwaterseconomics.org.

Table 6. 1970 - 2018 Population, Employment, and Income Trends in Analysis Area Counties. Source: Multiple Federal sources including County Business Patterns data, and multiple agencies. Accessed via Headwaters Economics EPS, https://headwaterseconomics.org.

Analysis Counties	Population, 2018	Population % change	Employment % change	Personal Income % change
Combined Counties	*1,497,198*	*85%*	*145%*	*246%*
Lane County, OR	379,611	75%	147%	241%
Jackson County, OR	219,564	130%	249%	376%
Deschutes County, OR	191,996	522%	859%	1213%
Linn County, OR	127,335	75%	118%	248%
Douglas County, OR	110,283	53%	84%	165%
Umatilla County, OR	77,516	72%	99%	168%
Klamath County, OR	67,653	34%	40%	105%
Walla Walla County, WA	60,922	45%	89%	160%
Nez Perce County, ID	40,408	33%	83%	137%
Malheur County, OR	30,725	32%	39%	81%
Union County, OR	26,461	35%	70%	130%
Jefferson County, OR	24,192	181%	160%	324%
Crook County, OR	23,867	137%	107%	297%
Asotin County, WA	22,610	63%	191%	234%
Idaho County, ID	16,513	27%	49%	100%
Baker County, OR	16,006	6%	37%	83%
Morrow County, OR	11,372	154%	249%	233%
Modoc County, CA	8,777	17%	10%	80%
Lake County, OR	7,879	24%	28%	92%
Harney County, OR	7,329	2%	16%	49%
Grant County, OR	7,176	1%	14%	70%
Wallowa County, OR	7,081	13%	75%	103%
Adams County, ID	4,250	48%	81%	124%
Columbia County, WA	4,059	-8%	-9%	35%
Garfield County, WA	2,247	-23%	-34%	-7%
Wheeler County, OR	1,366	-26%	-8%	15%

In current years, the highest unemployment was reported in Modoc, Grant, and Adams Counties. Similarly, the lowest average income or per capita income were reported in Wheeler, Wallowa, Idaho, Adams, Malheur, and Jefferson Counties. In 2018, average earnings per job in the impact area were $49,838 per year, compared to an average of $63,443 in the U.S. Common to other rural regions in the U.S., concerning economic performance is most apparent in some of the more sparsely populated counties.

Table 7. Analysis Area Economic Performance Measures for Income and Employment. Source: Multiple Federal sources including County Business Patterns data, and multiple agencies. Accessed via Headwaters Economics EPS, https://headwaterseconomics.org/.

Analysis Counties	Population, 2018	Unemployment rate	Average earnings per job	Per capita income
Combined Counties	*1,497,198*	*4.4%*	*$49,838*	*$45,703*
Lane County, OR	379,611	4.1%	$52,412	$46,746
Jackson County, OR	219,564	4.4%	$49,539	$47,442
Deschutes County, OR	191,996	3.9%	$52,484	$56,136
Linn County, OR	127,335	4.3%	$51,176	$43,663
Douglas County, OR	110,283	4.9%	$46,832	$41,135
Umatilla County, OR	77,516	4.8%	$48,225	$40,398
Klamath County, OR	67,653	6.2%	$47,080	$40,609
Walla Walla County, WA	60,922	4.9%	$53,638	$46,975
Nez Perce County, ID	40,408	2.8%	$50,737	$45,196
Malheur County, OR	30,725	4.1%	$41,760	$31,550
Union County, OR	26,461	4.8%	$43,839	$41,277
Jefferson County, OR	24,192	5.1%	$42,421	$33,555
Crook County, OR	23,867	5.3%	$45,393	$41,682
Asotin County, WA	22,610	4.1%	$47,380	$47,951
Idaho County, ID	16,513	4.5%	$37,235	$35,754
Baker County, OR	16,006	4.6%	$36,124	$41,432
Morrow County, OR	11,372	4.1%	$58,705	$39,798
Modoc County, CA	8,777	7.1%	$47,043	$45,629
Lake County, OR	7,879	5.4%	$42,499	$40,513
Harney County, OR	7,329	5.3%	$37,302	$39,827
Grant County, OR	7,176	6.9%	$40,957	$42,694

Wallowa County, OR	7,081	5.8%	$30,963	$45,910
Adams County, ID	4,250	6.8%	$34,517	$38,126
Columbia County, WA	4,059	5.5%	$52,098	$50,974
Garfield County, WA	2,247	5.4%	$50,841	$45,311
Wheeler County, OR	1,366	4.3%	$20,130	$37,811

Commodity sectors are industrial sectors that have the potential to use Federal public lands for the extraction of commodities. Commodity sectors include timber, mining (including oil, gas, and coal), and agriculture. Public lands can play a key role in stimulating local employment by providing opportunities for commodity extraction. It is important to understand the relative size of these sectors to put the economy related to commodity extraction in perspective. For example, a county with most of its employment in the commodity sectors has a higher chance of being impacted by decisions that permit (or restrict) timber, mining, and grazing activities on public lands than a county where only 10 percent of the workforce is in these sectors.

In 2018, agriculture, including range, was a slightly larger component of commodity sector employment in the analysis area, accounting for 4.3 percent of total employment, followed by timber at 3.8 percent of total employment (Table 8). Mining was far less critical to the employment base of this area and Travel and tourism activities supported 17.5 percent of the employment base in the same area. Depending on the county under review, these sectors vary in relative support they provide and percentage makeup the represent of the local economy. With a focus on the timber, it is worth noting that Douglas, Crook, Klamath, Linn, Idaho, and Baker County, have a relative higher percent of their employment base represented by timber sector industries. Similarly, in travel and tourism industries, Deschutes, Baker, Jefferson, and Harney County each have over 20% of their employment related (Figure 12Figure 12. Map of the Analysis Area County Sector Employment (2017-2018). Source: Multiple Federal sources including County Business Patterns data, and multiple agencies. Accessed via Headwaters Economics EPS, https://headwaterseconomics.org).

Table 8. Commodity Sector Percentage Employment including Travel and Tourism Sector. Source: Multiple Federal sources including County Business Patterns data, and multiple agencies. Accessed via Headwaters Economics EPS, https://headwaterseconomics.org

Analysis Counties	Population, 2018	Timber %	Mining %	Agriculture %	Travel & Tourism %
Combined Counties	*1,497,198*	*3.8%*	*0.1%*	*4.3%*	*17.5%*
Lane County, OR	379,611	4.1%	0.1%	1.8%	17.3%
Jackson County, OR	219,564	4.2%	0.1%	2.1%	19.1%
Deschutes County, OR	191,996	1.2%	0.1%	1.3%	21.7%
Linn County, OR	127,335	6.0%	0.1%	6.0%	12.1%
Douglas County, OR	110,283	12.3%	0.1%	4.6%	16.8%

Umatilla County, OR	77,516	0.5%	0.1%	9.2%	17.3%
Klamath County, OR	67,653	7.3%	0.0%	5.3%	18.1%
Walla Walla County, WA	60,922	0.0%	0.0%	9.1%	13.3%
Nez Perce County, ID	40,408	0.4%	0.6%	2.0%	15.1%
Malheur County, OR	30,725	0.0%	0.3%	12.4%	17.5%
Union County, OR	26,461	0.7%	0.0%	7.5%	15.7%
Jefferson County, OR	24,192	0.3%	0.0%	8.7%	21.6%
Crook County, OR	23,867	9.4%	0.3%	7.8%	15.7%
Asotin County, WA	22,610	0.0%	0.0%	2.3%	15.9%
Idaho County, ID	16,513	5.0%	1.1%	10.7%	11.5%
Baker County, OR	16,006	5.3%	2.5%	10.7%	23.5%
Morrow County, OR	11,372	1.5%	0.0%	16.4%	9.1%
Modoc County, CA	8,777	0.1%	0.0%	13.7%	11.4%
Lake County, OR	7,879	0.0%	1.5%	15.6%	16.9%
Harney County, OR	7,329	0.5%	0.0%	19.5%	23.4%
Grant County, OR	7,176	4.0%	0.0%	12.6%	12.0%
Wallowa County, OR	7,081	2.7%	0.0%	13.2%	15.2%
Adams County, ID	4,250	2.2%	0.0%	11.7%	18.4%
Columbia County, WA	4,059	0.0%	0.0%	16.8%	13.4%
Garfield County, WA	2,247	0.0%	0.0%	19.6%	2.0%
Wheeler County, OR	1,366	0.0%	0.0%	29.4%	13.9%

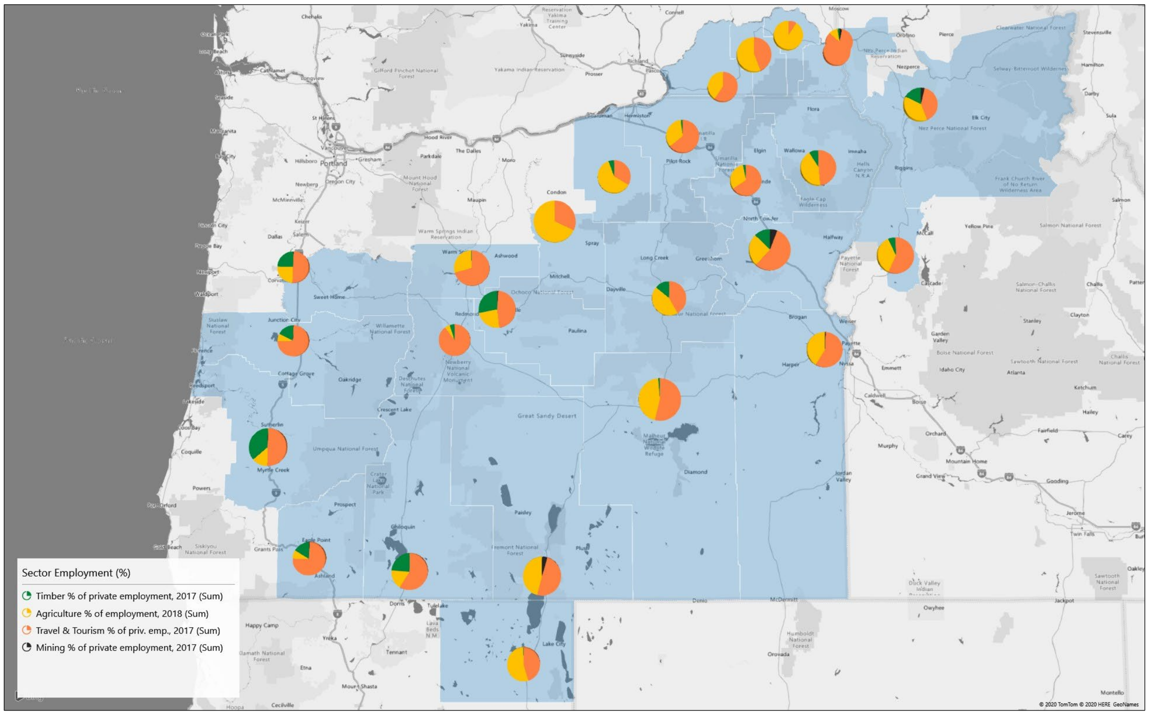

Figure 12. Map of the Analysis Area County Sector Employment (2017-2018). Source: Multiple Federal sources including County Business Patterns data, and multiple agencies. Accessed via Headwaters Economics EPS, https://headwaterseconomics.org

3.2.3.3 Land Use and Development

Lastly, in describing the economic affected environment, it is relevant to consider land-use patterns (Table 9). Land-use pressure, concerns with land management activities, and resource conflicts all seem to rise in relations to increasing residential development, especially development in the Wildland urban interface, and the relative proportion of land in each county that is managed by federal agencies. Approximately 32 percent of the multi-county analysis area is managed by USDA Forest Service, with a range of percentage ownership across counties, the highest being Idaho County with 82 percent. The highest levels of development in WUI areas tends to happen adjacent to metropolitan areas. In this case, Deschutes County, and the Bend residential development has driving WUI in this county up to 42 percent as was measured in 2010. Residential land area percentage change is most noticeable in counties with small populations that have grown more recently. Counties such as Crook and Adams County, for example, may have experienced trends of in-migration, or growing smaller residential areas.

Agency activities focused on fuels reductions and other WUI centered ecosystem needs are more likely to affect counties with high or rising WUI development.

Table 9. Land Use Ownership and Development, 2010. Source: Multiple sources. Accessed via Headwaters Economics EPS, https://headwaterseconomics.org

Analysis Counties	Forest Service Land %	Residential land area % change, 2000-2010	WUI % developed, 2010
Combined Counties	*32%*	*21%*	*7%*
Lane County, OR	48%	14%	12%
Jackson County, OR	25%	20%	14%
Deschutes County, OR	51%	22%	42%
Linn County, OR	31%	11%	3%
Douglas County, OR	31%	14%	3%
Umatilla County, OR	20%	12%	6%
Klamath County, OR	45%	20%	4%
Walla Walla County, WA	0%	25%	0%
Nez Perce County, ID	1%	23%	11%
Malheur County, OR	0%	27%	2%
Union County, OR	47%	40%	1%
Jefferson County, OR	24%	24%	10%
Crook County, OR	23%	92%	7%
Asotin County, WA	13%	53%	3%
Idaho County, ID	82%	59%	8%
Baker County, OR	33%	36%	4%
Morrow County, OR	11%	21%	6%
Modoc County, CA	51%	79%	2%
Lake County, OR	19%	80%	0%
Harney County, OR	8%	48%	0%
Grant County, OR	55%	43%	1%
Wallowa County, OR	57%	30%	2%
Adams County, ID	58%	138%	10%
Columbia County, WA	29%	43%	4%
Garfield County, WA	21%	23%	15%
Wheeler County, OR	15%	55%	0%

3.2.3.4 Populations at Risk and Environmental Justice Communities

Identification of potential environmental justice communities requires observations or measurements of poverty, federal assistance, and minority population presence in an assessment analysis area.

The human environment surrounding the National Forests in Eastern Oregon and Washington include families living below the poverty line. Tabular data below (Table 10) describes the number of families living below the poverty line, and separately reports families with children and single mother families with children. The Census defines a family as a group of two or more people who reside together and who are related by birth, marriage, or adoption. The Census Bureau uses a set of income thresholds that vary by family size and composition to define who is poor. If the total income for a family or an unrelated individual fall below the relevant poverty threshold, then the family or an unrelated individual is classified as being below the poverty level.

Families in poverty may lack the resources to meet their basic needs. Their challenges cross the spectrum of food, housing, health care, education, vulnerability to natural disasters, and emotional stress. To save money, families with low incomes often have to make lifestyle compromises such as unhealthy foods, less food, substandard housing, or delayed medical care. Lack of financial resources makes families in poverty more vulnerable to natural disasters. This is due to inadequate housing, social exclusion, and an inability to re-locate or evacuate. Inadequate shelter exposes occupants to increased risk from storms, floods, fire, and temperature extremes. Households with low incomes are more likely to have unhealthy housing such as leaks, mold, or rodents. The expense of running fans, air conditioners, and heaters makes low-income people hesitant to mitigate the temperature of their living spaces. Furthermore, those in high-crime areas may not want to open their windows. Families in poverty are disproportionately affected by higher food prices, which are expected to rise in response to climate change. Children in poor families, on average, receive fewer years of education compared to children in wealthier families. Low-income residents are less likely to have adequate property insurance, so they may bear an even greater burden from property damage due to natural hazards. Living in poverty can lead to a lack of personal control over potentially hazardous situations such as increased air pollution or flooding. Impoverished families may be less likely to take proactive measures to prevent harm.

Malheur and other rural counties measure above other counties in terms of the percentage of families observed in poverty. Multiple counties have a higher than U.S. average percentage of households in poverty.

Table 10. Families in Poverty by Analysis County, 2018. Source: U.S. Department of Commerce. 2019. Census Bureau, American Community Survey Office, Washington, D.C.

Analysis Counties	Total families for whom poverty status is determined	Families in poverty	Families with children in poverty	Single mother families in poverty
Combined Counties	*371106*	*10.5%*	*7.7%*	*4.4%*
Lane County, OR	88873	10.3%	7.5%	4.5%
Jackson County, OR	55629	11.5%	8.7%	4.6%
Deschutes County, OR	48879	7.3%	4.9%	2.4%
Linn County, OR	31814	10.5%	7.5%	3.9%
Douglas County, OR	29377	11.3%	7.8%	4.9%
Umatilla County, OR	18188	13.8%	11.5%	7.7%
Klamath County, OR	17277	14.0%	9.6%	4.9%
Walla Walla County, WA	14341	7.8%	6.4%	4.6%
Nez Perce County, ID	10657	9.0%	6.9%	4.9%
Malheur County, OR	6782	17.1%	14.4%	7.9%
Union County, OR	6733	10.5%	8.1%	5.3%
Crook County, OR	6198	10.1%	8.0%	5.4%
Asotin County, WA	5807	7.4%	5.7%	3.6%
Jefferson County, OR	5383	11.3%	8.0%	5.8%
Baker County, OR	4319	10.9%	7.8%	4.0%
Idaho County, ID	4244	9.0%	4.5%	1.6%
Morrow County, OR	2927	11.1%	7.8%	3.3%
Modoc County, CA	2173	9.0%	6.6%	1.1%
Harney County, OR	2137	11.9%	8.0%	5.3%
Lake County, OR	2120	15.3%	11.1%	8.6%
Wallowa County, OR	2051	11.5%	8.6%	4.9%
Grant County, OR	1937	7.6%	4.3%	2.4%
Adams County, ID	1115	6.5%	5.3%	4.8%
Columbia County, WA	1101	5.4%	2.3%	0.5%
Garfield County, WA	656	6.4%	5.6%	1.5%
Wheeler County, OR	388	12.1%	9.3%	2.3%

Other Federal assistance metrics can help evaluate poverty status (Table 11). Supplemental Security Income, or SSI, provides financial assistance to people with limited income who are aged, blind, or disabled. Unlike Social Security benefits, which are determined by the recipient's lifetime earnings, SSI benefits are not based on prior work. Cash public assistance can be from the Federal program, Temporary Assistance for Needy Families (TANF), or various state-level cash assistance programs. It does not include separate payments received for hospital or other medical care (vendor payments) or SSI or noncash benefits such as the Supplemental Nutrition Assistance Program.

The Supplemental Nutrition Assistance Program, or SNAP, (formerly known as food stamps), provides benefits to those who are unemployed, have no or low incomes, are elderly, are disabled with low incomes, or are homeless. The income threshold for SNAP varies with household size and other factors. SNAP benefits can be used to purchase grocery items such as breads, cereals, fruits, vegetables, meats, and dairy products. Median income can be used to identify areas of high or low income, but care should be taken to consider regional differences in cost of living.

The number of households receiving public assistance are indicative of households living in poverty or with insufficient resources. In 2011, families receiving public assistance spent 77 percent of their household budget to meet the basic necessities of housing, food, and transportation. Payments associated with economic hardship are associated with lower household income and educational attainment, higher poverty and unemployment. They are often high in communities that are losing population.

Similar counties are observed here with higher than average federal assistance per household.

Race is self-identified by Census respondents who choose the race or races with which they most closely identify. Included in Other Races are Asian, Native Hawaiian or Other Pacific Islander, and respondents providing write-in entries such as multiracial, mixed, or interracial. Ethnicity has two categories: Hispanic or Latino, and Non-Hispanic or Latino. The federal government considers race and Hispanic origin to be two separate and distinct concepts. Hispanics and Latinos may be of any race.

Table 11. Percentage of Households Receiving Additional Federal Assistance. Source: U.S. Department of Commerce. 2019. Census Bureau, American Community Survey Office, Washington, D.C.

Analysis Counties	Households	% SSI	% CPAI	% Food Stamps	Δ(SSI)	Δ (CPAI)	Δ Stamps
Combined counties	*581,852*	*5.6%*	*3.5%*	*19.1%*	*162%*	*52%*	*455%*
Lane County, OR	150,780	5.7%	3.6%	20.1%	158%	78%	400%
Jackson County, OR	87,417	5.1%	3.7%	19.2%	181%	79%	499%
Deschutes County, OR	72,471	3.0%	1.8%	13.6%	42%	-103%	394%
Linn County, OR	47,030	6.3%	3.9%	20.2%	268%	73%	507%
Douglas County, OR	45,026	6.7%	3.7%	21.2%	187%	79%	537%
Klamath County, OR	27,402	7.9%	4.4%	25.1%	243%	114%	731%
Umatilla County, OR	26,886	6.3%	4.4%	23.2%	230%	201%	573%
Walla Walla County, WA	22,304	5.6%	3.1%	13.4%	-3%	-177%	91%
Nez Perce County, ID	16,302	7.1%	4.0%	12.7%	247%	118%	391%
Union County, OR	10,481	5.3%	4.4%	19.3%	215%	146%	456%
Malheur County, OR	10,138	8.3%	4.9%	28.7%	390%	162%	1302%
Crook County, OR	9,339	6.7%	4.5%	23.0%	292%	236%	784%
Asotin County, WA	9,171	4.9%	3.6%	16.4%	-59%	62%	162%
Jefferson County, OR	7,892	6.6%	4.4%	27.4%	391%	93%	1126%
Baker County, OR	6,927	6.4%	4.4%	18.5%	219%	52%	257%
Idaho County, ID	6,466	4.8%	4.3%	8.9%	76%	151%	-83%
Morrow County, OR	3,959	5.0%	2.9%	17.4%	-75%	12%	105%
Modoc County, CA	3,660	5.7%	1.3%	9.5%	-264%	-422%	123%
Lake County, OR	3,494	6.1%	2.1%	19.2%	145%	-302%	309%
Grant County, OR	3,294	5.5%	2.6%	18.4%	140%	64%	359%
Wallowa County, OR	3,165	4.6%	5.6%	18.5%	20%	373%	564%
Harney County, OR	3,157	7.3%	5.4%	21.5%	248%	-142%	255%
Columbia County, WA	1,758	5.8%	3.5%	12.6%	240%	-127%	131%
Adams County, ID	1,675	6.0%	2.4%	6.8%	379%	-161%	316%
Garfield County, WA	997	9.2%	2.2%	8.6%	436%	-67%	21%
Wheeler County, OR	661	4.1%	2.1%	18.3%	-210%	117%	705%

Race and ethnicity are strongly correlated with disparities in health, exposure to environmental pollution, and vulnerability to natural hazards. Research consistently has found race-based environmental inequities across many variables, including the tendency for minority populations to live closer to noxious facilities and Superfund sites, and to be exposed to pollution at greater rates than whites. Many health outcomes are closely related to the local environment. Minority communities often have less access to parks and nutritious food, and are more likely to live in substandard housing. Minorities tend to be particularly vulnerable to disasters and extreme heat events. This is due to language skills, housing patterns, quality of housing, community isolation, and cultural barriers. Blacks and Hispanics, two segments of the population that are currently experiencing poorer health outcomes, are an increasing percentage of the US population. Research has identified measurable disparities in health outcomes between various minority and ethnic communities.

Across races, the rates of preventable hospitalizations are highest among black and Hispanic populations. Preventable hospital visits often reflect inadequate access to primary care. These types of hospital visits are also costly and inefficient for the health care system. Relative to other ethnicities and races, Hispanics and blacks are less likely to have health insurance, but rates of uninsured are dropping for both groups. Compared to other races, blacks have higher rates of infant mortality, homicide, heart disease, stroke, and heat-related deaths. Hispanics have higher rates of diabetes and asthma. American Indians have a distinct pattern of health effects different from blacks and Hispanics. Native populations are less likely to have electricity than the general population. They have high rates of infant mortality, suicide and homicide, and nearly twice the rate of motor vehicle deaths than the U.S. average.

Specific to the program actions associated with Eastside Screens, there is exist evidence that low-income and minority populations fail to benefit proportionally from hazardous fuel reduction projects on federal land (Adams and Charnley 2020). These potential impacts are important to consider, especially in the design and implementation of on-the-ground projects.

Across counties in the analysis area, Jefferson, Walla Walla, Umatilla, Lane, Klamath, Morrow, Malheur, have higher than average percentages of minorities within their populations and may be more likely to observe issues related to hazardous fuel reduction projects.

Similarly, the highest presence of Native American populations is observed in Jefferson, Nez Perce, Klamath, Umatilla, Idaho, and Lake Counties (Table 12). These population areas are of importance as they can spatially relate to the unique tribal community values placed on associated resources and species. More discussion on tribal values is provided in the Cultural and Heritage Resources section below.

Table 12. Race and Ethnic Profile by Analysis Counties, 2018. Source: U.S. Department of Commerce. 2019. Census Bureau, American Community Survey Office, Washington, D.C.

	All other races	Black or African American	American Indian	Other races	Hispanic ethnicity
Jefferson County, OR	29%	1%	17%	11%	20%
Walla Walla County, WA	16%	2%	1%	13%	21%
Umatilla County, OR	15%	1%	3%	10%	26%
Lane County, OR	13%	1%	1%	11%	9%
Klamath County, OR	12%	1%	4%	7%	13%
Morrow County, OR	11%	0%	1%	10%	36%
Malheur County, OR	11%	1%	1%	9%	33%
Combined Counties	*11%*	*1%*	*2%*	*8%*	*11%*
Nez Perce County, ID	10%	0%	6%	4%	4%
Modoc County, CA	10%	2%	3%	5%	14%
Linn County, OR	10%	0%	1%	8%	9%
Harney County, OR	9%	1%	2%	7%	5%
Lake County, OR	9%	0%	3%	6%	8%
Columbia County, WA	9%	1%	0%	8%	8%
Jackson County, OR	9%	1%	1%	7%	13%
Garfield County, WA	8%	0%	0%	8%	2%
Union County, OR	8%	1%	1%	6%	5%
Douglas County, OR	7%	0%	1%	6%	6%
Crook County, OR	7%	0%	1%	6%	8%
Asotin County, WA	7%	0%	1%	5%	4%
Baker County, OR	7%	1%	1%	5%	4%
Idaho County, ID	7%	0%	4%	3%	3%
Deschutes County, OR	7%	1%	0%	5%	8%
Wheeler County, OR	6%	0%	1%	5%	10%

Grant County, OR	5%	0%	1%	4%	4%
Wallowa County, OR	5%	0%	1%	4%	3%
Adams County, ID	4%	0%	1%	3%	4%

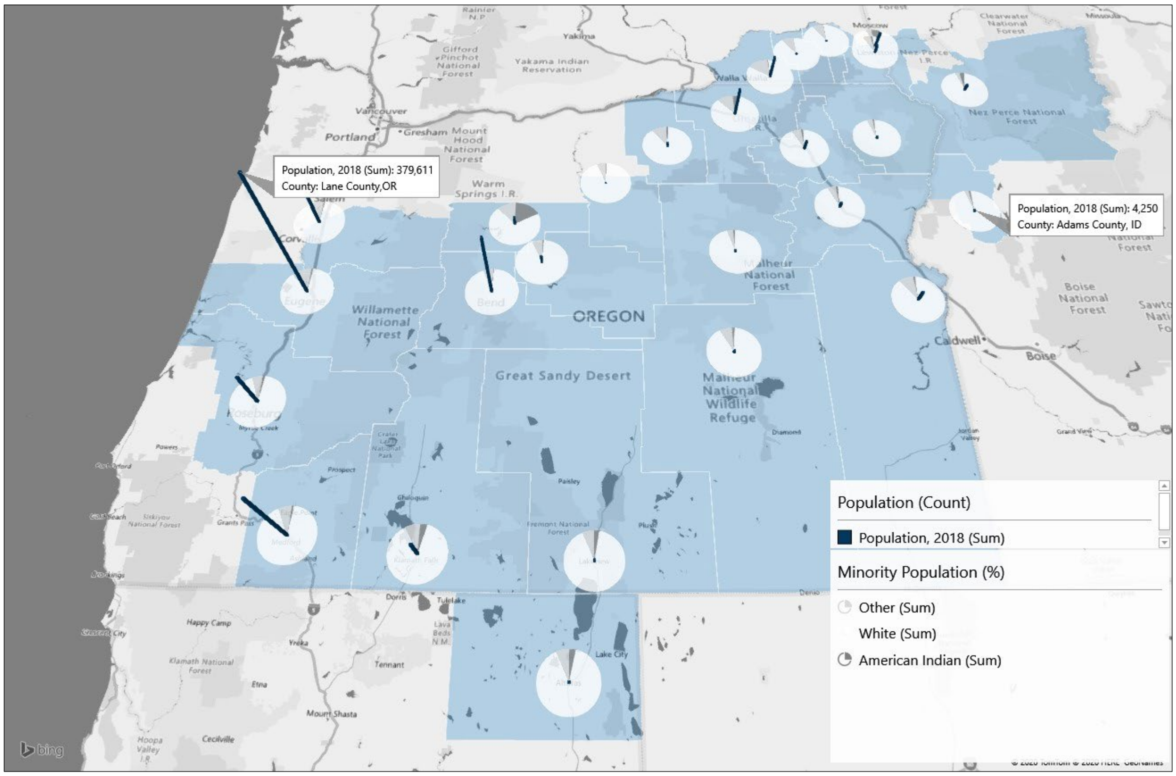

Figure 13. Map of the Analysis Area County Minority Populations (%, 2018). Source: Multiple Federal sources including County Business Patterns data, and multiple agencies. Accessed via Headwaters Economics EPS, https://headwaterseconomics.org

For more information on environmental justice communities see the “Social At-A-Glance” reports provided in the project record.

3.2.3.5 Benefits to People (Including Ecosystem Services)

National forests and grasslands provide public benefits (including ecological dependent benefits known as ecosystem services) such as timber, clean air and water, forage, and energy production. National Forest System lands also provide recreation, cultural and heritage opportunities that play an important role in how communities come together for physical and mental health, family, and to connect to the land. In many rural areas, the infrastructure, employment, goods and services provided are a basis for the structure of the community.

Across the Forests, benefits to people, including valued ecosystem services, include recreation opportunities and scenery, cultural and heritage resources, research and education, access, forest products, water and air, forage and botany of interest, minerals and more. For Forest specific information on benefits to people, refer to "Benefits to People At-A-Glance" reports provided in the project record.

Key ecosystem services reviewed in this analysis are those that have an importance to a wide group of people and may be potentially impacted by decisions within the scope of alternatives considered for a NEPA decision.

Of the broad categories of ecosystem services valued across the eastern Forests, forest products, cultural and heritage resources, wildlife presence through habitat management, and foraged botany are of the most relevance to the scope of the proposed amendment.

3.2.3.5.1 Forest Products (timber and other wood resources)

Forest products are of primary focus among other key ecosystem services due to the potential to be influenced by decision changes to Eastside Screens.

In terms of direct benefits to people, timber sale activities contribute to local income and employment opportunities, especially so in timber dependent communities. Douglas, Klamath, and Crook Counties, have a higher proportion of their population working in industries that generate income and employment from processing forest products and may be more susceptible to changes in timber market conditions, including supply of timber from National Forests.

Historically, harvested timber from the Forests in eastern Oregon and Washington was much higher in volume than it has been in more recent years (Figure 14). Harvested volumes have shrunk from a high in 1987 (1500 MMBF) down to a steady state level from 2000-2018, fluctuating around 200 MMBF annually. In 2018, 204 MMBF was harvested from the Forests in the analysis area. Given the duration of this new, steady period, forest product manufactures across this region will have long since adapted to the more limited timber availability from these National Forests. Industrial processing capacity needed to return to high volume harvest years would not be immediately available, and given the dynamics of competition for the production of structural lumber, especially, increasing volumes may not be strategically appropriate to firms operating in this particular subregion of the U.S.

The pattern of mill closures on the eastside is consistent with patterns across the West and elsewhere in the U.S. A review of the literature shows that mill closures result from a mix of factors, with timber supply changes being one contribution (Charnley et al. 2018). The importance of the federal timber supply to mill success is much greater, however, in areas such as the eastside where federal forests comprise most of the productive forestlands.

Complete loss of milling infrastructure would present a significant challenge to implementation of fuels reduction in frequent-fire forests. Prestemon et al. (2012) showed that if no timber products could be sold from forest restoration actions, there was no place in eastern Oregon or Washington where the expected net economic benefit from treatment would be positive, even when accounting for avoided wildfire damage because of fuel treatment. This implies that in the absence of the ability to sell timber: 1) all fuel treatments in eastern Oregon and Washington would have to be paid for, and 2) it makes little economic sense to do fuel treatments when the only economic benefit is potential avoided damage to property or natural resources from wildfire.

In general, mills have trended towards processing smaller logs over the last several decades (Gale et al. 2012, McIver et al. 2015). In some cases, mills on the eastside have added new infrastructure specifically focused on small-log processing (e.g., White 2018). Managers considering harvest of larger trees would need to be cognizant of input size restrictions of mills local to eastside forests, and their investments to recapitalize their infrastructure to more efficiently handle smaller material. Harvesting large trees from eastside forests only to have them shipped outside the local forest area for processing is inconsistent with community and local stakeholder motivations to positively affect local economies via restorative activities (White et al. 2015, Davis et al. 2018b, Brown 2019). Additional details on the forest products and timber industry in Oregon are available in the 21-inch Market Report, available in the project file. This short report details the Oregon industry size and trends along with identification of mills around the project area.

It is important to note that the relationship of the Eastside Screens, and changes to them, with potential harvest volume is not particularly strong. Silvicultural practices and timber sale administration allows for a great deal of substitution across species and dimension of trees available, not only in the market context, but specifically in the design and application of timber sale cutting units. Additionally, as discussed above industrial utilization across the West has greatly shifted towards smaller dimension timber, for economic and technological reasons. Larger dimension trees are more efficient for transportation costs but may be less desirable for sawmills that have transitioned capital for processing of smaller dimension timber. Lastly, it is anticipated that changes to Eastside Screens may increase the flexibility of timber sale designs to achieve project-level economic goals along with ecological ones, a result that may increase project efficiency, but not necessarily harvest volume supplied to market.

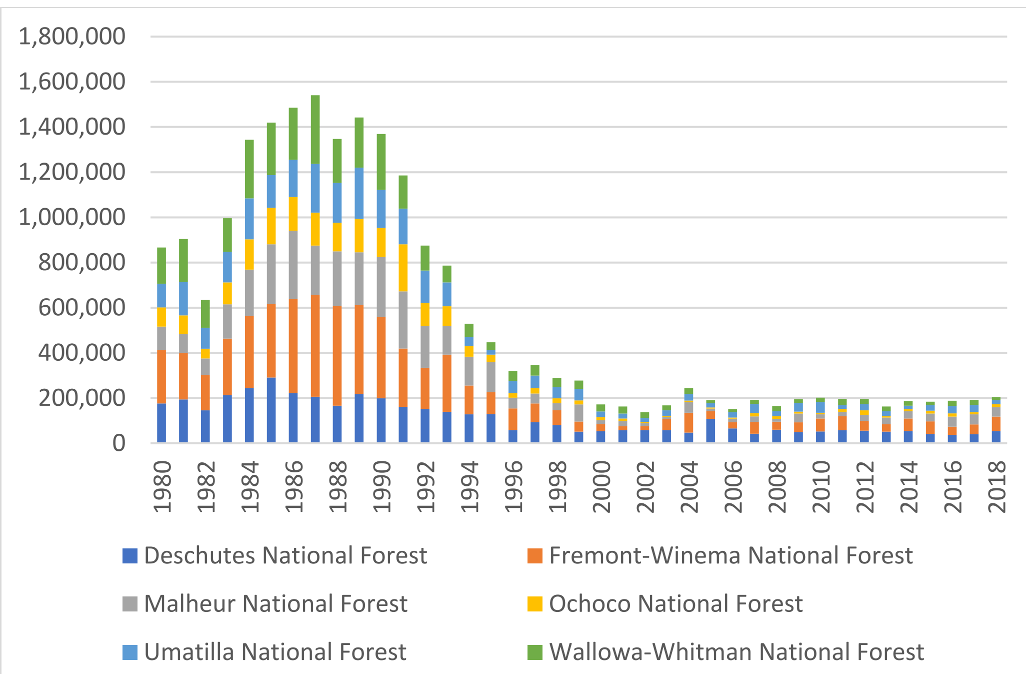

Figure 14. Timber Volume Cut from Six National Forests (MBF, 1980-2018)

Additional to timber, other wood resources for subsistence and other uses would be influenced and relevant to the scope of this project. This includes the availability of biomass, heating fuels, and other products that may result from commercial and non-commercial treatments under agency programmatic direction.

Fuels treatments specifically can generate additional raw materials for industry and subsistence uses. Like timber sales, treatment contracts can also influence local economics by generating income and employment for firms and proprietors located around National Forests.

Fuels treatment trends have decreases on some Forests, and increased on others, over the last forty years (Figure 15). For example, Deschutes National Forest has increased fuel treatments due to increasing WUI development, where fuels treatments are more critical for lowering asset risk during large fire events.

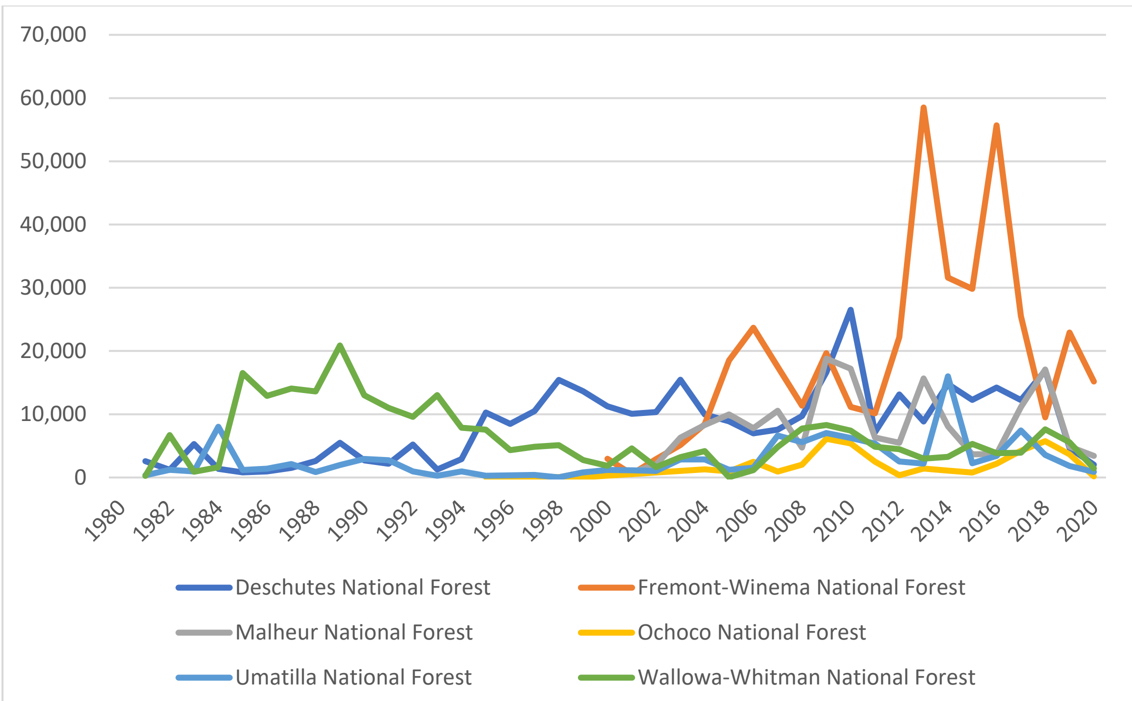

Figure 15. Annual Fuels Treatment Acreage from Six National Forests (Acres, 1980-2020).

3.2.3.5.2 Cultural and Heritage Resources

Regional cultural and heritage resources are of key interest with respect to Eastside Screens. In addition to specific sites, values are often associated with habitat types that foster diverse and culturally meaningful plants and animals, as well as important individual trees and groves. The proposed review and potential changes may involve important values that belong to tribal and other historically positioned communities and stakeholders.

Specifically, forests are important to tribes in part because of the environmental services they provide (e.g., filtering air and water); their role in sustaining habitats for fish and wildlife; the foods, medicines, fuels, and materials they produce; and their importance to tribal members' sense of place, all of which help sustain the lifeways, cultures, and spiritual practices of tribal members (Gordon et al. 2013). For example, California black oak (found across California and into southwest Oregon) is a cultural keystone species for many local tribes because it plays a fundamental role in their diet, materials, medicines, and/or spiritual practices (Long et al. 2016). Large-diameter oaks produce more acorns than small-diameter oaks, one of their most valued products (Long et al. 2016).

Another cultural keystone species important to PNW tribes is huckleberry, especially the thin-leaf huckleberry (Vaccinium membranaceum, Long et al. 2018, Steen-Adams et al. 2019). Forest tree size and distribution can have an impact on populations of thin-leaf huckleberry, which are most prevalent in open forest stands of the western Oregon Cascades (Kerns et al. 2004). The Sahaptin, Wasco, and Northern Paiute peoples (comprising the Confederated Tribes of Warm Springs) historically used fire in the moist mixed-conifer zone of the eastside Cascades to maintain and extend forest openings created by previous ignitions to promote huckleberry shrub productivity and access to harvest sites (Steen-Adams et al. 2019). Cultural burns ceased by the 1940s, causing forest canopy closure and encroachment of trees and shrubs. These changes contributed to a decline in huckleberry productivity in traditional harvest areas and declines in social and cultural traditions associated with huckleberry harvesting (Steen-Adams et al. 2019). Thus, it is important to consider how changes in forest management may affect culturally-important species.

Tribes also value large, old trees that have been culturally modified, bearing evidence of historic or prehistoric human forest uses, such as scars from wood, bark, or sap harvest. Some anthropogenic scars found on North American trees date back as far as the 1400s (Arno et al. 2008, Mobley and Eldridge 1992). For example, Deur (2009) describes Klamath and Modoc tribal use of sap and inner bark (or cambium) from pine (especially lodgepole pine, ponderosa pine, and junipers) in south-central Oregon and northeastern California. The Klamath Tribes' historical practice of harvesting cambium for food and medicinal use was also documented by earlier anthropologists (Coville 1897, Spier 1930). Today, culturally-modified trees provide Native American communities with a link to traditional cultural practices and beliefs, and a tie to the past (Deur 2009). They also provide information about traditional forest management practices, and beliefs about preservation and conservation, warranting further study (Turner et al. 2009). For instance, the partial harvest of tree products reflects a reverence for trees, as only parts of the tree were removed, keeping the tree alive (Zahn et al. 2018, Deur 2009, Turner et al. 2009). Government programs in the U.S. and Canada are crucial to the preservation of culturally-modified trees (Mobley and Eldridge 1992). Franklin et al. (2013:27) recommend conserving and restoring culturally-modified trees as a management goal on eastern Oregon forests.

Social-ecological systems in the PNW have been shaped by indigenous peoples over millennia, and there is great potential for integrating traditional ecological knowledge into forest management and decision-making (Long et al. 2018, Charnley et al. 2007, Steen-Adams et al. 2019). One effective way to do so is to directly engage traditional knowledge holders as active participants in forest planning, management, and implementation (Charnley et al. 2007). Collaboration in resource management can help build trust between the USFS and Native American tribes (Dockry et al. 2018). Other ways to build trust include upholding formal relationships and agreements, developing informal and personal relationships, practicing respect, listening, and demonstrating engaged leadership (Dockry et al. 2018).

The economic values associated with range, alone, are sizeable. In 2016, economic contributions from range resources across the six Forests in this analysis area provided an estimated direct employment of 820 jobs and millions in direct labor income associated with these jobs.

3.2.3.5.3 Wildlife and Wildlife-Based Recreation

Wildlife species present on National Forest System lands have varying levels of community interest and human-placed value. Effects to wildlife are covered in detail in section 3.2.4. In addition to sensitive, threatened, and endangered species, many others are important for hunting, viewing and existence values, and their vitality can contribute to social and economic conditions in surrounding communities.

3.2.3.5.4 Forage, Range and Botany

Similar to cultural and heritage resources, forage and range opportunities as well as botany species of interest have human-use and other economic and social value and may be influenced by changes to silvicultural practices. This benefit category includes resources within forest stands, as well as grazing opportunities on ranges lands leased by the Forest Service for cattle and other ranching businesses. For more information on botany, see the Botany section of the EA 3.2.5.

3.2.4 Environmental Effects

The proposed amendment, and the alternatives considered here, are programmatic and reflect changes to management practices, allowing for in some cases greater adaptivity to conditions found on the ground. Due to the limited scope of this amendment, and the unknowns associated with specific site and project activity, the potential social and economic effects described here are limited to qualitative, descriptive analysis, which are summarized in an ordinal ranking (Table 20) across alternatives.

The focus of this effects section is to identify the relative balance of key benefits to people, including ecosystem services, identifying any possible relative shift in benefit streams across alternatives. Key benefits are those that have a wide social or economic importance and, more importantly, have the potential to change as a result of a decision alternative. Below, the relative effects to key benefits are described in greater detail.

In summary of all alternatives (Table 20), available volume for forest products and jobs and income supported by the harvest of timber, and milling operations are ranked as having the highest benefit in the adaptive management alternative, second highest in the old tree standard alternative, third in the old tree and large tree guideline alternative, and lastly, forth under the current management alternative.

All other benefit types have the same or similar relative benefit ranking, across alternatives. That is, in total, all action alternatives are slightly, or higher, preferred over the current management alternative, for these remaining benefits listed below (Table 8). Benefit rankings indicate potential improvements to the overall human environment, both economically and socially, given the increased management flexibility offered by the action alternatives. Rankings were determined through a synthesis of resource discussions and analysis, as well as cumulative professional input.

There are multiple primary reasons for this ranking outcome. Foremost on the list, this result relates to increased potentially for larger natural disturbance impacts, under current management direction. Large fire events have the ability to remove or interrupt ecosystem services, and benefit streams that humans and communities enjoy, at greater scale and with less control in many cases, than human-sourced disturbances.

Another contributor to this ranking involves shading and encroaching habitat conditions. Older habitats and ponderosa pine encroachment can remove additional forage opportunities for recreation relates species, such as deer and elk, as well as for domestic cattle operations. They can also limit meadow and wetland retention, potentially affecting aquatic and terrestrial species that survive in these land types. Increased management flexibility leads to better fire management results, as well as habitat, current and future desired conditions.

Beyond over all rankings, for some species and resources there are important risk trade-offs to consider. For example, cultural resources include forage species like huckleberries, as well as characteristics such as large and old tree details that are impacted greatly by large fire events, in addition to disturbances by human activities. To the extent that action alternatives would improve fire event outcomes and limit the scale of impacts from natural disturbances relative to the slight increase in human disturbances, would represent an overall benefit, but still represent a risk trade-off. Similar risk trade-offs could be described for individual wildlife and plant species, as well as individual places and habitats with community significance. Analysis of individual species and resource details are available in respective resource sections of this EA.

Table 19. Alternative Ordinal Ranking Across Benefit Types

Benefit to People	Current Management Alternative	Old Tree and Large Tree Guideline Alternative (with Adaptive Management)	Old Tree Standard Alternative	Adaptive Management Alternative
Forest Products Resources	4th	3rd	2nd	1st
Jobs and Income Opportunities	4th	3rd	2nd	1st
Forage, Botany, Range Opportunities	2nd	1st	1st	1st
Cultural and Heritage Resources	2nd	1st	1st	1st
Wildlife and Wildlife-Based Recreation	2nd	1st	1st	1st
Aquatic Resources	2nd	1st	1st	1st

3.2.4.1 Effects Details for Forest Products

Volume availability was analyzed in the FVS model runs utilized in the vegetation section 3.2.1. The model was given the task to identify volume available for removal in commercial timber harvest as well as non-commercial thinning at intervals of time that were appropriate for silvicultural prescriptions. The result of the FVS model yielded the maximum available volume, across alternatives. Given the differences in stand management direction, each alternative yielded a slightly different total available volume. The following graphs visualize these differences across alternatives (Figure 16 - Figure 18: Alt0 – current management alternative, Alt1 - Old Tree and Large Tree Guideline Alternative (with Adaptive Management, Alt2 - Old Tree Standard Alternative, Alt3 - Adaptive Management Alternative).

Most notably, the Adaptive Management Alternative provided the highest level of management adaptability and therefore increased the available volume for treatment by approximately 45 percent over the current management alternative to 6.65 MMBF, compared to 4.60 MMBF under current management direction, in year one (Figure 17 and Figure 18). The old tree standard alternative and guideline alternative increase available volume as well, by 13 and 4 percent, respectively, or in volume terms 5.18 and 4.77 MMBF, respectively.

These potential volume availability differences do not represent Forest scheduled activities, or site-specific plans, but rather potential based on a density target. With increased volume available in the action alternatives, it is reasonable to assume that additional volume could be treated under the forest management projects of each Forest. As a result, the action alternatives provide increased potential for the support of income and employment associated with timber harvesting activities and forest products manufacturing.

Similar outcomes were determined for non-commercial volume available for removal. With the exception of a slight decrease in guideline alternative in year one, the action alternatives remain as productive, or better than the current management direction, in terms of offering smaller diameter wood resources for treatment (Figure 18).

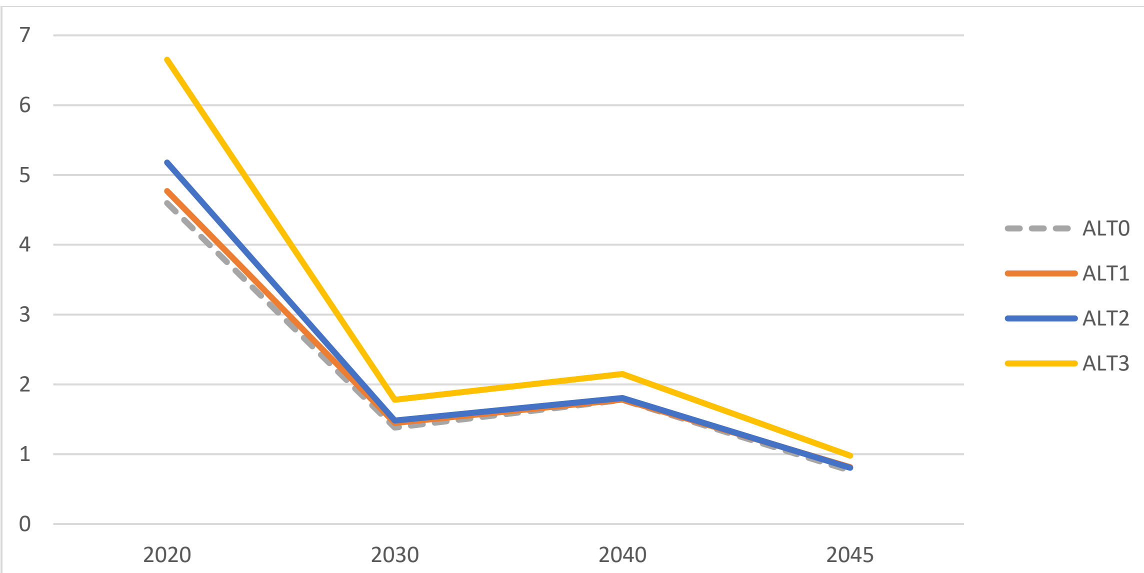

Figure 16. FVS modeled inventory of merchantable volume per alternative and event year in million board feet (MMBF).

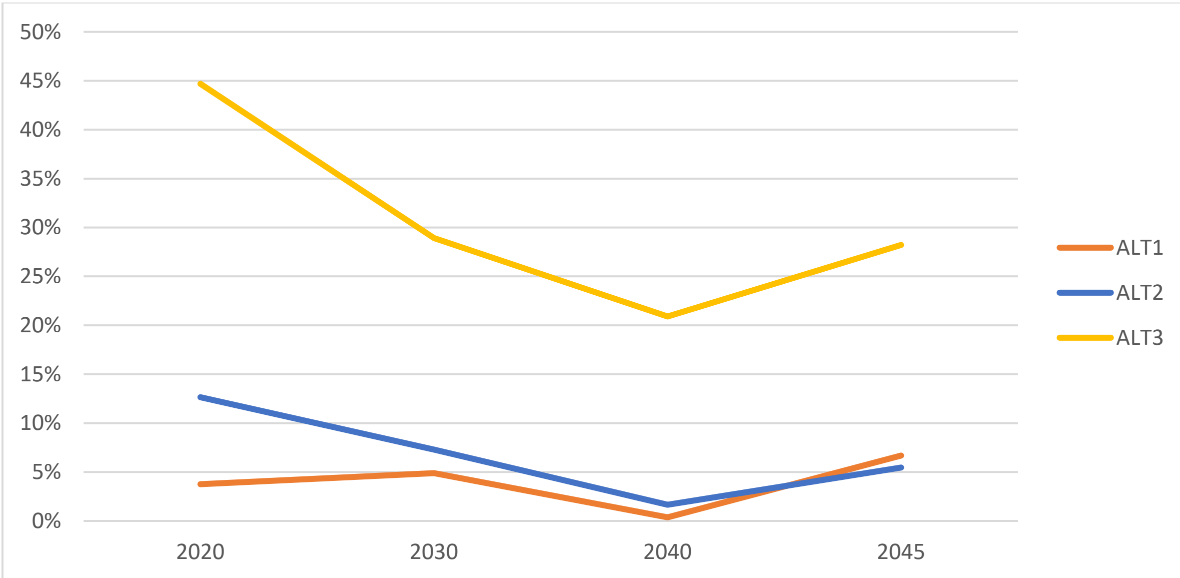

Figure 17. FVS modeled inventory of merchantable volume per alternative and event year (% above Current Management Alternative).

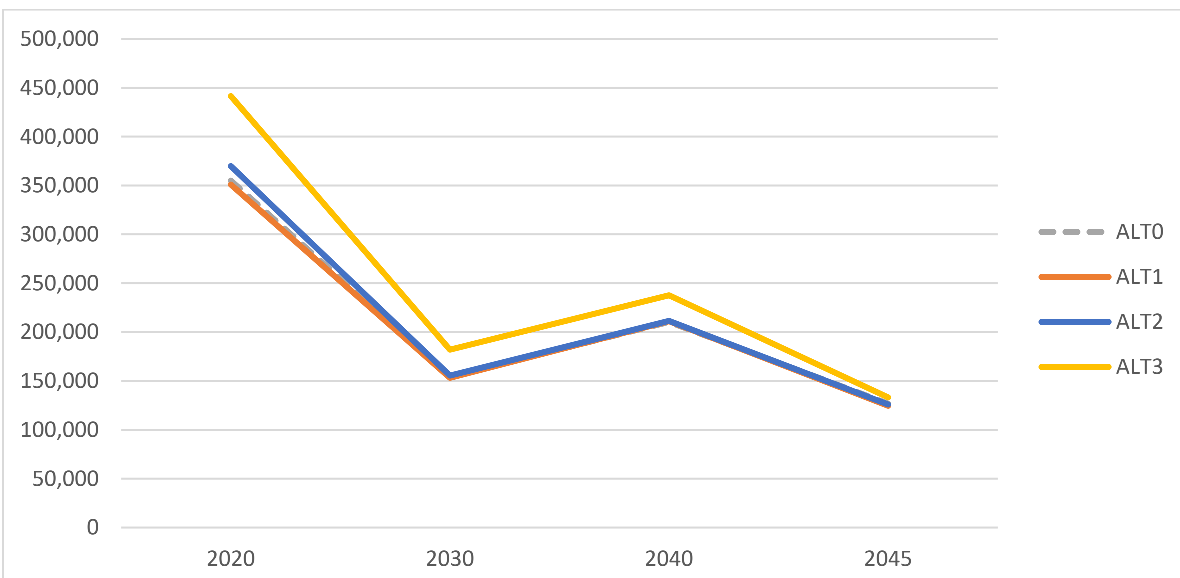

Figure 18. FVS modeled inventory of sub-merchantable volume per alternative and event year (Cubic Ft).

3.3 AQUATIC RESOURCES (FISHERIES)

The PACFISH and INFISH objectives, goals, standards and guides would not be changed. All management direction would remain the same within RHCAs for all six national forests (Table 13). PACFISH and INFISH management direction is similar to the goals of the amendment with regard to allowing vegetation treatments within RHCAs for the purposes of maintaining habitat that support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities (INFISH Appendix E; PACFISH Appendix C). Goals within PACFISH and INFISH strategies focus on ecological processes and functions under which riparian and aquatic ecosystems developed. These strategies do not limit the size of trees harvested within RHCAs. However, treatments cannot retard attainment of riparian management objectives (RMOs). Standards and guidelines within PACFISH and INFISH would still be applied at the project level in order to meet the RMOs. Since no changes will be made to these aquatic conservation strategies, a No Effect determination applies to all Threatened and Endangered, R6 Sensitive and MIS fish species (Table 14) in the analysis area.

Table 13. Aquatic Conservation Strategies by National Forest.

National Forest	Aquatic Conservation Strategy
Deschutes	INFISH
Fremont-Winema	INFISH
Malheur	INFISH & PACFISH
Ochoco	INFISH & PACFISH
Umatilla	PACFISH
Wallowa-Whitman	INFISH & PACFISH

Table 14. Threatened or Endangered (critical habitat present except where indicated), Management Indicator, Regional Forester Sensitive Fish Species on Each National Forest within the Amendment Area.

National Forest	Threatened or Endangered	MIS	RFSS
Deschutes	Bull Trout (*Salvelinus confluentus*) Steelhead – Middle Columbia River DPS (*Onchorhynchus mykiss*)	none	Inland Columbia Basin Redband Trout (*O. mykiss gairdneri*)
Fremont-Winema	Bull Trout Shortnose Sucker (*Chasmistes brevirostris*) Lost River Sucker (*Deltistes luxatus*) Warner Sucker* (*Catostomus warnerensis*)	All Salmonidae Family species found on the forest	Pacific Lamprey (*Entosphenus tridentatus*) Modoc Sucker (*Catostomus microps*) Goose Lake Sucker (*C. occidentalis lacusanserinus*) Pit Sculpin (*Cottus pitensis*)

			Miller Lake Lamprey (*Entosphenus minimus*) Pit Roach (*Lavinia symmetricus mitrulus*) Oregon Great Basin Redband Trout (*O. mykiss*) Oregon Lakes Tui Chub (*Siphateles bicolor oregonensis*) Goose Lake Tui Chub (*S. bicolor thalassina*)
Malheur	Bull Trout Steelhead – Middle Columbia River DPS	Bull Trout Steelhead – Middle Columbia River DPS Cutthroat Trout (*O. clarkii*) Redband Trout (*O. mykiss*)	Pacific lamprey Westslope Cutthroat Trout (*O. clarkii lewisi*) Inland Columbia Basin Redband Trout
Ochoco	Bull Trout Steelhead – Middle Columbia River DPS	Rainbow Trout (*O. mykiss*) Steelhead (*O. mykiss*)	Inland Columbia Basin Redband Trout
Umatilla	Bull Trout Steelhead – Middle Columbia River DPS Steelhead – Snake River DPS Chinook Salmon – Snake River Spring/Summer ESU* (*O. tshawytscha*) Chinook Salmon – Snake River Fall ESU	Rainbow Trout Steelhead	Pacific Lamprey Inland Columbia Basin Rainbow trout Westslope Cutthroat Trout Margined Sculpin (*Cottus marginatus*)
Wallowa-Whitman	Bull Trout Steelhead – Middle Columbia River DPS Steelhead – Snake River DPS Chinook Salmon – Snake River Spring/Summer ESU Chinook Salmon – Snake River Fall ESU	Redband/Rainbow Trout (*O. mykiss*) Steelhead	Pacific Lamprey Inland Columbia Basin Rainbow trout Westslope Cutthroat Trout

	Sockeye Salmon – Snake River ESU (*O. nerka*)		
* Critical habitat not located on National Forest Service lands, but actions can influence effects to species. DPS=Distinct Population Segment ESU=Environmentally Significant Unit			

3.4 WILDLIFE

3.4.1 Affected Environment

The planning area includes two broad ecoregions (based on the Level III ecoregions), the Blue Mountains Ecoregion of northeastern Oregon and southeastern Washington and the Eastern Cascades Ecoregion that occurs along north-south along the eastern portion of the Cascades mountains (Stine et al. 2014). The national forests associated with the Blue Mountains Ecoregion include the Umatilla, Malheur, and Wallowa-Whitman, and the national forests associated with the Eastern Cascades are the Deschutes, Ochoco, and Fremont-Winema (Table 16). These broad ecoregions have unique climate, topography, and disturbance regimes that interact to form a template upon which habitats are formed for a broad diversity of plant and animal species across the planning area.

There are four federally listed or proposed wildlife species that are Documented (D) or Suspected (S) to occur in the planning area, one species is Endangered (Gray wolf, Canis lupus), two species are Threatened (Oregon spotted frog, Rana pretiosa; Canada lynx, Lynx Canadensis), and one species is Proposed for listing (wolverine, Gulo gulo). In addition, there are 85 species that are on the Region 6 Sensitive Species list, including 25 bird species, eleven mammals, three amphibians, one reptile, and 45 invertebrates (USFS 2019).

There are a broad array of animal species across that planning area that are associated with Late and Old Structure (LOS)(Wisdom et al. 2000, Wales et al. 2011, Stine et al. 2014). The number of wildlife LOS associates includes federally listed mammal species and 14 Region 6 Sensitive Species. Of the R6 Sensitive Species that are associated with LOS, seven are bird species, two mammals, one amphibian, and four invertebrates.

3.4.1.1 Snags and Down Wood

Not all snags are created equal. Spatial scale, distribution, and species composition are relevant parameters when discussing the relationship of snags for wildlife as well as for ecological processes. It is often important to first take a broad approach looking at snag abundance across the landscape but follow with a more defined view at a smaller spatial scale. As an example, for most elements of vegetation structure and composition, change is usually slow (e.g., biomass increases as trees grow, species turnover as forest succession progresses, etc.). However, disturbance events, such as wildfire, timber harvesting, insect and disease outbreak, alter forest conditions rapidly over the course of days to years. At broad scales, slow, subtle trends may be difficult to capture and may be hard to differentiate from stable behavior (i.e., no change). Furthermore, is the trend ecologically meaningful? It is important to be well-aware of what constitutes an ecologically meaningful change in response variables. Scale is important when interpreting a perceived pattern.

For the broad-scale proposed amendment area of six forests, both the GNN Trend and Accounting Explorer (TrAccEr) and direct Forest Inventory and Analysis (FIA) plot data were used to illustrate snag abundance (estimated number of acres where snags greater than or equal to 20" d.b.h. were present). For annual FIA inventory, trend data are available for plots that have been measured twice using the same inventory plot design; these represent measurements from 2001-2007 and 2011-2017. The GNN Trend and

Accounting Explorer (TrAccEr) data were imputed utilizing FIA annual plots from 2001-2016, so trend data are available from 1995 to 2017.

Using the GNN Trend and Accounting Explorer (TrAccEr) estimates, the abundance of snags greater than or equal to 20” (50cm) has generally stayed the same between 1995 and 2017. The Deschutes and Ochoco National Forests have the lowest snag abundance, both viewed in terms of total acres and as a proportion of the total forest area. The largest increase in large snag abundance occurred on the Malheur. None of these changes were significant (Figure 19).

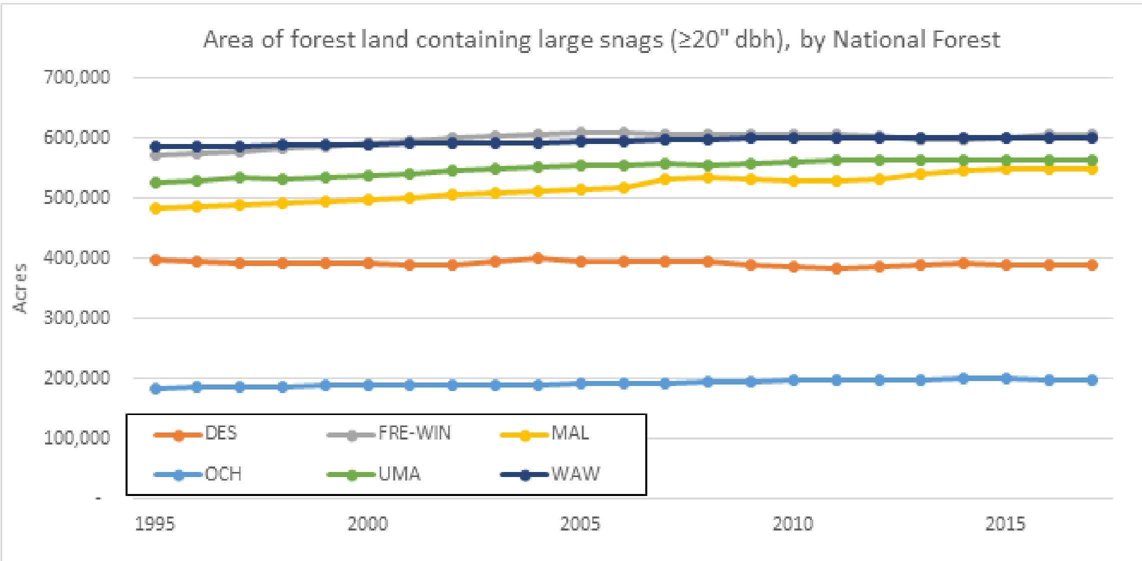

Figure 19. Abundance of large snags by National Forest, 1995-2017 GNN estimates. Abundance is estimated as the number of forested acres where at least one standing dead tree greater than or equal to 20” d.b.h. was present.

Using the FIA estimates, there was no statistically significant change in snag abundance on any of the six National Forests between years 2001-2007 and 2011-2017. A slight increase was observed for the Ochoco and for the Fremont portion of the Fremont-Winema, and a slight decrease for the remaining four forests (Table 15).

Table 15. Abundance of large snags by National Forest, 2001-2007 and 2011-2017 FIA data. Abundance is estimated as the number of forested acres where at least one standing dead tree greater than or equal to 20” d.b.h. was present.

Forest	2001-2007		2011-2017	
	Acres	SE	Acres	SE
DES	81,407	13,952	68,125	12,885
FRE-WIN	449,895	44,764	458,275	46,138
MAL	494,877	30,394	477,385	28,558
OCH	217,912	18,366	230,112	18,910

UMA	414,647	25,818	411,895	24,869
WAW	425,387	27,221	423,273	27,039

Wildlife Habitat Type (WHT) as referenced in Johnson and O'Neil and the DecAID tool was also analyzed using GNN Trend and Accounting Explorer (TrAccEr). The five WHTs present in eastern Oregon were examined across all ownerships and on National Forest land. Although a slight increase in large snag abundance was observed for each WHT, the degree of change was not significant over the 1995-2017 time period. There is lower total acreage of snags greater than or equal to 20" in the Lodepole pine WHT, (likely due to less acreage overall and fewer plots to draw data from), followed by the Montane Mixed Conifer and Ponderosa Pine/Douglas Fir WHT. The WHT with the highest abundance of snags greater than or equal to 20" is the Eastside Mixed Conifer/East Cascades Blue Mountains WHT (Figure 20).

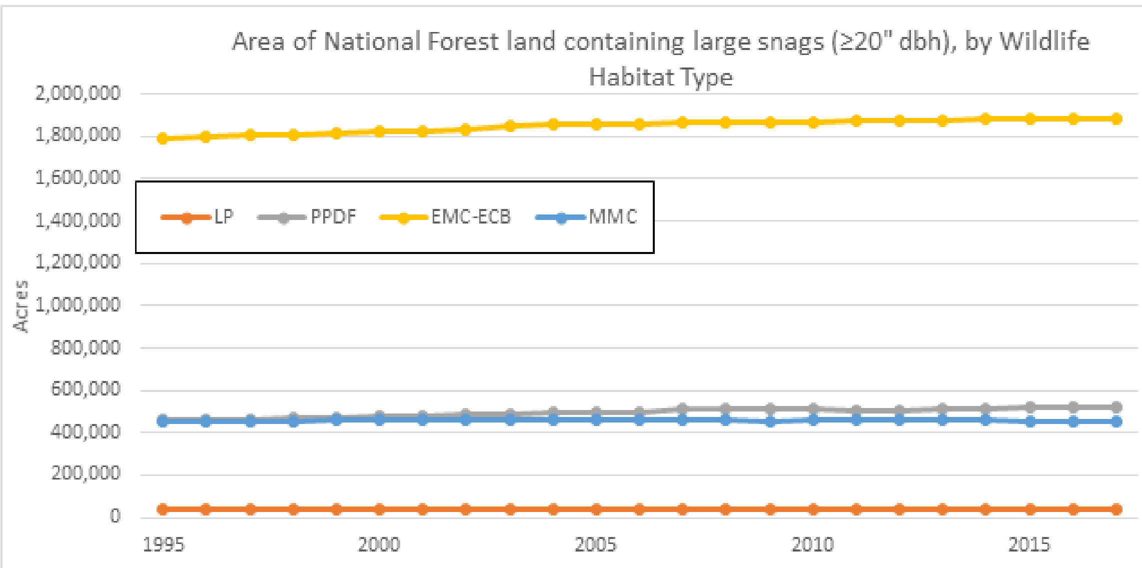

Figure 20. Abundance of large snags by Wildlife Habitat Type on National Forest lands within each WHT, 1995-2017 GNN estimates. Abundance is estimated as the number of forested acres where at least one standing dead tree greater than or equal to 20" d.b.h. was present.

In summary, we looked at three different data sets. Abundance by forest and by WHT using GNN Trend and Accounting Explorer (TrAccEr) and trend by forest using FIA. All three data sets revealed the following:

- There has been no significant change in snags greater than 20" in the analysis area over the time period assessed.

Down wood abundance and distribution can vary a great deal temporally, by forest, by vegetation type, by disturbance (large scale and small), and by other activities that may be occurring in the area (like firewood cutting). The best available science information at this time and at this spatial scale may not present an accurate representation for down wood. Furthermore, because this amendment will not change any of the standards or portions of the standards relative to down wood, an in-depth down wood analysis was not conducted. Forests will still be required to comply with existing forest plan standards and will use best available science to assess projects that might affect down wood.

3.4.1.2 Blue Mountains Ecoregion

The Federally listed wildlife species that are Documented (D) or Suspected (S) to occur on the Forests in the Blue Mountains Ecoregion include the gray wolf (D-Malheur), wolverine (D-Wallowa-Whitman, S-Umatilla, Malheur), and Canada lynx (S-Umatilla, Wallowa-Whitman). One of these species (Canada lynx) is associated with LOS. There are 41 R6 Sensitive wildlife species that are documented or suspected to occur on the Umatilla, of which eleven species are associated with LOS. There are 25 R6 Sensitive wildlife species on the Malheur National Forest, of which eight are associated with LOS. On the Wallowa-Whitman National Forest, there are 35 R6 Sensitive wildlife species, and nine are associated with LOS.

The current condition of wildlife habitats in the Blue Mountains shows that viability outcomes for a wide-range of species have declined from historical conditions (Wisdom et al. 2000, Wales et al. 2011, Stine et al. 2014, Gaines 2017). The species for which current viability outcomes have declined the least include those associated with multi-layered, closed canopy late and old structure (e.g., northern goshawk). This pattern is consistent across all three of the National Forests (Umatilla, Malheur, and Wallowa-Whitman) in the Blue Mountains Ecoregion.

The species whose current viability outcomes have declined the most from historical viability outcomes include those associated with open-canopy, single-strata late and old structure (e.g., white-headed woodpecker). Again, this pattern is consistent across the three National Forests that occur in the Blue Mountains Ecoregion.

3.4.1.3 East Cascades Ecoregion

The Federally listed or proposed wildlife species Documented (D) or Suspected (S) to occur on the Forests in the East Cascades Ecoregion include the gray wolf (S- Deschutes, D-Fremont-Winema), wolverine (S-Deschutes, Ochoco, Fremont-Winema), and Oregon spotted frog (D-Deschutes, Fremont-Winema). There are 29 R6 Sensitive wildlife species that are documented or suspected to occur on the Deschutes National Forest, of which eleven species are associated with LOS. There are 21 R6 Sensitive wildlife species on the Ochoco National Forest, of which 6 are associated with LOS. On the Fremont-Winema National Forest, there are 39 R6 Sensitive wildlife species, and nine are associated with LOS.

The condition of wildlife habitats in the East Cascades Ecoregion shows that the viability outcomes for a wide-range of species have declined from historical conditions (Wisdom et al. 2000, Stine et al. 2014, Haugo et al. 2015). The species for which current viability outcomes have declined the least include those associated with multi-layered, closed canopy late and old structure (e.g., northern goshawk)(Wisdom et al. 2000, Stine et al. 2014, Haugo et al. 2015). Some watersheds, particularly in the southern portion of the East Cascades Ecoregion (e.g., Fremont-Winema National Forest) showed increases in the availability of habitats for these species (Wisdom et al. 2000).

The species whose current viability outcomes have declined the most from historical viability outcomes include those associated with open-canopy, single-strata late and old structure (e.g., white-headed woodpecker)(Wisdom et al. 2000, Stine et al. 2014). Strong declines in viability outcomes are most pronounced in the northern and central portions of the Eastern Cascades Ecoregion, while habitat conditions are closer to historical conditions in the southern portion of the ecoregion (Wisdom et al. 2000).

Table 16. A summary of the suspected or documented TEP, R6 Sensitive, and MIS wildlife species (invertebrates and vertebrates) in the planning area and the number of species associated with late and old forest structure.

Species Status	National Forests in the Blue Mountains Ecoregion			National Forests in the East Cascades Ecoregion		
	Umatilla	Malheur	Wallowa-Whitman	Deschutes	Ochoco	Fremont-Winema
Wildlife						
No. Federally Listed Species	2	3	2	4	1	4
No. Federally Listed Species-LOS Associate	1	1	1	0	0	0
No. R6 Sensitive/MIS	41	25	35	29	21	39
No. R6 Sensitive/MIS-LOS Associate	11	8	9	11	6	9

3.4.1.4 Deer and Elk

Mule deer and Rocky Mountain elk are management indicator species used by the national forests in eastern Oregon. Deer and elk have considerable cultural, economic, and ecological values (ODFW 2003a,b).

Mule deer are widespread in eastern Oregon, and the population objective is about 350,000 (ODFW 2003a). The national forests in the planning area provide important summer range, which generally consists of adequate forage, cover, and security from disturbance. Fire exclusion has allowed forests to become denser, reducing the abundance and diversity of understory plants that provide mule deer forage. The application of thinning and prescribed fire can dramatically increase understory plant diversity and productivity, and restore forage availability for mule deer (Hull et al. 2020).

The Rocky Mountain elk population objective in eastern Oregon is about 72,000 elk, with major populations occurring in the Blue Mountains and in south-central Oregon (ODFW 2003b). The national forests in eastern Oregon provide much of the summer range that elk use. Summer elk forage consists of lush forbs, grasses and shrubs high in nutrients and easily digestible. Generally, higher elevation wet meadows, springs, and riparian areas in close proximity to forest cover offers these condition for the longest period into summer. Elk achieve peak body condition in the late summer and fall and their winter survival and productivity depend on their ability to develop fat reserves from the forage they consume during the summer. The application of thinning and prescribed fire to restore forest structure and composition can alter elk forage and cover, and fire suppression has resulted in an increase in closed-canopy forests throughout much of eastern Oregon forests (Haugo et al. 2015). Removal of tree canopy (to <40%) in dry forests using thinning and prescribed fire treatments can increase the availability of forage for elk by 2-3 times compared to closed-canopy forest conditions (Lehmkuhl et al. 2013).

3.4.1.5 Wildlife and Climate Change

Climate projections suggest year-round warming and declines in summer precipitation throughout the western US. This will have profound effects on the wildfire regimes of the Pacific Northwest with fire seasons lengthening and burned area increasing. Modeling suggests that burned area will increase by three to four times, individual fire sizes will increase, and fire severity will increase where forests are dense and layered with abundant woody fuels. The effects of a changed fire regime will interact with other stressors creating even more change in the forested ecosystems.

The anticipated climatic changes to eastern Oregon environments are likely to result in a variety of effects to wildlife populations and their habitats (Stine et al. 2014, Halofsky and Peterson 2016). A striking conclusion reached from several climate change studies is the degree of change that has already occurred to wildlife habitat and populations (Root et al. 2003, Lawler and Mathias 2007). There are a range of responses of wildlife to changing climatic conditions that have occurred, are occurring, or are anticipated to occur including: changes in species distributions, changes in the timing of breeding and other life history activities, changes in pathogens and invasive species distributions, changes in survival and extinction risks, and changes in the interactions among species (Stine et al. 2014). An important climate change impact that influences wildlife habitats is the documented increase in the amount and area burned of wildfires (Westerling et al. 2006, Westerling 2016) and the anticipated 2-4 fold increase in fires expected in the inland west by the 2040s (Littell et al. 2009). Climate adaptations that increase the resiliency of forested wildlife habitats to increased wildfire and other disturbances are important to sustaining viable wildlife populations (Halofsky and Peterson 2016).

3.4.1.6 Federally Listed Species

The federally listed species documented to occur in the planning area include the gray wolf, wolverine, and Columbia spotted frog.

3.4.1.7 Gray Wolf and Wolverine

The gray wolf and wolverine are habitat generalists, meaning they are not closely associated with any one type of vegetation or habitat. They are wide ranging species and are adaptable in their prey selection. However, the primary prey of gray wolves (deer and elk) will be addressed. The scope of this amendment has limited potential to affect gray wolves and wolverines. For more information see the wildlife report in the project record.

3.4.1.8 Columbia Spotted Frog

The Columbia spotted frog occurs on two of the six forests where the proposed amendment will apply. It will not be further evaluated in the analysis because the proposed action and alternatives don’t include changes to PACFISH/INFISH or other forest management plan standards and guidelines in the planning area.

3.4.1.9 Canada Lynx

Canada lynx is also a federally listed species and is suspected to occur in the Blue Mountains ecoregion of the planning area. Lynx are closely associated with mid and upper elevation subalpine fir forests (Aubry et al. 2000, ILBT 2013). The Blue Mountains are identified as a Peripheral Area by the US Fish and Wildlife Service (USFWS 2005) and in the lynx conservation strategy (ILBT 2013). There is no designated Critical Habitat for Canada lynx in the planning area (USFWS 2014). Canada lynx will not be further addressed in this analysis for the following reasons: (1) the uncertainty of lynx occurrence in the planning area, (2) the lack of any designated critical habitat in the planning area, (3) the only lynx conservation measure is consistent with the Eastside Screen (USFS 1995) emphasis on managing LOS habitats within the historic range of variation, and (4) project specific analyses would still be required to address any site-specific effects that projects may have on federally listed species.

3.4.2 Environmental Effects

3.4.2.1 Indicators and Wildlife Information Common to All Alternatives

3.4.2.1.1 Federally Listed Species – Gray Wolf and Wolverine

Previous programmatic consultations for forest management activities, including vegetation management, have established protection guidelines to reduce disturbance to gray wolf den and rendezvous sites on the national forests for which gray wolves are federally listed. All alternatives may affect, but would not likely adversely affect gray wolves, and may impact, but would not lead to federal listing of the wolverine.

Deer and elk are the primary prey species of gray wolves (Endangered-East Cascades Forests, R6 Sensitive Species-Blue Mountains Forests) and an important prey component for wolverine (Proposed Threatened-Documented on Wallowa-Whitman National Forest, suspected on the other five Forests). The effects of this alternative on deer and elk are presented below.

3.4.2.1.2 Late and Old Structure Associated Wildlife Species

Forest activities that directly influence the viability of LOS associated species and that are relevant to this amendment include the loss of LOS habitat from fire (Healy et al. 2008, Davis et al. 2011, 2015), vegetation treatments (e.g. timber harvest, thinning, prescribed fire) that affect forest structure (e.g., canopy closure, snags, down wood) (Healy et al. 2008, Wisdom and Bate 2008, Davis et al. 2011), and protection of riparian areas which are an important element of LOS habitat for some species (e.g., bald eagles). Riparian habitats are managed under PACFISH/INFISH (USFS 2005) (see above).

3.4.2.1.3 Habitat Sustainability and Resiliency

Since the mid-1980s, the area burned by large wildfires in the western United States has increased markedly (Westerling et al. 2006, Westerling et al. 2016, Halofsky and Peterson 2017, Halofsky et al. 2019), due, in part, to a reduction in fuel moisture driven by increased temperature and lower snowpack. The increase in fire risk and severity has also been driven, in part, by an increase in fuel loads because of fire suppression practices used over the last century (McKenzie et al. 2004). Predicted increases in spring and summer temperatures would exacerbate the frequency and intensity of disturbances such as fire (McKenzie et al. 2004, Wotton and Flannigan 1993) and defoliation caused by forest insects (Littell et al. 2009). In the Interior Columbia Basin, which includes this planning area, Littell et al. (2009) predict that the area burned is likely to double or even triple by 2050. Climate-driven changes in fire regimes would likely be the dominant driver of changes to forests and LOS habitats in the western United States over the next century. Climate change adaptations include the application of active forest management to reduce fire severity and restore stand and landscape resiliency (Halofsky et al. 2019).

Table 17. Key Indicators Used to Assess Potential Effects to Wildlife Habitats and Species.

Wildlife Habitat Issue	Wildlife Habitat Group	Key Indicators
Late and old forest habitat	LOS associated species • Late-closed habitat • Late-open habitat	The amount and trends in Late-closed habitat The amount and trends in Late-open habitat
Large trees, old trees, and large Snags	LOS associated species	Trends in the availability of large trees and large snags
Conifer encroachment into meadows and wetlands	Meadow and wetland associated species	Ability to manage conifer encroachment into special habitats
Availability and quality of forage for deer and elk	Management Indicator Species	Treatment that reduces canopy closure to <40%
Resilience of forested wildlife habitats	LOS associated species and other species associated with forested habitats	Ability to restore disturbance regimes and sustain wildlife habitat

3.4.2.2 Current Management Alternative

3.4.2.2.1 Late and Old Structure Associated Wildlife Species

The continued implementation of this alternative would result in a steady increase in the amount of late-closed habitat as a result of forest succession, and a low rate of increase in the amount of late-open habitat (Table 18). This alternative would provide for the viability of wildlife species associated with late-closed habitats (e.g., northern goshawk-MIS, and fisher-R6 Sensitive Species Fremont-Winema National Forest). However, the viability of species associated with late-open habitats would continue to decline and their viability outcomes (e.g., white-headed woodpecker-R6 Sensitive Species) are already well below historical conditions (Wisdom et al. 2001, Wales et al. 2011, Mellen-McLean et al. 2013, Gaines 2017).

Table 18. Current Amount and Trends for Late and Old Structure (LOS) Habitat under Current Management Alternative.

Potential Natural Vegetation Zone	Late and Old Structure Habitat	Trend 1995 to Present	Predicted Trend Present to +25 Years
Dry	Late-Open	Slight Increase	Low rate of Increase
	Late-Closed	Considerable Increase	Steady Increase*
Moist	Late-Open	Little Change	Low rate of Increase
	Late-Closed	Increase	Steady Increase*
Cold	Late-Open	Increase	No change expected
	Late-Closed	No Change	No change expected

*Increasing risk of habitat loss from large-scale high severity wildfire.

This alternative includes plan components for key elements of old forest habitat. This alternative includes a standard limiting the harvest of large live trees ≥21 inches dbh. This alternative does not provide for the retention of trees with old tree characteristics that are <21 inches dbh, and they are expected to decline over time due to a combination of stressors: competition, fire, insects, diseases and drought. The trend in the amount of trees >21 inches dbh varies by species. Since 1995, the tree species associated with dry forest (sugar pine, ponderosa pine, Douglas-fir) increased in abundance across the planning area, as did those associated with mixed conifer forests (white fir/grand fir). Tree species typically associated with late-open forest conditions would have increased more except they experienced high mortality from insects, disease and fire.

This alternative also includes management direction for large snags and green tree replacements, but desired snag levels are based on outdated scientific information (e.g., population potential for primary cavity excavators) that limits the contribution to the viability of species associated with snag habitats (Bull and Holthausen 1993) and does not provide specific guidelines on characteristics that optimize snag recruitment through green tree retention.

3.4.2.2.2 Meadow and Wetland Habitats

The tree diameter limit associate with this alternative has limited the ability to remove conifers encroaching on meadows and wetlands, thus reducing the contribution to the viability of species associated with these habitats.

3.4.2.2.3 Deer and Elk

Current management direction has limited the amount of forest treatments used to reduce canopy closure in closed-canopy forest habitats that have increased as a result of fire suppression and past management practices (Stine et al. 2014, Haugo et al. 2015, DeMeo et al. 2018, Hessburg et al. 2020). As a result, the amount of forage available for deer and elk has been reduced. This alternative would continue to limit the application of restoration treatments that can be applied to increase the quality and quantity of forage for deer and elk (Endress et al. 2012, Lehmkuhl et al. 2013, Hull et al. 2020). Deer and elk are the primary prey species of gray wolves and an important prey component for wolverine.

3.4.2.2.4 Habitat Sustainability and Resiliency

This alternative would limit the ability to apply active management to restore forest resiliency and enhance the sustainability of LOS habitats and other forested habitats.

3.4.2.2.5 Current Management Alternative Wildlife Summary

Implementation of this alternative would make a relatively low contribution to the viability of wildlife species associated with late-open habitats, whose viability outcomes (Viability Outcomes D and E, Appendix B) are well below their historical viability outcomes (Wisdom et al. 2000, Wales et al. 2011, Gaines et al. 2017). This alternative limits the ability to restore meadow and wetland habitats, and limits the ability to apply restoration treatments that reduce tree canopy closure and enhance elk and deer forage. This alternative would maintain the viability of species associated with late-closed habitats (Viability Outcomes A and B), though these habitats would be at relatively high risk of loss to uncharacteristically severe wildfires.

3.4.2.3 Old Tree and Large Tree Guideline Alternative (with Adaptive Management)

3.4.2.3.1 Key Assumption for this Alternative

Monitoring is carried out in a way that allows changes in the availability of large and old trees to be detected in a timely fashion so that adaptive management occurs before the viability outcome of any MIS or R6 Sensitive Species is reduced.

3.4.2.3.2 Late and Old Structure Associated Wildlife Species

The implementation of this alternative would result in an increase in the amount of late-closed habitat as a result of forest succession, though at a slower rate than the Current Management Alternative. This alternative would result in a low-moderate increase in the amount of late-open habitat as treatments are implemented that restore open structure and emphasize disturbance-resistant tree species (Table 19). This alternative would provide for the viability of wildlife species associated with late-closed habitats (e.g., northern goshawk-MIS, fisher-Proposed-Fremont-Winema National Forest), and contribute to the viability of species associated with late-open habitats (e.g., white-headed woodpecker-R6 Sensitive Species), whose viability outcomes are already well below historical conditions (Wisdom et al. 2001, Wales et al. 2011, Mellen-McLean et al. 2013, Gaines 2017).

Table 19. Current Amount and Trends for Late and Old Structure (LOS) Habitat under the Old and Large Tree Guideline Alternative.

Potential Natural Vegetation Zone	Late and Old Structure Habitat	Trend 1995 to Present	Predicted Trend Present to +25 Years
Dry	Late-Open	Slight Increase	Low-moderate Increase
	Late-Closed	Considerable Increase	Increase*
Moist	Late-Open	Little Change	Low-moderate Increase
	Late-Closed	Increase	Increase*
Cold	Late-Open	Increase	No change expected
	Late-Closed	No Change	No change expected

*Declining risk of habitat loss from large-scale high severity wildfire

This alternative includes plan components for key elements of old forest habitat. This alternative includes a guideline limiting the harvest of old trees regardless of tree size or species (Van Pelt 2008). Old trees are a key habitat component for LOS associated species. This alternative includes plan guidance to retain large trees to meet future LOS structural objectives and green trees for future large snags. This alternative would facilitate the management of large and old trees so that the impact of stressors such as competition, fire, insects, diseases and drought, would be reduced. This alternative would result in a continued increase in the abundance of large trees while moving species composition towards more resilient and sustainable conditions.

This alternative also includes management direction to retain large (>20 inches dbh) snags and to manage green tree replacements based on recent science (Mellen-McLean et al. 2017), or requires that a snag habitat assessment using best available science be completed to maintain or increase habitat for snag dependent species and provides an important structural component of habitat for LOS associated species.

3.4.2.3.3 Meadow and Wetland Habitats

Implementation of this alternative would increase the ability to remove conifers that have encroached on meadows and herbaceous wetlands, thus contributing to the viability of species associated with these habitats.

3.4.2.3.4 Deer and Elk

The implementation of this alternative would increase the amount of forest restoration treatments used to reduce canopy closure in the closed-canopy forest habitats that have increased as a result of fire suppression and past management practices (Haugo et al. 2015). As a result, the amount of forage available for deer and elk would be increased as understory plant diversity and composition is restored (Endress et al. 2012, Lehmkuhl et al. 2013, Hull et al. 2020).

3.4.2.3.5 Habitat Sustainability and Resiliency
This alternative would result in a declining risk of habitat loss because it allows for active management to restore forest resiliency and enhance the sustainability of LOS habitats and other forested habitats (Halofsky et al. 2019). Restoration treatments that include thinning and prescribed fire have been shown to reduce fire severity, increase large tree survival and, depending on the spatial location, alter fire behavior (Prichard et al. 2010, 2020).

3.4.2.3.6 Old and Large Tree Guideline Alternative Wildlife Summary
Implementation of this alternative would make a moderate contribution to the viability of wildlife species associated with late-open habitats, whose viability outcomes (Viability Outcomes D and E, Appendix B) are well below their historical viability outcomes (Wisdom et al. 2000, Wales et al. 2011, Gaines et al. 2017). This alternative facilitates the application of treatments to restore meadow and wetland habitats, and restoration treatments that reduce forest canopy closure and enhance elk and deer forage. This alternative would maintain the viability of species associated with late-closed habitats (Viability Outcome A or B), and reduce the risk of loss to uncharacteristically severe wildfires. This alternative would enhance the resiliency of forested habitats and the sustainability of LOS habitats.

3.4.2.4 Old Tree Standard Alternative

3.4.2.4.1 Federally Listed Species – Gray Wolf and Wolverine
Deer and elk are the primary prey species of gray wolves and an important prey component for wolverine. The effects of this alternative on deer and elk are presented below.

3.4.2.4.2 Late and Old Structure Associated Wildlife Species
The implementation of this alternative would result in an increase in the amount of late-closed habitat as a result of forest succession, though at a slower rate than the Current Management Alternative (Table 20). This alternative would result in a low-moderate increase in the amount of late-open habitat as treatments are implemented that restore open structure and emphasize disturbance-resistant tree species. This alternative would provide for the viability of wildlife species associated with late-closed habitats (e.g., northern goshawk-MIS, fisher-Proposed-Fremont-Winema National Forest), and contribute to the viability of species associated with late-open habitats (e.g., white-headed woodpecker-R6 Sensitive Species), whose viability outcomes are already well below historical conditions (Wisdom et al. 2001, Wales et al. 2011, Mellen-McLean et al. 2013, Gaines 2017).

Table 20. Current Amount Trends for Late and Old Structure (LOS) Habitat Under Old Tree Standard Alternative.

Potential Natural Vegetation Zone	Late and Old Structure Habitat	Trend 1995 to Present	Predicted Trend Present to +25 Years
Dry	Late-Open	Slight Increase	Low-moderate Increase
	Late-Closed	Considerable Increase	Increase*
Moist	Late-Open	Little Change	Slight Increase
	Late-Closed	Increase	Increase*
Cold	Late-Open	Increase	No change expected
	Late-Closed	No Change	No change expected

*Declining risk of habitat loss from large-scale high severity wildfire

This alternative includes plan components for key elements of old forest habitat. This alternative includes a standard limiting the harvest of old trees regardless of tree size or species (Van Pelt 2008). Old trees are a key habitat component for LOS associated species. This alternative includes plan guidance to retain large trees to meet future LOS structural objectives and green trees for future large snags. This alternative would facilitate the management of large and old trees so that the impact of stressors such as competition, fire, insects, diseases and drought, would be reduced. This alternative would result in a continued increase in the abundance of large trees while moving species composition towards more resilient and sustainable conditions. This alternative will develop old forest conditions with multiple cohorts of tree ages and size classes that will foster structural diversity as would be expected in fire prone ecosystems.

This alternative also includes management direction to retain large (>20 inches dbh) snags and to manage green tree replacements based on recent science (Mellen-McLean et al. 2017), or that a snag habitat assessment using best available science be completed to maintain or increase habitat for snag dependent species, and provides an important structural component of habitat for LOS associated species.

3.4.2.4.3 Meadow and Wetland Habitats

Implementation of this alternative would increase the ability to remove conifers that have encroached on meadows and wetlands, thus contributing to the viability of species associated with these habitats.

3.4.2.4.4 Deer and Elk

The implementation of this alternative would increase the amount of forest restoration treatments used to reduce canopy closure in the closed-canopy forest habitats that have increased as a result of fire suppression and past management practices (Haugo et al. 2015). As a result, the amount of forage available for deer and elk would be increased as understory plant diversity and composition is restored (Endress et al. 2012, Lehmkuhl et al. 2013, Hull et al. 2020).

3.4.2.4.5 Habitat Sustainability and Resiliency

This alternative would result in a declining risk of habitat loss because it allows for active management to restore forest resiliency and enhance the sustainability of LOS habitats and other forested habitats (Halofsky et al. 2019). Restoration treatments that include thinning and prescribed fire have been shown to reduce fire severity, increase large tree survival and, depending on the spatial location, alter fire behavior (Prichard et al. 2010, 2020).

3.4.2.4.6 Old Tree Standard Alternative Wildlife Summary

Implementation of this alternative would make a moderate contribution to the viability of wildlife species associated with late-open habitats, whose viability outcomes (Viability Outcomes D and E, Appendix B) are well below their historical viability outcomes (Wisdom et al. 2000, Wales et al. 2011, Gaines et al. 2017). This alternative would facilitate the application of treatments to restore meadow and wetland habitats, and restoration treatments that reduce forest canopy closure and enhance elk and deer forage. This alternative would maintain the viability of species associated with late-closed habitats (Viability Outcomes A and B, Appendix A), and reduce the risk of loss to uncharacteristically severe wildfires. This alternative would enhance the resiliency of forested habitats and the sustainability of LOS habitats.

3.4.2.5 Adaptive Management Alternative

3.4.2.5.1 Key Assumption for this Alternative

Monitoring is carried out in a way that allows changes in the availability of large and old trees to be detected in a timely fashion so that adaptive management occurs before the viability outcome of any MIS or R6 Sensitive Species is reduced.

3.4.2.5.2 Late and Old Structure Associated Wildlife Species

The implementation of this alternative would result in an increase in the amount of late-closed habitat as a result of forest succession, though at a slower rate than the Current Management Alternative. This alternative would result in a low-moderate increase in the amount of late-open habitat as treatments are implemented that restore open structure and emphasize early-seral tree species (Table 21). This alternative would provide for the viability of wildlife species associated with late-closed habitats (e.g., northern goshawk-MIS, fisher-Proposed-Fremont-Winema National Forest), and contribute to the viability of species associated with late-open habitats (e.g., white-headed woodpecker-R6 Sensitive Species), whose viability outcomes are already well below historical conditions (Wisdom et al. 2001, Wales et al. 2011, Mellen-McLean et al. 2013, Gaines 2017).

Table 21. Current amount, and past and future trends on late and old structure (LOS) habitat as a result of the implementation of Alternative D (adaptive management).

Potential Natural Vegetation Zone	Late and Old Structure Habitat	Trend 1995 to Present	Predicted Trend Present to +25 Years
Dry	Late-Open	Slight Increase	Low-moderate Increase
	Late-Closed	Considerable Increase	Increase*
Moist	Late-Open	Little Change	Low-moderate Increase
	Late-Closed	Increase	Increase*
Cold	Late-Open	Increase	No change expected
	Late-Closed	No Change	No changed expected

*Declining risk of habitat loss from large-scale high severity wildfire

This alternative does not include standards or guidelines for key elements of old forest habitat but relies monitoring and adaptive management to determine if large and old trees are being retained to move toward LOS habitat objectives. This alternative is likely to increase the abundance of large trees while the continued decline of old trees is anticipated. This alternative includes desired conditions to retain large trees to meet future LOS structural objectives and green trees for future large snags.

This alternative also includes management direction to retain large (>20 inches dbh) snags and to manage green tree replacements based on recent science (Mellen-McLean et al. 2017), or that a snag habitat assessment be completed using best available science to maintain or increase habitat for snag dependent species, and provides an important structural component of habitat for LOS associated species.

3.4.2.5.3 Meadow and Wetland Habitats

This implementation of this alternative would increase the ability to remove conifers that have encroached on meadows and herbaceous wetlands, thus contributing to the viability of species associated with these habitats.

3.4.2.5.4 Deer and Elk

The implementation of this alternative would increase the amount of forest restoration treatments used to reduce canopy closure in the closed-canopy forest habitats that have increased as a result of fire suppression and past management practices (Haugo et al. 2015). As a result, the amount of forage available for deer and elk would be increased as understory plant diversity and composition is restored (Endress et al. 2012, Lehmkuhl et al. 2013, Hull et al. 2020).

3.4.2.5.5 Habitat Sustainability and Resiliency

This alternative would result in a declining risk of habitat loss because this alternative allows for active management to restore forest resiliency and enhance the sustainability of LOS habitats and other forested habitats (Halofsky et al. 2019). Restoration treatments that include thinning and prescribed fire have been shown to reduce fire severity, increase large tree survival and, depending on the spatial location, alter fire behavior (Prichard et al. 2010, 2020).

3.4.2.5.6 Adaptive Management Alternative Summary

Implementation of this alternative would make a moderate contribution to the viability of wildlife species associated with late-open habitats, whose viability outcomes (Viability Outcomes D and E, Appendix B) are well below their historical viability outcomes (Wisdom et al. 2000, Wales et al. 2011, Gaines et al. 2017). However, a key assumption of this alternative is that monitoring is carried out in a manner that allows changes in the availability of LOS habitat, and large and old trees to be detected in a timely fashion so that adaptive management occurs before the viability outcome of any MIS or R6 Sensitive Species is reduced.

This alternative facilitates the application of treatments to restore meadow and wetland habitats, and restoration treatments that reduce forest canopy closure and enhance elk and deer forage.

This alternative would maintain the viability of species associated with late-closed habitats (Viability Outcomes A and B) and reduce the risk of loss to uncharacteristically severe wildfires. This alternative would enhance the resiliency of forested habitats and the sustainability of LOS habitats.

3.5 BOTANY

3.5.1 Affected Environment

The planning area includes two broad ecoregions (based on the Level III ecoregions), the Blue Mountains Ecoregion of northeastern Oregon and southeastern Washington and the Eastern Cascades Ecoregion that occurs along north-south along the eastern portion of the Cascades mountains (Stine et al. 2014). The national forests associated with the Blue Mountains Ecoregion include the Umatilla, Malheur, and Wallowa-Whitman (Table 22), and the national forests associated with the Eastern Cascades are the Deschutes, Ochoco, and Fremont-Winema (Table 22). These broad ecoregions have unique climate, topography, and disturbance regimes that interact to form a template upon which habitats are formed for a broad diversity of plant and animal species across the planning area.

3.5.1.1 Rare plant and fungal species

Two federally listed and one candidate plant species are known or suspected to occur in the planning area: two Threatened (MacFarlane's four-o'clock, *Mirabilis macfarlani*; Spalding's catchfly, *Silene spaldingii*) and one candidate, which is also a Region 6 Sensitive Species (whitebark pine, *Pinus albicaulis*). Excluding the candidate species, there are an additional 228 botanical taxa on the Region 6 Sensitive Species list, including 185 vascular plants, 34 bryophytes (i.e., non-vascular plants, excluding algae), three lichen, and six fungi (USFS 2019).

3.5.1.1.1 Blue Mountains Ecoregion

Plant and fungal species of the Blue Mountains Ecoregion include two Federally Threatened species (*Mirabilis macfarlanei*, D-Wallowa-Whitman; *Silene spaldingii*, D-

Umatilla, Wallowa-Whitman), one candidate species (*Pinus albicaulis*, D-Umatilla, Malheur, Wallowa-Whitman), and 170 R6 Sensitive Species. On the Umatilla National Forest, there are 117 R6 Sensitive plant and fungal species that are documented or suspected to occur. On the Malheur, there are 102 R6 Sensitive Species, and on the Wallowa-Whitman, 116 R6 Sensitive Species.

Threats to rare plant and fungal species in the region are varied, ranging from recreation to stream management to air pollution. Those most relevant to the proposed Eastside Screens Amendment include timber harvesting (including effects from tree loss, microclimate changes, equipment disturbance, roads, and introduced plant species) changes in fire regime (including effects from less frequent and higher-severity wildfire, conifer encroachment, and canopy infilling), and climate change (including effects from long-term hydrologic and temperature changes).

3.5.1.1.2 East Cascades Ecoregion

Plant and fungal species of the East Cascades Ecoregion include one candidate species (*Pinus albicaulis*, D-Deschutes, Fremont-Winema), and 116 R6 Sensitive Species. The candidate species is not associated with LOS. On the Deschutes National Forest, there are 64 R6 Sensitive plant and fungal species that are documented or suspected to occur, of which 10 are LOS-associated. On the Ochoco, there are 47 R6 Sensitive Species, of which 4 are LOS-associated. And on the Fremont-Winema, the 70 R6 Sensitive Species include 7 LOS-associates.

The varied threats to plant and fungal species in the region are similar as those of the Blue Mountain Ecoregion. The most relevant to the proposed amendment are, again, timber harvest, changes in fire regime, and climate change.

Table 22. A summary of the suspected or documented TEP, R6 Sensitive, and MIS plant and fungal taxa (vascular plants, bryophytes, lichen, and fungi) in the planning area.

Species Status	National Forests in the Blue Mountains Ecoregion			National Forests in the East Cascades Ecoregion		
	Umatilla	Malheur	Wallowa-Whitman	Deschutes	Ochoco	Fremont-Winema
Plants						
No. Federally Listed Species	1	0	2	0	0	0
No. Candidate species	1	1	1	1	0	1
No. R6 Sensitive/MIS	117	102	116	64	47	70

3.5.1.2 Climate Change

As with wildlife, plants and fungi are affected by climate change in a variety of ways, including changes in species distributions (Hoffman and Sgro 2011, You et al. 2018), growth (Ibañez et al. 2018), phenology (Khanduri et al. 2008, Gordo and Sanz 2010), and biotic interactions such as plant-soil feedbacks (Pugnaire et al. 2019). Changes to disturbance regimes, including wildfire frequency and area affected (Westerling et al. 2006, Westerling 2016), are another critical impact. Restoring historical forest structure and increasing the resiliency of vegetation to wildfire can help maintain native plant populations subject to shifts in natural disturbance regimes, including those in the planning area.

3.5.1.3 Invasive plants

An invasive plant is "a non-native plant whose introduction does or is likely to cause economic or environmental harm or harm to human health" (Executive Order 13122). Invasive plants have wide-ranging impacts in eastern Oregon forests and are the subject of much research and guidance (e.g., Harrod 2001, LeDoux and Martin 2013). In the planning area, invasive plant management is directed by standards and guidelines in current Forest Plans and Amendments, which require minimizing their introduction, establishment, and spread, and incorporating prevention and control into project planning.

3.5.2 Environmental Effects

3.5.2.1 Key indicators

Table 23 outlines the key indicators used to assess the potential effects of the alternatives on botanical resources.

Table 23. Key indicators used to assess potential effects of the alternatives to botanical resources.

Resource element	Key Indicator
Threatened, Endangered, Proposed, and candidate plant species • Spalding's catchfly • MacFarlane's four-o'clock • Whitebark pine (also a Region 6 Sensitive Species)	Likelihood of impact
	Trends in area and condition of habitat type
	Changes in the level of relevant threats
Region 6 Sensitive Species • 229 plants and fungi	Likelihood of impact
	Trends in area and condition of habitat types
	Changes in the level of relevant threats
Invasive plants	Changes to relevant factors influencing the establishment and spread of invasive plants

3.5.2.2 Federally-listed and candidate species not further addressed

MacFarlane's four-o'clock (*Mirabilis macfarlani)* is a Threatened species documented on the Wallowa-Whitman National Forest. However, this plant does not occur in or near habitat affected by the alternatives. It is endemic to canyon grasslands of the Snake, Salmon, and Imnaha Rivers in Oregon and Idaho, which are dry and open with occasional shrubs (Yates 2007). The habitat contains essentially no conifer trees and is far from forest, so it is not affected by timber harvest or thinning activities. Thus, all alternatives would have no effect on this species, and it was not further considered in this analysis.

Whitebark pine (*Pinus albicaulis*) is candidate for federal listing and is a Region 6 Sensitive Species. It occurs in the Cascade, Blue, and Wallowa Mountains and is documented in five of the six forests affected by the proposed amendment (not documented on the Ochoco National Forest). All alternatives would have no effect on this species and it was not further considered in this analysis for the following reasons:

1) Its primary habitat is outside of areas that the proposed amendment would affect. In the planning area, whitebark pine occurs primarily in subalpine and montane cold forests in Wilderness and Roadless areas; these areas are typically not subject to timber sales and comprised less than 1% of the forests in the planning area.
2) The emphasis of the Eastside Screens on managing LOS habitats within the historic range of variation, including managing for historical and resilient species composition, is consistent with the Range-Wide Restoration Strategy for Whitebark Pine utilized by the Forest Service (Keane et al. 2012). This emphasis on restoration of whitebark pine would continue and would be unaffected by the proposed amendment.
3) Existing protections for whitebark pine, as defined by the standards and guidelines in Forest Plans and Amendments, would not be affected. For example, project-specific analyses would still be required to address site-specific effects on candidate species like whitebark pine.

3.5.2.3 Current Management Alternative

Under all alternatives, rare plant and fungal species would continue to be protected by standards and guidelines in current Forest Plans and Amendments, which require project level-NEPA analysis and Endangered Species Act (ESA) consultation. These also include PACFISH/INFISH standards and guidelines protecting Riparian Habitat Conservation Areas. While broad-scale effects to botanical resources are presented here, impacts to individual species will be more appropriately assessed at the project level. The Current Management Alternative makes no changes to the regulatory framework guiding these project-level analyses.

3.5.2.3.1 Threatened, Endangered, and Proposed Plant Species: Spalding's catchfly

Spalding's catchfly (*Silene spaldingii*) is a Threatened species documented on the Umatilla and Wallowa-Whitman National Forests. It primarily occurs in open grasslands, but is occasionally found in open, park-like ponderosa pine forests with Idaho fescue (*Festuca idahoensis*) in the understory (USFWS 2007). Under the Current Management Alternative, the overall area of this habitat type (dry, late-open ponderosa pine forest) is expected to increase slowly, but the abundance of old ponderosa pine trees is expected to decrease, shifting species composition and increasing vulnerability to mortality (Vegetation Environmental Effects). While predicting the resulting outcome for any one population of Spalding's catchfly is not possible, at a broad scale, the species may experience an increase in potential habitat as more late-open forest develops, but a decline in the suitability of occupied habitat as species composition and disturbance vulnerability shift.

Table 24. Effects to habitats of sensitive plant and fungal taxa as a result of the Alternatives. Effects are categorized as negative (-), neutral (0), or positive (+). Predicted changes of forest structure and disturbance regimes are based on the Vegetation Effects Analysis of this EA. Effects outlined apply to habitat types and not to individual species. While habitat effects have implications for species viability, effects to individual species as a result of projects arising from the proposed alternatives should be analyzed at the project level.

Habitat type	Relevant threats	Current Management	Old & Large Tree Guideline (Proposed)	Old Tree Standard	Adaptive management
Dry, open forest • Ponderosa or mixed conifer • Includes late-open	• Disturbance from timber harvest • Loss of habitat due to canopy closure • Loss of habitat due to high-severity wildfire or outbreak of insects or disease	(**0**) No change in harvest area (**+**) Late-open increasing at low rate (-) Mid-open decreasing at high rate (-) Limited ability to apply treatments to restore open structure and reduce impact of disturbance	(**0**) No change in harvest area (**+**) Late-open increasing slightly faster (low to mod. rate) (**+**) Mid-open decreasing slightly slower (mod. rate) (**+**) Enhanced opportunity to restore open structure and reduce impact of disturbance	(**0**) No change in harvest area (**+**) Late-open increasing slightly faster (low to mod. rate) (**+**) Mid-open decreasing slightly slower (mod. rate) (**+**) Enhanced opportunity to restore open structure and reduce impact of disturbance	(**0**) No change in harvest area (**+**) Late-open increasing slightly faster (low to mod. rate) (**+**) Mid-open decreasing slightly slower (mod. rate) (**+**) Most enhanced opportunity to restore open structure and reduce impact of disturbance (**+**) Highest site-specific habitat management
Late-seral, closed canopy forest (late-closed)	• Disturbance from timber harvest • Loss of habitat due to high-severity wildfire or	(**0**) No change in harvest area	(**0**) No change in harvest area (**+**) Late-closed increasing	(**0**) No change in harvest area (**+**) Late-closed increasing	(**0**) No change in harvest area (**+**) Late-closed increasing

• Primarily moist, mixed conifer forest	outbreak of insects or disease	(**+**) Late-closed increasing at highest rate (-) Decrease in abundance of old, fire-tolerant trees (-) Succession toward decreasing dominance of fire-tolerant species and increased vulnerability to uncharacteristic mortality	(**+**) Stabilizing abundance of old, fire-tolerant trees (-) Succession toward decreasing dominance of fire-tolerant species and increased vulnerability to uncharacteristic mortality	(**+**) Stabilizing abundance of old, fire-tolerant trees (-) Succession toward decreasing dominance of fire-tolerant species and increased vulnerability to uncharacteristic mortality	(**+**) Stabilizing abundance of old, fire-tolerant trees (**+**) Improved ability to modify succession toward decreasing dominance of fire-tolerant species and increased vulnerability to uncharacteristic mortality (**+**) Highest site-specific habitat management
Unique features in forests • Includes rock outcrops, forest openings, snags, rotting logs, etc.	• Disturbance from timber harvest • Change in microclimate • Loss of downed wood from fallen snags	(**0**) No change in harvest area (-) Forests increasingly vulnerable to uncharacteristic mortality (-) Outdated snag management science (**0**) No change to down log guidance in Eastside Screens	(**0**) No change in harvest area (-) Forests increasingly vulnerable to uncharacteristic mortality (**+**) Improved snag management based on recent science (**0**) No change to down log guidance in Eastside Screens	(**0**) No change in harvest area (-) Forests increasingly vulnerable to uncharacteristic mortality (**+**) Improved snag management based on recent science (**0**) No change to down log guidance in Eastside Screens	(**0**) No change in harvest area (**+**) Slightly slower rate of forests becoming increasingly vulnerable to uncharacteristic mortality (**+**) Improved snag management based on recent science

					(**0**) No change to down log guidance in Eastside Screens
Wet and dry meadows	• Conifer encroachment • Disturbance from conifer removal	(-) Limited ability to remove encroaching conifers >21 inch	(**+**) Increased ability to remove encroaching conifers >21 inch	(**+**) Increased ability to remove encroaching conifers >21 inch	(**+**) Increased ability to remove encroaching conifers >21 inch
Streams, riparian areas, and wetlands	• Disturbance from timber harvest, including indirect effects such as sediment increase	(**0**) Protected by existing riparian and wetland regulations	(**0**) Protected by existing riparian and wetland regulations	(**0**) Protected by existing riparian and wetland regulations	(**0**) Protected by existing riparian and wetland regulations
Alpine and subalpine	None	(**0**) Very little amendment-related activity at these elevations	(**0**) Very little amendment-related activity at these elevations	(**0**) Very little amendment-related activity at these elevations	(**0**) Very little amendment-related activity at these elevations

3.5.2.3.2 Region 6 Sensitive Species

Effects to the habitats of Region 6 Sensitive Species under the Current Management Alternative would differ among habitat types (Table 24). General habitat types for each of the 229 Sensitive Species are provide in Appendix A.

Effects described apply to habitat types and not to individual species. While habitat effects have implications for species viability, effects to individual species as a result of projects arising from the proposed alternatives should be analyzed at the project level. Furthermore, there would no change in the provisions requiring project-level surveys and analyses or Forest Plan standards and guidelines. As a result, for all Region 6 Sensitive Species, this alternative may impact individuals or habitat but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species (MIIH), does not lessen protections, and does not have a significantly adverse effect.

Under the Current Management Alternative, dry, open forest habitats (including late-open) such as park-like ponderosa stands would have mixed outcomes: late-open forests would continue to slowly increase in area, but managers' ability to adapt treatments to further encourage open-structure forests and reduce uncharacteristic mortality from disturbance would be limited. As a result, the risk of habitat loss to disturbance would continue to be a considerable threat for Sensitive Species associated with this habitat type.

Outcomes for moist, late-seral forests (including late-closed) would also be mixed: their coverage would increase as open forests densify or mid-closed forests mature, but continued loss of old, fire-tolerant trees and increasing risk of mortality from high-severity disturbance would continue to be threats for species dependent on the longevity and spatial variability of these habitats.

Species associated with unique features in forests, such as those associated with rock outcrops or rotting logs, would similarly suffer from the increasing risk of mortality with disturbance, which would alter the microclimates these species are sensitive to. They would also continue to be affected by outdated snag management science, which contributes to the large logs and snags upon which some Sensitive lichen and fungi depend.

Meadow-associated species are currently threatened by conifer encroachment, and the continued limitations on removing these conifers as a result of the 21-inch standard would continue, likely affecting the long-term viability of these species.

Riparian, wetland, alpine, and subalpine species – as well as species associated with habitats not listed in Table 24 – would continue to be protected by existing regulations and experience little change compared to their existing condition.

3.5.2.3.3 Invasive Plants

Under the Current Management Alternative, invasive plants would continue to be managed according to the standards and guidelines in current Forest Plans and Amendments, which require minimizing their introduction, establishment, and spread, and incorporating prevention and control into project planning. Measures to prevent and control their spread – such as monitoring, treatment, and native plant restoration – would be ongoing, as would the ecological and management factors that tend to increase their abundance and distribution, including climate change, high-severity wildfire, and ground disturbance (Harrod and Reichard 2002, Keeley et al. 2003, Keeley 2006, LeDoux and Martin 2013, Halofsky and Peterson 2017, Reilly et al. 2020).

3.5.2.4 Old Tree and Large Tree Guideline Alternative (with Adaptive Management)

Under all alternatives, rare plant and fungal species would continue to be protected by standards and guidelines in current Forest Plans and Amendments, which require project level-NEPA analysis and Endangered Species Act (ESA) consultation. These also include PACFISH/INFISH standards and guidelines protecting Riparian Habitat Conservation Areas. While broad-scale effects to botanical resources are presented here, impacts to individual species will be more appropriately assessed at the project level. The Old and Large Tree Guideline Alternative makes no changes to the regulatory framework guiding these project-level analyses.

3.5.2.4.1 Threatened, Endangered, and Proposed Plant Species: Spalding's Catchfly

Federally Threatened Spalding's catchfly (*Silene spaldingii*) is the only federally-listed species that may be affected by the proposed alternatives. It primarily occurs in open grasslands but is occasionally found in open, park-like ponderosa pine forests with Idaho fescue in the understory (USFWS 2007). This pine habitat may be affected under the Old Tree and Large Tree Guideline Alternative, under which both adverse and beneficial effects are possible but are insignificant and discountable.

Adverse effects could occur from timber harvesting activities that cause ground disturbance in occupied habitat, if harvesting were more widespread as a result of this alternative. However, we assume the area of timber harvest will not differ from that currently occurring. Further, project-level standards and guidelines would require avoiding adverse disturbances in occupied habitat of Spalding's catchfly.

Beneficial effects for Spalding's catchfly under the Old and Large Tree Guideline Alternative are theoretically possible with the removal of encroaching conifers on grasslands or the determination and attainment of stocking levels required in its pine habitat (Jerold Hustafa, personal communication, June 30, 2020). However, conifer encroachment is a minor threat to the species; human development, grazing, and invasive species are more impactful (USFWS 2007). The disturbance associated with conifer removal would likely pose more of a threat than the conifers themselves, and most encroaching conifers are of diameters smaller than 21 inches. Further, the manipulation of forest structure is not recommended as a restoration strategy for this species (USFWS 2007).

Importantly, the effects described above are unlikely to occur because entry for harvest or thinning into late-open pine stands, such as those in which Spalding's catchfly is occasionally found, is unlikely to occur. This alternative would not change the following relevant elements of the interim Eastside Screens, or any other component in the existing Forest Plans covering the six National Forests proposed for this amendment:

- Exempted activities would still be assessed through NEPA analysis, and ESA consultation will still be conducted at the project level.

- The Eastside Screens ecosystem screen would remain in for HRV analysis.
- Forests must still apply riparian guidance described in the PACFISH/INFISH standard and wildlife standards, as applicable, including maintaining open, park-like stand conditions where this condition occurred historically.

Collectively, existing standards and guidelines along with new language under the Old Tree and Large Tree Guideline Alternative would provide the ability to increase the area of late-open forest while limiting activity in those existing.

3.5.2.4.2 Region 6 Sensitive Species

Outcomes for many habitat types of Sensitive Species under the Old Tree and Large Tree Guideline Alternative would be slightly improved compared to the Current Management Alternative (Table 24). General habitat types for each of the 229 Sensitive Species are provide in Appendix A.

Effects described apply to habitat types and not to individual species. While habitat effects have implications for species viability, effects to individual species as a result of projects arising from the proposed alternatives should be analyzed at the project level. Furthermore, there would no change in the provisions requiring project-level surveys and analyses or Forest Plan standards and guidelines. As a result, for all Region 6 Sensitive Species, this alternative may impact individuals or habitat but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species (MIIH), does not lessen protections, and does not have a significantly adverse effect.

Forested habitats would experience slightly improved outcomes under the Old Tree and Large Tree Alternative. The area of timber harvest, and thus the level of this threat, would not change. Instead, improved restoration opportunities due to the option of removing young and/or large trees, while maintaining the LOS objectives emphasized in the Eastside Screens, would enhance forested habitats. Compared to current management, late-open forests would increase in area at a slightly faster rate, and managers' ability to adapt treatments to further encourage open-structure forests and reduce uncharacteristic mortality from disturbance would be enhanced. Late-closed forests would continue to increase in coverage and the abundance of old, fire-tolerant trees would stabilize. As a result, both open and closed forested habitats, and the unique features within them, would have slightly improved outcomes, conceivably enhancing the viability of associated Sensitive species.

Improved snag science and management would likely enhance the long-term viability of species associated with snags.

Conifer encroachment into meadows would be better managed, particularly because these trees can be fast-growing, achieving 21-inch dbh well before 150 years. Species associated with these habitats would then benefit.

Riparian, wetland, alpine, and subalpine species – as well as species associated with habitats not listed in Table 24 – would continue to be protected by existing regulations and experience little change compared to their existing condition.

3.5.2.4.3 Invasive Plants

Management of invasive plants would continue to be guided by standards and guidelines in current Forest Plans and Amendments. The standards and guidelines require minimizing the introduction, establishment, and spread of invasive plants and incorporating prevention and control into project planning. Thus, while a broad-scale analysis is provided here, most analysis and mitigation of the impacts to invasive plants as a result of the proposed amendment change would occur at the project level.

The Old Tree and Large Tree Guideline Alternative would have the potential to cause both negative and positive effects regarding invasive plants. The ecological factors influencing the abundance and distribution of invasive plants are numerous, interactive, and play roles at scales smaller than that of this analysis. The following are brief summaries of highly-relevant factors and related effects of this alternative. Factors are categorized as negative (-), neutral (0), or positive (+) based on the summarized effect of the alternative.

1. Climate change (+)
    a. Increasing the resiliency of forests to drought and disturbance is recommended to ameliorate the increased abundance and distribution of invasive plant species expected as a result of climate change (Halofsky and Peterson 2017).
    b. This alternative would enhance managers' ability to adapt treatments to promote open-structure, drought-tolerant forests and reduce uncharacteristic mortality from disturbance.
2. Wildfire (+)
    a. Wildfire can catalyze rapid change of forests to non-forested or alternative disturbance regime states (Kerns et al. 2020). Severe wildfires typically increase the diversity and abundance of nonnative species (Harrod and Reichard 2002, Keeley et al. 2003, Reilly et al. 2020). Fuel breaks tend to facilitate invasion (Merriam et al. 2006).
    b. This alternative would enhance managers' ability to adapt treatments to encourage fire-tolerant species and reduce uncharacteristic mortality from disturbance. It would not change management of fuel breaks or fire suppression.
3. Thinning and timber harvest (-)
    a. Thinning for fuels reduction and other types of timber harvest can increase nonnative plant invasion as a result of ground disturbance, operations such as equipment movement, and canopy opening (Charbonneau and Fahrig 2004, Keeley 2006, LeDoux and Martin 2013, Averett et al. 2016, Willms et al. 2017).
    b. This alternative would not alter the acreage of timber harvest or fuels-reduction activities, and thus the acreage of resulting ground disturbance and equipment movement. It would, however, create the opportunity to thin to a smaller basal area and increase canopy opening.

These factors would act in concert with each other, other ecological factors, and ongoing prevention and control practices to affect invasive plants in the planning area. Given the myriad influences, the net effect of this alternative on the distribution and abundance of invasive plants would be small. This alternative would not change the regulatory framework guiding project-level analyses or prevention and control measures, resulting in little change from the Current Management Alternative.

3.5.2.5 Old Tree Standard Alternative

Under all alternatives, rare plant and fungal species would continue to be protected by standards and guidelines in current Forest Plans and Amendments, which require project level-NEPA analysis and Endangered Species Act (ESA) consultation. These also include PACFISH/INFISH standards and guidelines protecting Riparian Habitat Conservation Areas. While broad-scale effects to botanical resources are presented here, impacts to individual species will be more appropriately assessed at the project level. The Old Tree Standard Alternative makes no changes to the regulatory framework guiding these project-level analyses.

3.5.2.5.1 Threatened, Endangered, and Proposed Plant Species: Spalding's Catchfly

Federally Threatened Spalding's catchfly (*Silene spaldingii*) is the only federally-listed species that may be affected by the proposed alternatives. It primarily occurs in open grasslands but is occasionally found in open, park-like ponderosa pine forests with Idaho fescue in the understory (USFWS 2007). This pine habitat may be affected under the Old Tree Standard Alternative, under which both a decrease and increase in habitat are possible but are insignificant and discountable.

Adverse effects could occur from timber harvesting activities that cause ground disturbance in occupied habitat, if harvesting were more widespread under the Old Tree Standard Alternative. However, the footprint of timber harvest is not predicted to differ from that currently occurring; further, project-level standards and guidelines would require avoiding adverse disturbances in occupied habitat of Spalding's catchfly.

Beneficial effects for Spalding's catchfly with the Old Tree Standard Alternative are theoretically possible with the removal of encroaching conifers on grasslands or the determination and attainment of stocking levels required in its pine habitat (Jerold Hustafa, personal communication, June 30, 2020). However, conifer encroachment is a minor threat to the species; human development, grazing, and invasive species are more impactful (USFWS 2007). The disturbance associated with conifer removal would likely pose more of a threat than the conifers themselves, and most encroaching conifers are of diameters smaller than 21 inch. Further, the manipulation of forest structure is not recommended as a restoration strategy for this species (USFWS 2007). In sum, both adverse and beneficial effects to Spalding's catchfly under the Old Tree Standard Alternative are possible but unlikely.

Importantly, the effects described above are unlikely to occur because entry for harvest or thinning into late-open pine stands, such as those in which Spalding's catchfly is occasionally found, is unlikely to occur. This alternative would not change the following relevant elements of the interim Eastside Screens, or any other component in the existing Forest Plans covering the six National Forests proposed for this amendment:

- Exempted activities would still be assessed through NEPA analysis, and ESA consultation will still be conducted at the project level.
- The Eastside Screens ecosystem screen would remain in for HRV analysis.
- Forests must still apply riparian guidance described in the PACFISH/INFISH standard and wildlife standards, as applicable, including maintaining open, park-like stand conditions where this condition occurred historically.

Collectively, existing standards and guidelines along with new language under the Old Tree and Large Tree Guideline Alternative would provide the ability to increase the area of late-open forest while limiting activity in those existing.

3.5.2.5.2 Region 6 Sensitive Species

Outcomes for many habitat types of Sensitive Species would be improved under the Old Tree Standard Alternative than under the Current Management Alternative (Table 24). They would be very similar to those under the Old Tree and Large Tree Guideline Alternative. General habitat types for each of the 229 Sensitive Species are provide in Appendix A.

Effects described apply to habitat types and not to individual species. While habitat effects have implications for species viability, effects to individual species as a result of projects arising from the proposed alternatives should be analyzed at the project level. Furthermore, there would no change in the provisions requiring project-level surveys and analyses or Forest Plan standards and guidelines. As a result, for all Region 6 Sensitive Species, this alternative may impact individuals or habitat but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species (MIIH), does not lessen protections, and does not have a significantly adverse effect.

Forested habitats would experience slightly improved outcomes under the Old Tree Standard Alternative. The area of timber harvest, and thus the level of this threat, would not change. Instead, improved restoration opportunities due to the option of removing young, large trees, while maintaining the LOS objectives emphasized in the Eastside Screens, would enhance forested habitats. Compared to current management, late-open forests would increase in area at a slightly faster rate, and managers' ability to adapt treatments to further encourage open-structure forests and reduce uncharacteristic mortality from disturbance would be enhanced. Late-closed forests would continue to increase in coverage and the abundance of old, fire-tolerant trees would stabilize. As a result, both open and closed forested habitats, and the unique features within them, would have slightly improved outcomes, conceivably enhancing the viability of associated Sensitive species.

Improved snag science and management would likely enhance the long-term viability of species associated with snags.

Conifer encroachment into meadows would be better managed, particularly because these trees can be fast-growing, achieving 21-inch dbh well before 150 years. Species associated with these habitats would then benefit.

As under the Current Management Alternative, riparian, wetland, alpine, and subalpine species – as well as species associated with habitats not listed in Table 24 – would continue to be protected by existing regulations and experience little change compared to their existing condition.

3.5.2.5.3 Invasive Plants

Effects to invasive plants under the Old Tree Standard Alternative would be very similar to those under the Old Tree and Large Tree Guideline Alternative. Management would continue to be guided by standards and guidelines in current Forest Plans and Amendments, and, due to the myriad factors contribute to invasive plants in the planning area, the net effect of this alternative on the distribution and abundance of invasive plants would be small. See Environmental Effects of the Old Tree and Large Tree Guideline Alternative for details.

3.5.2.6 Adaptive Management Alternative

Under all alternatives, rare plant and fungal species would continue to be protected by standards and guidelines in current Forest Plans and Amendments, which require project level-NEPA analysis and Endangered Species Act (ESA) consultation. These also include PACFISH/INFISH standards and guidelines protecting Riparian Habitat Conservation Areas. While broad-scale effects to botanical resources are presented here, impacts to individual species will be more appropriately assessed at the project level. The Adaptive Management Alternative makes no changes to the regulatory framework guiding these project-level analyses.

3.5.2.6.1 Threatened, Endangered, and Proposed Plant Species: Spalding's Catchfly

Federally Threatened Spalding's catchfly (*Silene spaldingii*) is the only federally-listed species that may be affected by the proposed alternatives. It primarily occurs in open grasslands but is occasionally found in open, park-like ponderosa pine forests with Idaho fescue in the understory (USFWS 2007). This pine habitat may be affected under the Adaptive Management Alternative, under which both a decrease and increase in habitat are possible but are insignificant and discountable.

Adverse effects could occur from timber harvesting activities that cause ground disturbance in occupied habitat, if harvesting were more widespread as a result of this alternative. However, the footprint of timber harvest is not predicted to differ from that currently occurring; further, project-level standards and guidelines would require avoiding adverse disturbances in occupied habitat of Spalding's catchfly.

Beneficial effects for Spalding's catchfly with the Adaptive Management Alternative are theoretically possible with the removal of encroaching conifers on grasslands or the determination and attainment of stocking levels required in its pine habitat (Jerold Hustafa, personal communication, June 30, 2020). However, conifer encroachment is a minor threat to the species; human development, grazing, and invasive species are more impactful (USFWS 2007). The disturbance associated with conifer removal would likely pose more of a threat than the conifers themselves, and most encroaching conifers are of diameters smaller than 21 inch. Further, the manipulation of forest structure is not recommended as a restoration strategy for this species (USFWS 2007). In sum, both adverse and beneficial effects to Spalding's catchfly as a result of the Adaptive Management Alternative are possible but unlikely.

Importantly, the effects described above are unlikely to occur because entry for harvest or thinning into late-open pine stands, such as those in which Spalding's catchfly is occasionally found, is unlikely to occur. This alternative would not change the following relevant elements of the interim Eastside Screens, or any other component in the existing Forest Plans covering the six National Forests proposed for this amendment:

- Exempted activities would still be assessed through NEPA analysis, and ESA consultation will still be conducted at the project level.
- The Eastside Screens ecosystem screen would remain in for HRV analysis.
- Forests must still apply riparian guidance described in the PACFISH/INFISH standard and wildlife standards, as applicable, including maintaining open, park-like stand conditions where this condition occurred historically.

Collectively, existing standards and guidelines along with new language under the Old Tree and Large Tree Guideline Alternative would provide the ability to increase the area of late-open forest while limiting activity in those existing.

3.5.2.6.2 Region 6 Sensitive Species

Outcomes for many habitat types of Sensitive Species under the Adaptive Management Alternative would be improved compared to the Current Management Alternative (Table 24). This alternative provides for more site-specific management and the potential for greater habitat improvements than the other action alternatives. General habitats for each of the 229 Sensitive Species are provide in Appendix A.

Effects described apply to habitat types and not to individual species. While habitat effects have implications for species viability, effects to individual species as a result of projects arising from the proposed alternatives should be analyzed at the project level. Furthermore, there would no change in the provisions requiring project-level surveys and analyses or Forest Plan standards and guidelines. As a result, for all Region 6 Sensitive Species, this alternative may impact individuals or habitat but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species (MIIH), does not lessen protections, and does not have a significantly adverse effect.

Forested habitats would experience slightly improved outcomes under the Adaptive Management Alternative. The area of timber harvest, and thus the level of this threat, would not change. Instead, improved restoration opportunities due to the option of removing young and/or large trees, while maintaining the LOS objectives emphasized in the Eastside Screens, would enhance forested habitats. Compared to current management, late-open forests would increase in area at a slightly faster rate, and managers' ability to adapt treatments to further encourage open-structure forests and reduce uncharacteristic mortality from disturbance would be enhanced. Late-closed forests would continue to increase in coverage and the abundance of old, fire-tolerant trees would stabilize. As a result, both open and closed forested habitats, and the unique features within them, would have slightly improved outcomes, conceivably enhancing the viability of associated Sensitive species.

Improved snag science and management would likely enhance the long-term viability of species associated with snags.

Conifer encroachment into meadows would be easier to address, particularly because these trees can be fast-growing, achieving 21-inch dbh well before 150 years. Species associated with these habitats would then benefit.

Riparian, wetland, alpine, and subalpine species – as well as species associated with habitats not listed in Table 24 – would continue to be protected by existing regulations and experience little change compared to their existing condition.

3.5.2.6.3 Invasive Plants

Effects to invasive plants under the Adaptive Management Alternative would be very similar to those under the Old Tree and Large Tree Guideline Alternative. Management would continue to be guided by standards and guidelines in current Forest Plans and Amendments, and, due to the myriad factors contribute to invasive plants in the planning area, the net effect of this alternative on the distribution and abundance of invasive plants would be small. See Environmental Effects of the Old Tree and Large Tree Guideline Alternative for details.

Table 25. Summary of Effects to Rare Botanical Species.

Status	Species	Habitat	Effects call for all alternatives	Rationale
Threatened	MacFarlane's four o'clock	Canyon grasslands	No effect	No activity in or near habitat
Threatened	Spalding's catchfly	Mostly grasslands, occasionally open pine	Insignificant and discountable	Both + and – are possible, but highly unlikely
Candidate + R6 Sensitive	Whitebark pine	Subalpine	No effect	• Virtually no activity in habitat • HRV emphasis of Eastside Screens consistent with restoration strategy
R6 Sensitive	228	Many, including open and closed forest	May impact individuals or habitat No lessening of protections	• Project-level surveys and analyses would still occur • Forest Plan and Amendments standards and guidelines still in place • Many habitats unaffected by amendment • Forest habitat may slightly improve with improved restoration opportunities

3.6 CUMULATIVE EFFECTS

A cumulative effect is the impact to the environment resulting from the incremental impact of the action when added to effects from other past, present, and reasonably foreseeable future actions. Other actions are considered regardless of what agency or person undertakes these other actions and regardless of land ownership on which the other actions occur (40 CFR 1508.7). An individual action when considered alone may not have a significant effect, but when its effects are considered in sum with the effects of other actions, the effects may be significant.

Cumulative effects were considered for Forest Service lands in eastern Oregon and the portion of the Umatilla NF in Washington, in addition to private lands and other public lands within the same counties as the analysis area. The temporal window for our cumulative effects analysis is 25 years into the future.

Effects of past actions are reflected in the existing conditions and are not described or listed in extensive detail because they inherently contributed to the present state of the landscape. Past actions that are reflected in the existing condition include:

- Fire exclusion
- Large wildfires
- Pre-1994 (Eastside Screens) removal of large and old trees
- Restoration management
- Timber production and harvest
- Recreation
- Roads management
- Grazing
- Invasive species management

The reasonably foreseeable future actions overlap in time and location and may have environmental effects. The reasonably foreseeable future actions are expected to be similar to the past actions except for the pre-1994 targeting of large trees.

Prior to the Eastside Screens, management focused much more on the removal of large and old trees on Forest Service lands in the analysis area. Since the inception of the Eastside Screens, with its standard requiring management activities to move forests toward LOS, forest management has shifted toward restoration, resilience, and the co-production of timber. This overall shift in management focus under the Eastside Screens will continue to support the development and maintenance of LOS forest on federal lands. Adjacent federal lands west of the project area, including portions of the Deschutes and Fremont-Winema National Forests, are managed under the Northwest Forest Plan (NWFP) which emphasizes the viability of late and old growth forest associated species which will also support LOS development into the future.

Timber harvest on large private forest lands will likely continue to be managed with harvest objectives that generally do not allow for the development of LOS habitat. These lands consist of 12.8% of the forested lands in eastern Oregon. Land ownership trends have changed since 1994, with private land ownership shifting toward real estate trust and investment funds. Objectives for these lands usually result in shorter timber harvest rotation periods, usually less than 150 years. Private lands have seen a 34% decrease in old trees. In contrast, state and local lands have increased old trees by about 125% in the past decade. Across all ownerships a net decrease of 8% of old trees has occurred. Federal lands will continue to provide that most significant amount of LOS across the landscape. The cumulative effect of management on private lands would not change the effect of the proposed action or any of the alternatives.

Recreation, roads management, grazing, and other forest management activities that influence wildlife habitat and viability (Wisdom et al. 2000, Wales et al. 2011, Gaines 2017) will continue, and the cumulative effects of these activities would not change the impact of the proposed action or any of the alternatives.

In the foreseeable future, recreation, roads management, grazing, invasive species management, and other forest management activities that influence plant habitat and viability will continue. The development and implementation of recovery plans for rare plants and fungi will also continue. The cumulative effects of these activities, both beneficial and adverse, would not change the impact of the proposed action or any of the alternatives.

Cumulative effects for forest products are limited to long term changes to volume availability as highlighted in the Social and Economic section. It is possible the volume available due to increased management flexibility under the action alternatives leads to mid and long term changes in small industry and proprietor practices within the forest products sector around the six Forest area.

There are no significant cumulative effects, only slight changes in indicators as described above.

4 PUBLIC INVOLVEMENT AND AGENCIES AND PERSONS CONSULTED

4.1 TRIBES

Starting in March 2020, the Forest Supervisors for the six National Forests in the planning area have been discussing the project with the tribes individually. This interaction is expected to continue throughout the process, including into implementation at the project level. The tribes were also invited to attend the public and governmental workshops. One tribe has responded to the team leader about the amendment.

Tribes Contacted

- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of the Warm Springs
- Burns Paiute Tribe
- Klamath Tribes
- Nez Perce Tribe
- Fort Bidwell Tribe

The Nez Perce Tribe requested Cooperating Agency status on July 7, 2020. The Forest Service verbally accepted the Nez Perce Tribe's offer and is currently working with Tribal officials on the specifics of their cooperating agency status.

4.2 STAKEHOLDER ENGAGEMENT

Outreach to inform key stakeholder about the project was conducted during the pre-NEPA period and resulted in conversations with more than 40 key counties, states, tribal governments, interest groups, and other nongovernmental entities. Direct outreach was followed by invitations from groups to virtually present and discuss the project. Meetings ranged from 30 minutes to about 2 hours. Discussion and questions focused on the project purpose and need, project scope, and further engagement opportunities.

4.3 OTHER AGENCIES

Coordination with ODFW, WDFD (for UMA portion in WA), and the USFWS will be scheduled upon release of the draft EA and will be ongoing through the final EA and decision.

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6 Appendix A-Botany Sensitive Species List

	Taxa type	Latin Name	Common Name	Habitat type	Blue Mountains	East Cascades
1	BR	Anastrophyllum minutum	Liverwort	Subalpine wet	y	y
2	BR	Barbilophozia lycopodioides	Liverwort	Subalpine wet	y	y
3	BR	Blepharostoma arachnoideum	Liverwort	Cool moist forest	n	y
4	BR	Brachydontium olympicum	Moss	Cliffs, outcrops;Subalpine dry	n	y
5	BR	Bryum calobryoides	Moss	Cliffs, outcrops;Cold forest;Cool moist forest;Subalpine wet;Warm Dry forest	y	n
6	BR	Calliergon richardsonii	Moss	Moist/wet meadows;Subalpine wet	y	y
7	BR	Campylium stellatum	Moss	Subalpine wet	y	y
8	BR	Cephaloziella spinigera	Liverwort	Moist/wet meadows	n	y
9	BR	Conostomum tetragonum	Moss	Cliffs, outcrops;Subalpine dry	n	y
10	BR	Encalypta brevipes	Moss	Cliffs, outcrops	y	y
11	BR	Entosthodon fascicularis	Moss	Cliffs, outcrops;Dry grasslands;Moderate riparian;Moist/wet meadows	y	y

12	BR	Gymnomitrion concinnatum	Liverwort	Cliffs, outcrops;Subalpine wet	n	y
13	BR	Haplomitrium hookeri	Liverwort	Cliffs, outcrops;Moist/wet meadows	n	y
14	BR	Harpanthus flotovianus	Liverwort	Cold forest;Moist/wet meadows;Subalpine wet	y	y
15	BR	Jungermannia polaris	Liverwort	Aquatic;Moist/wet meadows;Subalpine wet	y	y
16	BR	Lophozia gillmanii	Liverwort	Moist/wet meadows;Subalpine wet	y	y
17	BR	Marsupella sparsifolia	Liverwort	Cliffs, outcrops;Subalpine wet	n	y
18	BR	Nardia japonica	Liverwort	Cliffs, outcrops;Moist/wet meadows;Subalpine wet	n	y
19	BR	Peltolepis quadrata	Liverwort	Cliffs, outcrops;Subalpine dry;Subalpine wet	y	n
20	BR	Polytrichastrum sexangulare var. vulcanicum	Moss	Subalpine dry	n	y
21	BR	Polytrichum strictum	Moss	Cold forest;Subalpine wet	y	n
22	BR	Preissia quadrata	Liverwort	Moderate riparian;Moist/wet meadows;Subalpine wet	y	y
23	BR	Pseudocalliergon trifarium	Moss	Moist/wet meadows	y	y
24	BR	Ptilidium pulcherrimum	Liverwort	Cliffs, outcrops;Cold forest;Cool moist forest	y	n

25	BR	Racomitrium depressum	Moss	Low elevation riparian;Moderate riparian;Subalpine wet	n	y
26	BR	Rivulariella gemmipara	Liverwort	Aquatic;Subalpine wet	n	y
27	BR	Schistidium cinclidodonteum	Moss	Cold forest;Cool moist forest;Moderate riparian;Subalpine wet;Warm Dry forest;Warm moist forest	y	y
28	BR	Schofieldia monticola	Liverwort	Subalpine wet	n	y
29	BR	Scouleria marginata	Moss	Moderate riparian	y	n
30	BR	Splachnum sphaericum	Moss	Moist/wet meadows;Subalpine wet	y	y
31	BR	Tetraphis geniculata	Moss	Cool moist forest	y	n
32	BR	Tortula mucronifolia	Moss	Cold forest;Cool moist forest;Moderate riparian;Warm Dry forest	y	y
33	BR	Trematodon asanoi	Moss	Subalpine wet	n	y
34	BR	Tritomaria exsecta	Liverwort	Cold forest	y	y
35	FU	Albatrellus avellaneus	Fungus	Cold forest;Cool moist forest	y	n
36	FU	Gastroboletus vividus	Fungus	Cool moist forest	n	y
37	FU	Helvella crassitunicata	Fungus	Cool moist forest	n	y
38	FU	Phaeoclavulina abietina	Fungus	Cold forest;Cool moist forest	y	n
39	FU	Pseudorhizina californica	Fungus	Cool moist forest	y	y

40	FU	Rhizopogon alexsmithii	Fungus	Cool moist forest	n	y
41	LI	Dermatocarpon meiophyllizum	Lichen	Aquatic;Subalpine wet	y	n
42	LI	Texosporium sancti-jacobi	Lichen	Big sage;Dry grasslands	y	y
43	LI	Tholurna dissimilis	Lichen	Subalpine dry	n	y
44	VA	Achnatherum hendersonii	Henderson's ricegrass	Dry grasslands;Lithosols	y	y
45	VA	Achnatherum nevadense	Nevada needlegrass	Big sage;Dry grasslands;Subalpine dry	y	n
46	VA	Achnatherum richardsonii	Richardson's ricegrass	Dry grasslands;Warm Dry forest	y	n
47	VA	Achnatherum wallowaense	Wallowa ricegrass	Lithosols	y	y
48	VA	Adiantum jordanii	California maiden-hair	Cliffs, outcrops;Cool moist forest	n	y
49	VA	Agoseris elata	Tall agoseris	Dry grasslands;Warm Dry forest	n	y
50	VA	Allium campanulatum	Sierra onion	Cliffs, outcrops;Dry grasslands;Warm Dry forest	y	n
51	VA	Allium dictuon	Blue mountain onion	Cliffs, outcrops;Dry grasslands;Lithosols	y	n
52	VA	Allium geyeri var. geyeri	Geyer's onion	Dry grasslands;Lithosols	y	n
53	VA	Ammannia robusta	Ammannia	Aquatic;Low elevation riparian;Vernal pools	y	n
54	VA	Antennaria corymbosa	Meadow pussy-toes	Cold forest;Moist/wet meadows	y	n

55	VA	Arabis crucisetosa	Cross-haired rockcress	Low elevation grasslands;Warm Dry forest	y	n
56	VA	Arnica viscosa	Shasta arnica	Subalpine dry	n	y
57	VA	Asplenium septentrionale	Grass-fern	Cliffs, outcrops	n	y
58	VA	Asplenium viride	Green spleenwort	Cliffs, outcrops;Subalpine wet	y	n
59	VA	Astragalus arrectus	Palouse milk-vetch	Low elevation grasslands;Warm Dry forest	y	n
60	VA	Astragalus arthurii	Arthur's milk-vetch	Low elevation grasslands	y	n
61	VA	Astragalus cusickii var. cusickii	Cusick's milk-vetch	Cliffs, outcrops;Low elevation grasslands	y	n
62	VA	Astragalus diaphanus var. diurnus	South fork john day milk-vetch	Low elevation riparian;Moderate riparian	y	y
63	VA	Astragalus lemmonii	Lemmon's milk-vetch	Moderate riparian;Moist/wet meadows	n	y
64	VA	Astragalus misellus var. misellus	Pauper milk-vetch	Dry grasslands;Lithosols	y	n
65	VA	Astragalus peckii	Peck's milk-vetch	Juniper;Lithosols;Warm Dry forest	n	y
66	VA	Astragalus tegetarioides	Bastard kentrophyta	Lithosols	y	y
67	VA	Boechera atrorubens	Sickle-pod rockcress	Cliffs, outcrops;Dry grasslands;Warm Dry forest	y	n
68	VA	Boechera hastatula	Hells canyon rockcress	Cliffs, outcrops	y	n

69	VA	Boechera paddoensis	Mt. Adams rockcress	Cliffs, outcrops;Subalpine dry	y	n
70	VA	Bolandra oregana	Oregon bolandra	Low elevation riparian	y	n
71	VA	Botrychium ascendens	Upward-lobed moonwort	Moderate riparian;Moist/wet meadows	y	y
72	VA	Botrychium campestre	Prairie moonwort	Dry grasslands;Moderate grasslands;Moist/wet meadows	y	n
73	VA	Botrychium crenulatum	Crenulate moonwort	Moderate riparian;Moist/wet meadows	y	y
74	VA	Botrychium hesperium	Western moonwort	Moderate riparian;Moist/wet meadows	y	n
75	VA	Botrychium lineare	Slender moonwort	Moderate riparian;Moist/wet meadows	y	n
76	VA	Botrychium lunaria	Moonwort	Cold forest;Moist/wet meadows;Subalpine wet	y	y
77	VA	Botrychium montanum	Mountain grape-fern	Moderate riparian;Moist/wet meadows	y	y
78	VA	Botrychium paradoxum	Twin-spiked moonwart	Moderate riparian;Moist/wet meadows	y	y
79	VA	Botrychium pedunculosum	Stalked moonwort	Moderate riparian;Moist/wet meadows	y	n
80	VA	Botrychium pumicola	Pumice grape-fern	Cold forest;Subalpine dry;Warm Dry fores	n	y

81	VA	Bupleurum americanum	Bupleurum	Subalpine dry	y	n
82	VA	Calamagrostis breweri	Brewer's reedgrass	Moist/wet meadows;Subalpine wet	n	y
83	VA	Calochortus greenei	Greene's mariposa-lily	Dry grasslands	n	y
84	VA	Calochortus longebarbatus var. peckii	Peck's mariposa-lily	Moist/wet meadows	y	y
85	VA	Calochortus macrocarpus var. maculosus	Green-band mariposa-lily	Low elevation grasslands;Warm Dry forest	y	n
86	VA	Calyptridium roseum	Rosy pussypaws	Big sage;Moist/wet meadows;Warm Dry forest	y	n
87	VA	Camissonia pusilla	Washoe suncup	Big sage	n	y
88	VA	Carex atrosquama	Blackened sedge	Subalpine dry;Subalpine wet	y	n
89	VA	Carex capillaris	Hairlike sedge	Subalpine wet	y	n
90	VA	Carex capitata	Capitate sedge	Moist/wet meadows;Subalpine wet	y	y
91	VA	Carex comosa	Bristly sedge	Moist/wet meadows;Subalpine wet	n	y
92	VA	Carex concinna	Low northern sedge	Moderate riparian;Subalpine wet	y	n
93	VA	Carex cordillerana	Cordilleran sedge	Cool moist forest;Juniper;Moderate riparian;Warm Dry forest	y	y
94	VA	Carex diandra	Lesser panicled sedge	Subalpine wet	y	y
95	VA	Carex gynocrates	Yellow bog sedge	Moist/wet meadows;Subalpine wet	y	n
96	VA	Carex idahoa	Idaho sedge	Moist/wet meadows	y	y

97	VA	Carex lasiocarpa	Slender sedge	Moist/wet meadows;Subalpine wet	y	y
98	VA	Carex livida	Pale sedge	Moist/wet meadows	n	y
99	VA	Carex media	Intermediate sedge	Cold forest;Subalpine wet	y	n
100	VA	Carex micropoda	Pyrenaean sedge	Subalpine dry;Subalpine wet	y	n
101	VA	Carex nardina	Spikenard sedge	Subalpine dry	y	n
102	VA	Carex pelocarpa	New sedge	Subalpine dry	y	n
103	VA	Carex retrorsa	Retrorse sedge	Low elevation riparian;Moderate riparian	y	y
104	VA	Carex saxatilis	Russet sedge	Subalpine wet	y	y
105	VA	Carex scirpoidea ssp. stenochlaena	Alaskan single-spiked sedge	Subalpine wet	y	n
106	VA	Carex subnigricans	Dark alpine sedge	Subalpine wet	y	n
107	VA	Carex tahoensis	Tahoe sedge	Subalpine dry	y	n
108	VA	Carex vernacula	Native sedge	Subalpine dry;Subalpine wet	y	y
109	VA	Castilleja chlorotica	Green-tinged paintbrush	Big sage;Warm Dry forest	n	y
110	VA	Castilleja collegiorum	Collegial paintbrush	Moist/wet meadows	n	y
111	VA	Castilleja flava var. rustica	Rural paintbrush	Big sage;Dry grasslands;Subalpine dry	y	n
112	VA	Castilleja fraterna	Fraternal paintbrush	Subalpine dry	y	n
113	VA	Castilleja rubida	Purple alpine paintbrush	Subalpine dry	y	n

114	VA	Castilleja viscidula	Sticky paintbrush	Subalpine dry	y	n
115	VA	Chaenactis xantiana	Desert chaenactis	Big sage;Dry grasslands	y	n
116	VA	Cheilanthes feei	Fee's lip-fern	Cliffs, outcrops	y	y
117	VA	Cheilanthes intertexta	Coastal lipfern	Cliffs, outcrops;Cool moist forest	n	y
118	VA	Collomia mazama	Mt. Mazama collomia	Cold forest;Subalpine dry	n	y
119	VA	Comastoma tenellum	Slender gentian	Subalpine wet	y	n
120	VA	Cryptantha grandiflora	Clearwater cryptantha	Cliffs, outcrops;Dry grasslands;Low elevation grasslands;Warm Dry forest	y	n
121	VA	Cryptantha simulans	Pine woods cryptantha	Cliffs, outcrops;Dry grasslands;Warm Dry forest	y	y
122	VA	Cryptogramma stelleri	Steller's rockbrake	Cliffs, outcrops	y	n
123	VA	Cymopterus nivalis	Snowline spring-parsley	Subalpine dry	y	n
124	VA	Cyperus acuminatus	Short-pointed cyperus	Low elevation riparian;Vernal pools	n	y
125	VA	Cyperus lupulinus ssp. lupulinus	Great Plains flatsedge	Moist/wet meadows	y	y
126	VA	Cypripedium fasciculatum	Clustered lady's-slipper	Cool moist forest;Moderate riparian	y	n
127	VA	Diphasiastrum complanatum	Ground cedar	Cold forest;Cool moist forest;Moderate riparian;Warm Dry forest	y	y
128	VA	Diplacus cusickii	Cusick's monkeyflower	Big sage;Dry grasslands;Lithosols	y	n

129	VA	Diplacus tricolor	Three-colored monkeyflower	Moist/wet meadows;Vernal pools	n	y
130	VA	Dracocephalum parviflorum	American dragonhead	Moderate riparian;Warm Dry forest	y	n
131	VA	Elatine brachysperma	Short seeded waterwort	Moist/wet meadows	y	y
132	VA	Eleocharis bolanderi	Bolander's spikerush	Low elevation riparian;Moderate riparian;Warm Dry forest	y	y
133	VA	Eremothera pygmaea	Dwarf evening-primrose	Low elevation grasslands;Low elevation riparian	y	y
134	VA	Erigeron davisii	Engelmann's daisy	Dry grasslands;Moderate grasslands	y	n
135	VA	Erigeron disparipilus	White cushion erigeron	Dry grasslands;Lithosols;Warm Dry forest	y	n
136	VA	Eriogonum cusickii	Cusick's buckwheat	Dry grasslands;Lithosols	y	y
137	VA	Eriogonum prociduum	Prostrate buckwheat	Big sage;Lithosols	n	y
138	VA	Eriogonum salicornioides	Playa buckwheat	Alkali	y	n
139	VA	Eriogonum umbellatum var. glaberrimum	Green buckwheat	Big sage;Cold forest	n	y
140	VA	Erythranthe hymenophylla	Membrane-leaved monkeyflower	Low elevation riparian	y	n
141	VA	Erythranthe inflatula	Disappearing monkeyflower	Low elevation riparian;Moderate riparian	y	y
142	VA	Erythranthe patula	Stalk-leaved monkeyflower	Low elevation grasslands;Low elevation riparian	y	n

143	VA	Eucephalus gormanii	Gorman's aster	Cliffs, outcrops;Subalpine dry	n	y
144	VA	Galium serpenticum ssp. warnerense	Warner mt. bedstraw	Subalpine dry	n	y
145	VA	Gentiana newberryi var. newberryi	Newberry's gentian	Moist/wet meadows;Subalpine wet	n	y
146	VA	Gentiana prostrata	Moss gentian	Subalpine wet	y	n
147	VA	Geum rossii var. turbinatum	Slender-stemmed avens	Cliffs, outcrops;Subalpine dry	y	n
148	VA	Githopsis specularioides	Common blue-cup	Moderate riparian;Warm Dry forest	y	n
149	VA	Gratiola heterosepala	Boggs lake hedge-hyssop	Moist/wet meadows;Vernal pools	n	y
150	VA	Hackelia diffusa var. diffusa	Diffuse stickseed	Cliffs, outcrops;Dry grasslands;Lithosols	y	n
151	VA	Heliotropium curassavicum	Salt heliotrope	Low elevation riparian;Moist/wet meadows;Vernal pools	y	y
152	VA	Ipomopsis tenuituba	Rydberg's gilia	Subalpine dry	y	y
153	VA	Isoetes minima	Midget quillwort	Cool moist forest;Dry grasslands;Lithosols;Warm Dry forest	y	n
154	VA	Ivesia shockleyi	Shockley's ivesia	Cold forest;Subalpine dry	n	y
155	VA	Juncus hemiendytus var. abjectus	Least rush	Low elevation riparian;Moist/wet meadows;Vernal pools	n	y

156	VA	Juncus howellii	Howell's rush	Moderate riparian;Moist/wet meadows	y	n
157	VA	Juncus tiehmii	Tiehm's rush	Vernal pools	n	y
158	VA	Juncus triglumis var. albescens	Three-flowered rush	Subalpine wet	y	n
159	VA	Kobresia myosuroides	Bellard's kobresia	Subalpine dry;Subalpine wet	y	n
160	VA	Kobresia simpliciuscula	Simple kobresia	Subalpine dry;Subalpine wet	y	n
161	VA	Lipocarpha aristulata	Aristulate lipocarpha	Low elevation riparian	y	y
162	VA	Listera borealis	Northern twayblade	Cold forest;Cool moist forest;Moderate riparian	y	n
163	VA	Lobelia dortmanna	Water lobelia	Aquatic;Moist/wet meadows	n	y
164	VA	Lomatium erythrocarpum	Red-fruited lomatium	Subalpine dry	y	n
165	VA	Lomatium greenmanii	Greenman's desert-parsley	Subalpine dry	y	n
166	VA	Lomatium ochocense	Ochoco lomatium	Lithosols	n	y
167	VA	Lomatium pastorale	Meadow lomatium	Lithosols	y	n
168	VA	Lomatium rollinsii	Rollins' lomatium	Low elevation grasslands	y	n
169	VA	Lomatium tarantuloides	Spider biscuitroot	Lithosols	y	n
170	VA	Luina serpentina	Colonial luina	Cliffs, outcrops;Warm Dry forest	y	n
171	VA	Lupinus lepidus var. cusickii	Cusick's lupine	Big sage	y	n

172	VA	Lycopodiella inundata	Bog club-moss	Moist/wet meadows	n	y
173	VA	Muhlenbergia minutissima	Annual dropseed	Low elevation riparian;Moist/wet meadows	y	y
174	VA	Ophioglossum pusillum	Adder's-tongue	Moderate riparian;Moist/wet meadows;Subalpine wet	y	y
175	VA	Pellaea bridgesii	Bridges' cliff-brake	Cliffs, outcrops;Subalpine dry	y	n
176	VA	Penstemon deustus var. variabilis	Variable hot-rock penstemon	Cliffs, outcrops;Dry grasslands	y	n
177	VA	Penstemon glaucinus	Blue-leaved penstemon	Cold forest	n	y
178	VA	Penstemon peckii	Peck's penstemon	Warm Dry forest	n	y
179	VA	Penstemon pennellianus	Blue Mountain penstemon	Cliffs, outcrops;Dry grasslands;Lithosols	y	n
180	VA	Penstemon wilcoxii	Wilcox's penstemon	Cliffs, outcrops;Dry grasslands;Lithosols	y	n
181	VA	Perideridia erythrorhiza	Red-rooted yampah	Moist/wet meadows;Warm Dry forest	n	y
182	VA	Phacelia minutissima	Dwarf phacelia	Cool moist forest;Moderate riparian;Warm Dry forest	y	n
183	VA	Phacelia tetramera	Dwarf phacelia	Big sage;Moist/wet meadows;Vernal pools	y	n
184	VA	Phemeranthus spinescens	Spinescent fameflower	Lithosols	n	y
185	VA	Phlox hendersonii	Henderson's phlox	Subalpine dry	y	n

186	VA	Phlox multiflora	Many-flowered phlox	Cliffs, outcrops;Dry grasslands	y	n
187	VA	Phlox solivagus	Lonely phlox	Cliffs, outcrops;Subalpine dry	y	n
188	VA	Pilularia americana	American pillwort	Vernal pools	y	y
189	VA	Pinus albicaulis	Whitebark pine	Subalpine dry	y	y
190	VA	Pinus flexilis	Limber pine	Cold forest	y	n
191	VA	Piptatheropsis exigua	Little ricegrass	Dry grasslands;Lithosols;Subalpine dry	y	n
192	VA	Plagiobothrys salsus	Desert allocarya	Alkali;Moist/wet meadows	n	y
193	VA	Platanthera obtusata	Small northern bog-orchid	Moist/wet meadows;Subalpine wet	y	n
194	VA	Pleuropogon oregonus	Oregon semaphoregrass	Moderate riparian;Moist/wet meadows	y	y
195	VA	Pogogyne floribunda	Profuse-flowereed mesa mint	Vernal pools	n	y
196	VA	Potamogeton diversifolius	Rafinesque's pondweed	Aquatic;Moderate riparian;Moist/wet meadows	y	y
197	VA	Potentilla versicolor var. darrachii	Darrach's cinquefoil	Subalpine dry	y	n
198	VA	Pyrrocoma racemosa var. paniculata	Panicled goldenweed	Low elevation riparian	n	y
199	VA	Pyrrocoma scaberula	Rough pyrrocoma	Dry grasslands	y	n

200	VA	Ranunculus populago	Mountain buttercup	Cold forest;Moderate riparian;Moist/wet meadows;Subalpine wet	y	n
201	VA	Ribes cereum var. colubrinum	Wax currant	Warm Dry forest	y	n
202	VA	Ribes oxyacanthoides ssp. irriguum	Idaho gooseberry	Low elevation riparian;Warm Dry forest	y	n
203	VA	Ribes wolfii	Wolf's currant	Cold forest;Cool moist forest	y	n
204	VA	Rorippa columbiae	Columbia cress	Low elevation riparian;Moderate riparian	y	y
205	VA	Rotala ramosior	Lowland toothcup	Low elevation riparian;Moderate riparian;Moist/wet meadows	y	y
206	VA	Rubus bartonianus	Bartonberry	Cliffs, outcrops	y	n
207	VA	Salix farriae	Farr's willow	Subalpine wet	y	n
208	VA	Salix nivalis	Snow willow	Subalpine wet	y	n
209	VA	Salix wolfii	Wolf's willow	Subalpine wet	y	y
210	VA	Saxifraga adscendens ssp. oregonensis	Wedge-leaf saxifrage	Subalpine dry;Subalpine wet	y	n
211	VA	Scheuchzeria palustris ssp. americana	Scheuchzeria	Aquatic;Moist/wet meadows	n	y
212	VA	Schoenoplectus subterminalis	Water clubrush	Moderate riparian;Moist/wet meadows	n	y

213	VA	Scirpus pendulus	Drooping bulrush	Moist/wet meadows	n	y
214	VA	Sesuvium verrucosum	Verrucose sea-purslane	Alkali;Vernal pools	n	y
215	VA	Silene scouleri ssp. scouleri	Scouler's catchfly	Dry grasslands	y	n
216	VA	Spartina pectinata	prairie cordgrass	Low elevation riparian	y	n
217	VA	Spiranthes porrifolia	Western ladies-tresses	Moderate riparian;Moist/wet meadows	y	n
218	VA	Stanleya confertiflora	Biennial stanleya	Dry grasslands	y	n
219	VA	Suksdorfia violacea	Violet suksdorfia	Cliffs, outcrops;Low elevation riparian	y	n
220	VA	Swertia perennis	Swertia	Moist/wet meadows;Subalpine wet	y	n
221	VA	Thalictrum alpinum	Alpine meadowrue	Subalpine wet	y	n
222	VA	Thelypodium eucosmum	Arrow-leaf thelypody	Juniper;Low elevation riparian;Moderate riparian;Warm Dry forest	y	y
223	VA	Townsendia montana	Mountain townsendia	Subalpine dry	y	n
224	VA	Townsendia parryi	Parry's townsendia	Subalpine dry	y	n
225	VA	Trifolium douglasii	Douglas' clover	Moderate riparian;Moist/wet meadows;Warm Dry forest	y	n
226	VA	Triglochin palustris	Slender bog arrowgrass	Moist/wet meadows;Subalpine wet	y	n

227	VA	Trollius albiflorus	American globeflower	Cold forest;Moderate riparian;Moist/wet meadows;Subalpine wet	y	n
228	VA	Utricularia minor	Lesser bladderwort	Aquatic;Subalpine wet	y	y
229	VA	Utricularia ochroleuca	Northern bladderwort	Aquatic;Subalpine wet	y	y

7 APPENDIX B-ALTERNATIVES CROSSWALK

No other standard of the Eastside Screens is being proposed for amendment outside of the 1995 Interim Wildlife Standard and there are no proposed changes to Scenario B of the 1995 Interim Wildlife Standard.

1995 Interim Wildlife Standard

a. The interim wildlife standard has two possible scenarios to follow based on the Historical Range of Variability (HRV) for each biophysical environment within a given watershed. For the purposes of this standard, late and old structural stages (LOS) can be either “Multi-strata with Large Trees,” or “Single Strata with Large Trees,” as described in Table l of the Ecosystem Standard. These LOS stages can occur separately or in some cases, both may occur within a given biophysical environment.

b. LOS stages are calculated separately in the interim ecosystem standard. Use Scenario A whenever any one type of LOS is below HRV. If both types occur within a single biophysical environment and one is above HRV and one below, use Scenario A. Only use Scenario B when both LOS stages within a particular biophysical environment are at or above HRV.

c. The following sale types were exempted from consideration of HRV through the interim ecosystem standard, but must still meet the intent of the wildlife standards by following the direction provided in Scenario A, 1) through 4), as applicable to the type of sale being proposed, and regardless of whether the stand is LOS or not:

1. precommercial thinning sales,
2. sales of material sold as fiber,
3. sales of dead material less than sawlog size (7-inch dbh) with incidental green volume,
4. salvage sales with incidental green volume located outside currently mapped old growth,
5. commercial thinning and/or understory removal sales located outside currently mapped old growth.

The interim wildlife standard only altered portions of current Forest Plans. All additional Forest Plan wildlife standards and guidelines not altered in this direction still apply.

d. Scenario A

Scenario A table illustrating the difference between current language and proposed amendment language by Alternative.

	Current Language (No Action)	Old Tree Standard	Old and Large Trees Guideline (Proposed Action)	Adaptive Management
d.	If either one or both of the late and old structural (LOS) stages falls BELOW HRV in a particular biophysical environment within a watershed, then there should be NO NET LOSS OF LOS from that biophysical environment. DO NOT allow timber sale harvest activities to occur within LOS stages that are BELOW HRV.	No change	No change	No change
d.1	Some timber sale activities can occur within LOS stages that are within or above HRV in a manner to maintain or enhance LOS with-in that biophysical environment. It is allowable to manipulate one type of LOS to move stands into the LOS stage that is deficit if this meets historical conditions. **Under the No Action alternative, we will assume that there will be no change in the common practice of Forests applying sub-part d.2(a) to subpart d.1 of Scenario A of the wildlife standard.**	Clarification in DN. Spelled out assumptions in Alts. **For this proposed amendment to Scenario A of the wildlife standard, we are assuming under all action alternatives that subpart d.1 is not to be interpreted as having a 21-inch live tree harvest restriction as long as the intent of the ecosystem standard and Scenario A wildlife standard are met including NO NET LOSS OF LOS from respective biophysical environments.** In other words it is assumed that when LOS	Clarification in DN. Spelled out assumptions in Alts **Same assumptions as other action alternatives.**	Clarification in DN. Spelled out assumptions in Alts **Same assumptions as other action alternatives.**

		(single- or multi-strata) is within or above HRV for a biophysical setting that timber sale activities that accomplish either 1) the maintenance or improvement of LOS conditions or 2) the manipulation of multi-strata LOS to single strata LOS consistent with the Historical Ranges of Variation; is acceptable as long as no net loss of LOS occurs.		
d.2	Outside of LOS, many types of timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components in stands subject to timber harvest as much as possible, by adhering to the following standards:	No change	No change	No change
d.2.a	Maintain all remnant late and old seral and/or structural live trees > 21-inch dbh that currently exist within stands proposed for harvest activities	Standard: Old trees estimated to be > 150 years shall not be removed. Forests will use best available science information to estimate old trees based on physical characteristics. Guideline:	Guideline: Management activities should retain and generally emphasize recruitment of old and large trees. Management activities should first prioritize old trees for retention and recruitment. If there are no	Guideline: Management activities don't include a size or age requirement but must still adhere to the rest of the screens including d.2.b and d.2.c.

		Management activities should consider species composition and spatial arrangement within stands and across the landscape.	old trees, the largest trees should be retained. Old trees are defined as having visual characteristics that suggest an age > 150 years. Large trees are defined as grand fir, white fir, or Douglas-fir ≥ 30 inches dbh or trees of any other species ≥ 21 inches dbh. Old and large trees will be identified through best available science information. Management activities should consider species composition and spatial arrangement within stands and across the landscape.	
d.2.b	Manipulate vegetative structure that does not meet late and old structural (LOS) conditions (as described in Table 1of the Ecosystem Standard), in a manner that moves it towards these conditions as appropriate to meet HRV.	No change	No change	No change
d.2.c	Maintain open, park-like stand conditions where this condition occurred historically. Manipulate vegetation in a manner to	No change	No change	No change

	encourage the development and maintenance of large diameter, open canopy structure. (While understory removal is allowed, some amount of seedlings, saplings, and poles need to be maintained for the development of future stands).			
d.3	Maintain connectivity and reduce fragmentation of LOS stands by adhering to the following standards … (See Appendix xx for a complete reproduction of this standard.)	No change	No change	No change
d.4.	Adhere to the following specific wildlife prescriptions. These standards are set at MINIMUM levels of consideration. Follow Forest Plan standards and guidelines when they EXCEED the following prescriptive levels	No change	No change	No change
d.a Snags, Green Tree Replacements and Down Logs: **INTENT STATEMENT**	Most (if not all) wildlife species rely on moderate to high levels of snags and down logs for nesting, roosting, denning and feeding. Large down logs are a common and important component of most old and late structural forests. Past management practices have greatly reduced the number of large snags and down logs in managed stands.	No change	No change	No change
4.a.1	All sale activities (including intermediate and regeneration harvest in both even-age and uneven-age systems, and salvage) will maintain snags and green replacement trees of >21 inches dbh (or whatever is the representative dbh of the overstory layer if it is less than 21 inches), at 100% potential	**Snag Standard:** 1.a Maintain all snags ≥ 20”(or whatever is the representative DBH of the overstory layer if it is less than 20”)	Same as Alt 1.	Same as Alt. 1

	population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current snag models or other documented procedures. NOTE: for Scenario A, the live remnant trees (< 21-inch dbh) left can be considered for part of the green replacement tree requirement	**OR** 1.b Complete a snag analysis using the best available science on snag-dependent species ecological requirements as applied through current snag tools, models, or other documented procedures to maintain or increase habitat for a diverse composition of wildlife species 2. If snags ≥ 20" (or whatever is the representative DBH of the overstory layer if it is less than 20") OR those that have been identified for retention using the best available science must be felled for operational safety then: **Guidelines:** • Protect snags from operations by grouping or clustering in skips or leave areas. • Avoid large snags during logging system design.		

		• Avoid cutting of large snags in landing designations. **Green Tree Retention:** **Standard:** Retain and recruit large trees of the appropriate species and spatial arrangements to meet LOS objectives and wildlife tree objectives. Use best available science to determine green tree retention. **Guideline:** Use natural decay processes and agents to recruit snags from green trees: • Strive for diverse composition and size class of tree species • Strive for tree species that are tolerant, resistant, or immune to root disease • Prioritize hollow, deformed or damaged, broken topped, and pockets of heart rot • Whenever possible, retain some trees having large-		

		volume brooms with platforms, however retention selections for brooms should be carefully designed to maximize wildlife benefits while minimizing the potential for spread to healthy trees and uninfected portions of the stand • Consider retention in dense groups and sub-stand level tree competition		
4.a.2	Pre-activity (currently existing) down logs may be removed only when they exceed the quantities listed below. When pre-activity levels of down logs are below the quantities listed, do not remove downed logging debris that fits within the listed categories. It is not the intention of this direction to leave standing trees for future logs in addition to the required snag numbers, nor to fall merchantable material to meet the down log requirements. The snag numbers are designed to meet future down log needs in combination with natural mortality. Exceptions to meeting the down log requirement can be made where fire protection needs for life and property cannot be accomplished with this quantity of debris	No change	No change	No change

	left on site. The down log criteria are not intended to preclude the use of prescribed burning as an activity fuels modification treatment. Fire prescription parameters will ensure that consumption will not exceed 3 inches total (1½ inch per side) of diameter reduction in the featured large logs (sizes below). Tools such as the CONSUME and FOFEM computer models, fire behavior nomograms, and local fire effects documentation can aid in diameter reduction estimates. Leave logs in current lengths; do not cut them into pieces. Longer logs may count for multiple "pieces" without cutting them. Cutting them may destroy some habitat uses and also cause them to decay more rapidly. It is also not expected that the "pieces" left will be scattered equally across all acres.			
4.b Goshawks: INTENT STATEMENT	Goshawks are known to use interior forest habitats of mature/old growth structure. Habitat uses, nesting stand characteristics, and key habitat structural components in eastern Oregon/Washington are currently being studied. Until further information is known, and management plans approved to ensure species viability, the following standards are to be met as a minimum. Forest Plan standards and guidelines that EXCEED the levels described below should be used	No change	No change	No change

	instead of, or in addition to, the following … (See Appendix XX for complete reproduction of the Eastside Screens.)			

e. Scenario B

(No changes are proposed to this section of the Eastside Screens.)

Within a particular biophysical environment within a watershed, if the single, existing late and old structural (LOS) stage is WITHIN OR ABOVE HRV, OR if both types of LOS stages occur and BOTH are WITHIN OR ABOVE HRV, then timber harvest can occur within these stages as long as LOS conditions do not fall below HRV. Enhance LOS structural conditions and attributes as possible, consistent with other multiple use objectives. The intent of the following direction is to maintain options by impacting large and/or contiguous stands of LOS as little as possible, while meeting other multiple use objectives.

1) Harvest activities, (any and all types being considered), can occur in the following stand types in order of priority:

a) Activities should occur within stands other than LOS as a first priority.

b) Second priority for harvest activities is within smaller, isolated LOS stands <100 acres in size, and/or at the edges (first 300 ft) of large blocks of LOS stands (t 100 acres).

c) Some harvesting can occur, but only as a last priority, within the interior of large LOS stands (t 100 acres); REGENERATION AND GROUP SELECTION ACTIVITIES ARE NOT ALLOWED. REFER TO NON-FRAGMENTATION STANDARDS, 3), BELOW.

2) Maintain connectivity as directed in Scenario A, 3)

3) Non-fragmentation standards – Within the interior of large LOS stands t 100 acres, (beyond 300 ft from edge), harvest activities are limited to non-fragmenting prescriptions such as thinning, single-tree selection (UEAM), salvage, understory removal, and other non-regeneration activities. Group selection (UEAM) is only allowed when openings created either mimic the natural forest pattern, and do not exceed ½ acre in size.

4) Adhere to wildlife prescriptions provided in SCENARIO A, 4) a) for snags, green tree replacements, and down logs; and 5) for goshawks with the following exception for goshawk post fledging areas in 5) c): A 400-acre "Post Fledging Area" (PFA) will be established around every active nest site. While harvesting activities can occur within this area, up to 60% of the area should be retained in an LOS condition, (i.e., if 35% of the area is now in LOS stands then it all needs to be retained; if 75% of the area is now in LOS stands then some can be harvested, as long as this late and old stand structure does not drop below 60% of the area)

8 APPENDIX C-1995 EASTSIDE SCREENS

REVISED

INTERIM MANAGEMENT DIRECTION

ESTABLISHING RIPARIAN, ECOSYSTEM AND WILDLIFE STANDARDS FOR TIMBER SALES

REGIONAL FORESTER'S FOREST PLAN AMENDMENT #2

6/12/95

REGIONAL FORESTER'S EASTSIDE FOREST PLAN AMENDMENT NO. 2

ALTERNATIVE 2, as adopted

1. All timber sales, except as identified below, will be designed to incorporate the interim ripar- ian, ecosystem and wildlife standards.

2. The following types of sales will not be subject to the interim standards: personal use fire- wood sales; post and hole sales; sales to protect health and safety; and sales to modify vege- tation within recreation special use areas. NEPA and required consultation under Section 7 of the Endangered Species Act must be completed.

3. Five other types of sales will not be subject to the interim ecosystem standard, but must apply the interim riparian and wildlife standards: precommercial thinning sales; sales of material sold as fiber; sales of dead material less than 7-inch dbh, with incidental green volume (ref. RO 2430 ltr, 8/16/93); salvage sales, with incidental green volume, located outside currently mapped old growth (ref. RO 2430 ltr. 8/16/93); and commercial thinning and understory re- moval sales located outside currently mapped old growth.

4. Interim riparian standard: Timber sales (green and salvage) will not be planned or located within riparian areas as described below:

    a. Perennial and intermittent fish-bearing streams: consists of the stream and the area on ei- ther side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet including both sides of the stream channel), whichever is greatest.

    b. Perennial nonfish-bearing streams: consists of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet, including both sides of the stream channel), whichever is greatest.

    c. Intermittent non-fish bearing streams: consists of the stream channel from the edges of the stream channel to the top of the inner gorge, or to the outer edges of the riparian vege- tation, or to the extent of landslides or landslide-prone area, or to a distance of 100 feet slope distance (200 feet, including both sides of the channel), whichever is greatest.

    See FSM 2526 9/80 R-6 Supp 42 for definitions of Perennial and Intermittent stream.

    d. Ponds, lakes, reservoirs, seeps and springs, bogs and wetlands consist of the body of wa- ter or wetland and/or seeps/spring source and the area to the outer edges of the

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riparian vegetation, or to the extent of the seasonally saturated soil, or to the extent of moderately and highly unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond or lake, whichever is greatest.

5. Interim ecosystem standard:

   a. Characterize the proposed timber sale and its associated watershed for patterns of stand structure by biophysical environment and compare to the Historic Range of Variability(HRV). The HRV should be based on conditions in the pre-settlement era; however 1900s photography may be acceptable. HRV should be developed for large landscapes across which forest types, environmental settings, and disturbance regimes (fire and in- sects/disease) are relatively uniform. Each component watershed should not be expected to reflect the average conditions for the larger landscape, but the sum of conditions across watersheds within the area for which HRV is developed should reflect ranges of conditions determined in the HRV evaluation. Note: LOS, a term used in the interim wildlife standard, refers to the structural stages where large trees are common, i.e. Multi-stratum with Large Trees, and Single-stratum with Large Trees. See Table 1.

   b. Ecosystem characterization steps to determine HRV:

      1) Describe the dominant historical disturbance regime, i.e. the disturbance types and their magnitudes and frequencies.

      2) Characterize the landscape pattern and abundance of structural stages (Table 1) maintained by the disturbance regime. Consider biophysical environmental setting (Table 2) across the large landscape to make this determination.

      3) Describe spatial pattern and distribution of structural stages under the HRV disturbance regime, and

      4) Map the current pattern of structural stages and calculate their abundance by bio- physical environmental setting.

   c. Characterize the difference in percent composition of structural stages between HRV and current conditions (Table 3). Identify structural conditions and biophysical environment combinations that are outside HRV conditions to determine potential treatment areas.

Table 1. Structural stages for use with HRV analysis. Structural stage is not necessarily associated with stand age or to seral (species composition) development.

Structural Stage	Definition	Description
Stand Initiation	Growing space is reoccupied following a stand replacing dis- turbance, typically by seral spe- cies.	One canopy stratum (may be broken or continuous), one dominant cohort[2] of seedlings or saplings. Grass, forbs, or shrubs may also be present with early seral trees.[3]
Stem Exclusion: Open Canopy	Occurrence of new tree stems is excluded (moisture limited). Crowns are open grown. Canopy is discontinuous. This structure can be maintained by frequent underburning or management.	One discontinuous canopy stratum. One cohort of trees. New tree stems excluded by competition. Trees may be poles or of small or medium diameter. Understory shrubs, grasses, or forbs may be present.
Stem Exclusion: Closed Canopy	Occurrence of new tree stems is excluded (light or moisture lim- ited). Crowns are closed and abrading.	Canopy layer is closed and continuous. One or more can- opy strata may be present. Lower canopy strata, if pre- sent, is the same age class as the upper stratum. Trees may be poles or of small or medium diameter. Understory shrubs, grasses, or forbs may be present.
Understory Reinitiation	A second cohort of trees is established under an older, typically seral, overstory. Mortality in the overstory creates growing space for new trees in the understory. Large trees are uncommon.	The overstory canopy is discontinuous. Two or more can- opy layers are present. Two or more cohorts of trees are present. Overstory trees may be poles or of small or medium diameter. Understory trees are seedlings, sap- lings or poles.
Multi- stratum, without large trees	Several cohorts of trees are es- tablished. Large overstory trees are uncommon. Pole, small, and medium sized trees dominate.	The overstory canopy is discontinuous. Two or more can- opy layers are present. Large trees are uncommon in the overstory. Horizontal and vertical stand structure and tree sizes are diverse. The stand may be a mix of seedlings, saplings, poles, or small or medium diameter trees.
Multi-stratum, with large trees	Several to many cohorts and strata of trees are present. Large trees are common.	The overstory canopy is broken or discontinuous. Two or more canopy layers are present. Two or more cohorts of trees are present. Medium and large sized trees dominate the overstory. Trees of all sizes may be present. Horizon- tal and vertical stand structure and tree sizes are diverse.

Single stratum, with large trees	A single stratum of large trees is present. Large trees are common. Young trees are absent or few in the understory. Park-like condi- tions may exist.	The single dominant canopy stratum consists of medium sized or large trees. One or more cohorts of trees may be present. An understory may be absent or consist of sparse or clumpy seedlings or saplings. Grasses, forbs, or shrubs may be present in the understory.

[1] Adapted from an unpublished report by K. O'Hara, Assistant Professor of Silviculture, University of Montana, under contract to the Interior Columbia Basin Ecosystem Project for the Eastside EIS. Modifications developed by Miles Hemstrom, USFS Regional Office, Portland, Oregon, with input from Paul Hessburg, USFS/PNW Research Station, Wenatchee Lab, Wenatchee, Washington.

[2] A cohort is a class of trees arising after a common natural or artificial disturbance.

[3] "Trees" refers to live trees, not snags or other dead trees.

Table 2. Example biophysical environments matrix. Analysis areas may have more or fewer kinds of biophysical environments and characteristics of each environment may differ from those shown. This table is only provided as an example. The biophysical environments listed are not comprehensive. Each landscape area may have these or different environments.

Biophysical Environment[4]	Dominant Disturbance Factors	Disturbance Regime[5]	Average Disturbance Patch	Typical Landform Setting	Typical Elevation Range	Typical Aspects
Hot, Dry: PIPO, ABGR	Fire, insects, and disease	Low	<l acre	Ridge tops and steep side slopes	2500-4000 feet	S, SW
Warm, Dry: PSME, ABGR	Fire, insects, and disease	Moderat e	<5 acres	Side slopes	3000-5000 feet	S, SW
Cool, Mesic: PSME, ABGR, ABLA2, PIEN	Fire, insects, and disease	High	80-120 acres	Various	3000-5000 feet	Various
Cool, Wet: ABGR, ABLA2, TSME	Insects and disease, fire	High	>250 acres	Bottom lands	3000-5000 feet	NE, N, NW, Flat

[4] Temperature and moisture regime, characteristic late seral species, first two letters of genus and species.

[5] Agee (1990). "The historical role of fire in Pacific Northwest forests", Natural and Prescribed Fire in Pacific Northwest Forests, Oregon State University Press.

Low severity regime: 1-25 year return interval, 0% to 20% mortality of large trees.

Moderate severity regime: 26-100 year return interval, 26% to 70% mortality of large

trees. High severity regime: >100 year return interval, >70% mortality of large trees.

Table 3. Example biophysical environment by structural stage matrix. This is only an example. The number and kind of biophysical environments and the historic and current distribution of structural conditions vary by landscape. H% is the es- timated range of the percent extent of each condition from HRV assessment. C% is the estimated percent extent of each

condition at present in the watershed under examination. D% is a range indicating the difference between H% and C%; D%

= C%-H%. Negative values indicate a reduction from historical conditions. *This table is only provided as an example. The bio- physical environments listed are not comprehensive. Each landscape area may have these or different environments.*

	Stand Initiation			Stem Exclusion: Open Canopy			Stem Exclusion: Closed Canopy			Understory Reinitiation			Multi-stratum, without large trees			Multi-stratum, with large trees			Single-stratum, with large trees		
Envt	H%	C%	D%	H%	C%	D%	H%	C%	D%	H%	C%	D%	H%	C%	D%	H%	C%	D%	H%	C%	D%
Hot, Dry	5 to 15	15	0 to 10	5 to 20	20	0 to 15	NA	NA	NA	NA	NA	NA	5 to 10	30	20 to 25	2 to 15	20	5 to 18	20 to 70	15	-5 to -55
Warm, Dry	1 to 15	5	4 to -10	5 to 20	20	0 to 15	1 to 10	10	0 to 9	1 to 10	10	0 to 9	5 to 25	25	0 to 20	5 to 20	35	15 to 30	15 to 55	5	-10 to -50
Cool, Mesic	1 to 5	2	1 to -3	NA	NA	NA	5 to 25	5	0 to -20	5 to 25	5	0 to -20	50 to 70	65	15 to -5	5-25	24	19 to -1	NA	NA	NA
Cool, Wet	1 to 10	1	0 to -10	NA	NA	NA	1 to 10	3	2 to -7	5 to 25	10	5 to -15	20 to 50	40	20 to -10	30 to 60	46	16 to -14	NA	NA	NA

6. Interim wildlife standard:

   a. The interim wildlife standard has two possible scenarios to follow based on the Historical Range of Variability (HRV) for each biophysical environment within a given watershed. For the purposes of this standard, late and old structural stages (LOS) can be either “Multi-strata with Large Trees,” or “Single Strata with Large Trees,” as described in Ta- ble l of the Ecosystem Standard. These LOS stages can occur separately or in some cases, both may occur within a given biophysical environment.

   b. LOS stages are calculated separately in the interim ecosystem standard. Use Scenario A whenever any one type of LOS is below HRV. If both types occur within a single bio- physical environment and one is above HRV and one below, use Scenario A. Only use Scenario B when both LOS stages within a particular biophysical environment are at or above HRV.

   c. The following sale types were exempted from consideration of HRV through the interim ecosystem standard, but must still meet the intent of the wildlife standards by following the direction provided in Scenario A, 1) through 4), as applicable to the type of sale being proposed, and regardless of whether the stand is LOS or not:

      1. precommercial thinning sales,

      2. sales of material sold as fiber,

      3. sales of dead material less than sawlog size (7-inch dbh) with incidental green vol- ume,

      4. salvage sales with incidental green volume located outside currently mapped old growth,

      5. commercial thinning and/or understory removal sales located outside currently mapped old growth.

The interim wildlife standard only altered portions of current Forest Plans. All additional Forest Plan wildlife standards and guidelines not altered in this direction still apply.

   d. Scenario A

   If either one or both of the late and old structural (LOS) stages falls BELOW HRV in a par- ticular biophysical environment within a watershed, then there should be NO NET LOSS OF LOS from that biophysical environment. DO NOT allow timber sale harvest activities to occur within LOS stages that are BELOW HRV.

1) Some timber sale activities can occur within LOS stages that are within or above HRV in a manner to maintain or enhance LOS with-in that biophysical environment. It is allowable to manipulate one type of LOS to move stands into the LOS stage that is deficit if this meets historical conditions.

2) Outside of LOS, many types of timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components in stands subject to timber harvest as much as possible, by adhering to the following standards:

   a) Maintain all remnant late and old seral and/or structural live trees ≥ 21-inch dbh that currently exist within stands proposed for harvest activities.

   b) Manipulate vegetative structure that does not meet late and old structural (LOS) conditions (as described in Table 1of the Ecosystem Standard), in a manner that moves it towards these conditions as appropriate to meet HRV.

   c) Maintain open, park-like stand conditions where this condition occurred histori- cally. Manipulate vegetation in a manner to encourage the development and maintenance of large diameter, open canopy structure. (While understory re- moval is allowed, some amount of seedlings, saplings, and poles need to be main- tained for the development of future stands).

3) Maintain connectivity and reduce fragmentation of LOS stands by adhering to the following standards:

INTENT STATEMENT: While data is still being collected, it is the best understanding of wildlife science, today, that wildlife species associated with late and old structural condi- tions, especially those sensitive to "edge," rely on the connectivity of these habitats to al- low free movement and interaction of adults and dispersal of young. Connectivity corri- dors do not necessarily meet the same description of "suitable" habitat for breeding, but allow free movement between suitable breeding habitats. Until a full conservation as- sessment is completed that describes in more detail the movement patterns and needs of various species and communities of species in eastside ecosystems, it is important to in- sure that blocks of habitat maintain a high degree of connectivity between them, and that blocks of habitat do not become fragmented in the short-term.

   a) Maintain or enhance the current level of connectivity between LOS stands and be- tween all Forest Plan designated "old growth/MR" habitats by maintaining stands between them that serve the purpose of connection as described below:

(1) Network pattern – LOS stands and MR/Old Growth habitats need to be con- nected with each other inside the watershed as well as to like stands in adja- cent watersheds in a contiguous network pattern by at least 2 different direc- tions.

(2) Connectivity Corridor Stand Description – Stands in which medium diameter or larger trees are common, and canopy closures are within the top one-third of site potential. Stand widths should be at least 400 ft. wide at their narrow- est point. The only exception to stand width is when it is impossible to meet 400 ft with current vegetative structure, AND these “narrower stands” are the only connections available (use them as last resorts). In the case of lodgepole pine, consider medium to large trees as appropriate diameters for this stand type.

If stands meeting this description are not available in order to provide at least 2 different connections for a particular LOS stand or MR/Old Growth habitat, leave the next best stands for connections. Again, each LOS and MR/Old Growth habitat must be connected at least 2 different ways.

(3) Length of Connection Corridors – The length of corridors between LOS stands and MR habitats depends on the distance between such stands. Length of corridors should be as short as possible.

(4) Harvesting within connectivity corridors is permitted if all the criteria in (2) above can be met, and if some amount of understory (if any occurs) is left in patches or scattered to assist in supporting stand density and cover. Some understory removal, stocking control, or salvage may be possible activities, depending on the site.

b) To reduce fragmentation of LOS stands, or at least not increase it from current levels, stands that do not currently meet LOS that are located within, or sur- rounded by, blocks of LOS stands should not be considered for even-aged re- generation, or group selection at this time. Non-regeneration or single tree se- lection (UEAM) activities in these areas should only proceed if the prescription moves the stand towards LOS conditions as soon as possible.

4) Adhere to the following specific wildlife prescriptions. These standards

are set at MINIMUM levels of consideration. Follow Forest Plan standards and guidelines when they EXCEED the following prescriptive levels:

a) Snags, Green Tree Replacements and Down Logs:

INTENT STATEMENT – Most (if not all) wildlife species rely on moderate to high levels of snags and down logs for nesting, roosting, denning and feeding. Large down logs are a common and important component of most old and late structural forests. Past management practices have greatly reduced the number of large snags and down logs in managed stands.

(1) All sale activities (including intermediate and regeneration harvest in both even-age and uneven-age systems, and salvage) will maintain snags and green replacement trees of ≥ 21 inches dbh (or whatever is the representative dbh of the overstory layer if it is less than 21 inches), at 100% potential population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current snag models or other documented procedures. NOTE: for Scenario A, the live remnant trees (≥ 21-inch dbh) left can be considered for part of the green replace- ment tree requirement.

(2) Pre-activity (currently existing) down logs may be removed only when they exceed the quantities listed below. When pre-activity levels of down logs are below the quantities listed, do not remove downed logging debris that fits within the listed categories. It is not the intention of this direction to leave standing trees for future logs in addition to the required snag numbers, nor to fall merchantable material to meet the down log requirements. The snag numbers are designed to meet future down log needs in combination with natural mortality. Exceptions to meeting the down log requirement can be made where fire protection needs for life and property cannot be accom- plished with this quantity of debris left on site.

The down log criteria are not intended to preclude the use of prescribed burn- ing as an activity fuels modification treatment. Fire prescription parameters will ensure that consumption will not exceed 3 inches total (1½ inch per side) of diameter reduction in the featured large logs (sizes below). Tools such as the CONSUME and FOFEM computer models, fire behavior nomograms, and local fire effects documentation can aid in diameter reduction estimates.

Leave logs in current lengths; do not cut them into pieces. Longer logs may count for multiple “pieces” without cutting them. Cutting them may destroy some habitat uses and also cause them to decay more rapidly. It is also not expected that the “pieces” left will be scattered equally across all acres.

SPECIES	PIECES PER ACRE	DIAMETER SMALL END	PIECE LENGTH AND TOTAL LINEAL LENGTH	
Ponderosa Pine	3-6	12"	>6 ft.	20-40 ft.
Mixed Conifer	15-20	12"	>6 ft.	100-140 ft.
Lodgepole Pine	15-20	8"	>8 ft.	120-160 ft.

b) GOSHAWKS:

INTENT STATEMENT: Goshawks are known to use interior forest habitats of ma- ture/old growth structure. Habitat uses, nesting stand characteristics, and key habitat structural components in eastern Oregon/Washington are currently being studied.

Until further information is known and management plans approved to insure species viability, the following standards are to be met as a minimum. Forest Plan standards and guidelines that EXCEED the levels described below should be used instead of, or in addition to, the following:

(1) Protect every known active and historically used goshawk nest-site from dis- turbance. “Historical” refers to known nesting activity occurring at the site in the last 5 years. Seasonal restrictions on activities near nest sites will be re- quired for activity types that may disturb or harass pair while bonding and nesting.

(2) 30 acres of the most suitable nesting habitat surrounding all active and historical nest tree(s) will be deferred from harvest.

(3) A 400-acre “Post Fledging Area” (PFA) will be established

around every known active nest site. While harvest activities can occur within this area, retain the LOS stands and enhance younger stands towards LOS condition, as possible.

e. Scenario B

Within a particular biophysical environment within a watershed, if the single, existing late and old structural (LOS) stage is WITHIN OR ABOVE HRV, OR if both types of LOS stages occur and BOTH are WITHIN OR ABOVE HRV, then timber harvest can occur within these stages as long as LOS conditions do not fall below HRV. Enhance LOS structural conditions and attributes as possible, consistent with other multiple use objectives.

The intent of the following direction is to maintain options by impacting large and/or contiguous stands of LOS as little as possible, while meeting other multiple use objectives.

1) Harvest activities, (any and all types being considered), can occur in the following stand types in order of priority:

    a) Activities should occur within stands other than LOS as a first priority.

    b) Second priority for harvest activities is within smaller, isolated LOS stands <100 acres in size, and/or at the edges (first 300 ft) of large blocks of LOS stands

    (≥ 100 acres).

    c) Some harvesting can occur, but only as a last priority, within the interior of large LOS stands (≥ 100 acres); REGENERATION AND GROUP SELECTION AC- TIVITIES ARE NOT ALLOWED. REFER TO NON-FRAGMENTATION STANDARDS, 3), BELOW.

2) Maintain connectivity as directed in Scenario A, 3)
3) Non-fragmentation standards – Within the interior of large LOS stands ≥ 100 acres, (beyond 300 ft from edge), harvest activities are limited to non-fragmenting prescriptions such as thinning, single-tree selection (UEAM), salvage, understory removal, and other non-regeneration activities. Group selection (UEAM) is only allowed when openings created either mimic the natural forest pattern, and do not exceed ½ acre in size.
4) Adhere to wildlife prescriptions provided in SCENARIO A, 4) a) for snags, green tree replacements, and down logs; and 5) for goshawks with the following exception for goshawk post fledging areas in 5) c):
A 400-acre "Post Fledging Area" (PFA) will be established around every active nest site. While harvesting activities can occur within this area, up to 60% of the

area should be retained in an LOS condition, (i.e., if 35% of the area is now in LOS stands then it all needs to be retained; if 75% of the area is now in LOS stands then some can be harvested, as long as this late and old stand structure does not drop below 60% of the area).

9 APPENDIX D-WILDLIFE EFFECTS TABLE

NAME and ESU or DPS DESCRIPTION (if applicable)	Column1	LOS/Forest Associated	Johnson and O"Neil Habitat types	Johnson and O'Neil Structure Classes	THREATS	Column2	Column3	Column4	Column5	Column6
Scientific Name	**Common Name**	**X=LOS Associate**			**Timber Harvest**	**Conifer Encroachment**	**Grazing**	**Roads**	**Recreation**	**Invasive Species**
Leucosticte atrata	Black rosy finch		Alpine	Grassland and shrublands			X	X	X	X
Vulpes vulpes necator	Sierra nevada red fox		Alpine	Grassland and shrublands			X	X	X	
Leucosticte tephrocotis wallowa	Wallowa rosy finch		Alpine	Grassland and shrublands			X	X	X	X
Lynx canadensis	Canada lynx	X	Subalpine/Montane mixed-conifer forest	Sapling/pole closed/medium tree/large tree	X				X	
Corynorhinus townsendii	Townsend's big-eared bat		Unique Habitat	Unique Habitats	X			X		
Strix nebulosa	Great gray owl	X	Montane mixed-conifer, Lodgepole pine forest and woodlands	medium and large tree-single and multistory-moderate and closed	X			X		
Myotis lucifugus	Little Brown myotis	X	Montane mixed-conifer, East-side mixed-conifer	medium and large tree-single and multistory-moderate and closed						
Accipiter gentilis	Northern goshawk	X	Montane mixed-conifer, East-side mixed-conifer	medium and large tree-single and multistory-moderate and closed	X			X	X	
Canis lupus	Gray wolf		Habitat Generalist	Habitat Generalist			X	X		
Gulo gulo	Wolverine		Habitat Generalist	Habitat Generalist				X	X	
Progne subis	Purple martin	X	Ponderosa pine forest and woodlasnds	medium and large tree-single and multistory-open				X		X

Picoides albolarvatus	White-headed woodpecker	X	Ponderosa pine forest and woodlands	medium and large tree-single and multistory-open	X	X		X		X
Pekania pennanti	Fisher	X	East-side mixed conifer forest	medium and large tree-single and multistory-moderate and closed	X			X		
Myotis thysanodes	Fringed myotis	X	East-side mixed-conifer, ponderosa pine forest and woodlands	medium and large tree-single and multistory-open	X			X		
Melanerpes lewis	Lewis's woodpecker		Postfire	Postfire <10 years following disturbance	X			X		
Cypseloides niger	Black swift		Montane coniferous wetlands, eastside riparian wetlands						X	
Histrionicus histrionicus	Harlequin duck	X	Montane coniferous wetlands, eastside riparian wetlands	large tree-single and multistory-moderate and closed	X			X	X	
Parkesia noveboracensis	Northern waterthrush		Montane coniferous wetlands, eastside riparian wetlands				X			
Ascaphus montanus	Rocky mountain tailed frog	X	Montane coniferous wetlands, eastside riparian wetlands		X		X	X		
Actinemys marmorata	Western pond turtle		Open water				X	X		X
Haliaeetus leucocephalus	Bald eagle	X	Montane coniferous wetlands, eastside riparian wetlands, open water	large tree-single and multistory-moderate and closed	X			X	X	
Bucephala albeola	Bufflehead	X	Montane coniferous wetlands, eastside riparian wetlands, open water	large tree-single and multistory-moderate and closed	X			X	X	
Rana luteiventris	Columbia spotted frog		Open water				X	X		X
Oreortyx pictus	Mountain quail		Eastside riparian-wetlands				X	X	X	
Rana pretiosa	Oregon spotted frog		Open water				X	X		X
Bartramia longicauda	Upland sandpiper		Eastside grasslands				X	X		X

Anser albifrons elgasi	Tule goose		Open water						X	
Coturnicops noveboracensis	Yellow rail		Open water							
Pelecanus erythrorhynchos	American white pelican		Open water					X	X	
Dolichonyx oryzivorus	Bobolink		Herbaceous wetland				X	X		
Podiceps auritus	Horned grebe		Herbaceous wetland, Open water				X	X	X	
Podiceps grisegena	Red-necked grebe		Herbaceous wetland, Open water				X	X	X	
Agelaius tricolor	Tricolored blackbird		Herbaceous wetland							
Tympanuchus phasianellus columbianus	Columbian sharp-tailed grouse		Eastside shrubland/grasslands				X	X	X	X
Ovis canadensis	Bighorn sheep		Eastside shrubland/grasslands				X		X	X
Ammodramus savannarum	Grasshopper sparrow		Eastside grasslands				X			
Centrocercus urophasianus	Greater sage-grouse		Eastside shrublands				X	X	X	X
Pipilo chlorurus	Green-tailed towhee		Eastside shrublands				X			X
Oreamnos americanus	Mountain goat		Eastside shrubland/grasslands			X			X	
Lithobates pipiens	Northern leopard frog		Eastside shrubland/grasslands							
Antrozous pallidus	Pallid bat		Eastside shrubland/grasslands					X	X	

Sorex preblei	Preble's shrew		Eastside shrubland/grasslands							
Brachylagus idahoensis	Pygmy rabbit		Eastside shrublands/Shrub-steppe				X	X		X
Euderma maculatum	Spotted bat		Eastside shrubland/grasslands					X	X	
Driloleirus americanus	Giant palouse earthworm		Ponderosa pine forest and woodland; Shrub-steppe	medium and large tree-single story-open	X		X			
Colligyrus depressus	Harney Basin duskysnail		Eastside riparian-wetlands				X		X	
Cryptomastix hendersoni	Columbia Gorge oregonian		Eastside riparian-wetlands				X	X	X	
Cryptomastix populi	Poplar oregonian		Basalt talus							X
Fisherola nuttalli	Shortface lanx		Open water		X		X			
Fluminicola fuscus	Columbia pebblesnail		Open water		X		X			
Fluminicola modoci	Modoc pebblesnail		Open water		X		X			
Fluminicola turbiniformis	Turban pebblesnail		Open water					X		X
Helicodiscus salmonaceus	Salmon coil		Shrub-steppe					X		
Helisoma newberryi	Great basin ramshorn		Open water				X	X		
Lanx alta	Highcap lanx		Open water		X		X			
Megomphix lutarius	Umatilla megomphix		Montane coniferous wetlands, eastside riparian wetlands		X		X	X		
Oreohelix strigosa delicata	Blue mountainsnail		Ponderosa pine forest and woodland		X	X	X	X		

Oreohelix variabilis	Dalles mountainsnail		Basalt talus				X	X	X	
Polygyrella polygyrella	Humped coin		Ponderosa pine forest and woodland; Eastside mixed conifer forest	medium and large tree-single or multi story-open	X		X	X		
Pristiloma crateris	Crater Lake tightcoil		Montane coniferous wetlands, eastside riparian wetlands		X		X		X	
Pristiloma idahoense	Thinlip tightcoil		Montane coniferous wetlands, eastside riparian wetlands		X		X		X	
Pristiloma wascoense	Shiny tightcoil		Ponderosa pine forest and woodland; Eastside mixed conifer forest		X		X		X	
Pristinicola hemphilli	Pristine springsnail		Montane coniferous wetlands, eastside riparian wetlands		X		X	X	X	
Pyrgulopsis archimedis	Archimedes springsnail		Open water				X			
Radiodiscus abietum	Fir pinwheel	X	Eastside mixed conifer	medium and large tree-single and multistory-moderate and closed	X		X	X		
Vertigo andrusiana	Pacific vertigo		Meadow		X					
Vespericola depressus	Dalles hesperian	X	Eastside mixed conifer	medium and large tree-single and multistory-moderate and closed	X		X			
Vespericola sierranus	Siskiyou hesperian		Eastside riparian-wetlands		X		X		X	
Vorticifex effusus diagonalis	Lined ramshorn		Open water				X			
Vorticifex klamathensis klamathensis	Klamath ramshorn		Open water				X			
Bombus morrisoni	Morrisoni bumble bee		Meadow; Subalpine parkland			X	X			X

Bombus occidentalis	Western bumble bee		Meadow; Subalpine parkland			X	X			X
Bombus suckleyi	Suckley cuckoo bumble bee		Meadow; Subalpine parkland			X	X			X
Boloria bellona	Meadow fritillary		Herbaceuous wetlands; Montane coniferous wetlands			X	X			
Boloria selene	Silver-bordered fritillary		Herbaceuous wetlands; Montane coniferous wetlands			X				
Callophrys gryneus chalcosiva	Barry's hairstreak		Western juniper and Mountain Mahogany Woodlands			X				
Callophrys johnsoni	Johnson's hairstreak	X	Ponderosa pine forest and woodland; Eastside mixed conifer forest	medium and large tree-single and multistory-moderate and closed	X					
Colias christina sullivani	Sullivan's sulphur		Sagebrush-steppe			X	X			X
Colias occidentalis pseudochristina	Intermountain sulphur	X	Ponderosa pine forest and woodland	medium and large tree-single story-open	X		X			
Euphydryas gillettii	Gillette's checkerspot		Subalpine parkland			X	X			
Lycaena cupreus	Lustrous copper		Alpine grassland and shrublands			X				
Ochlodes yuma	Yuma skipper		Open water				X		X	X
Philotiella leona	Leona's little blue butterfly		Lodgepole pine forest and woodlands	Grass/forb-open and closed	X	X				X
Plebejus podarce klamathensis	Gray-blue butterfly		Alpine grassland and shrublands		X	X				
Polites mardon	Mardon skipper		Meadow			X	X			X
Speyeria egleis	Great basin fritillary		Alpine grassland and shrublands; Eastside grasslands				X			X

Aeshna sitchensis	Zigzag darner		Herbaceuous wetlands; Montane coniferous wetlands		X		X			
Gomphus lynnae	Columbia clubtail		Open water				X	X		X
Chloealtis aspasma	Siskiyou short-horned grasshopper		Eastside mixed conifer	Grass/forb-open and closed	X	X			X	

10 Appendix E – Description of the Viability Outcomes

The viability outcomes are based on (Wales et al. 2011, Gaines 2017, Gaines et al. 2017) and were calculated for current and historical conditions to assess changes in habitat conditions. The term "suitable environment" refers to a combination of source habitat and risk factors that influence the probability of occupancy and demographic performance of a surrogate species. The five viability outcomes that were used:

1. Outcome A—Suitable environments are broadly distributed across the historical range of the species throughout the assessment area. Habitat abundance is high relative to historical conditions. The combination of distribution and abundance of environmental conditions provides opportunity for continuous or nearly continuous intraspecific interactions for the surrogate species.

2. Outcome B—Suitable environments are broadly distributed across the historical range of the species. Suitable environments are of moderate to high abundance relative to historical conditions, but there may be gaps where suitable environments are absent or present in low abundance. However, any disjunctive areas of suitable environments are typically large enough and close enough to permit dispersal among subpopulations and to allow the species to potentially interact as a metapopulation. Species with this outcome are likely well distributed throughout most of the assessment area.

3. Outcome C—Suitable environments moderately distributed across the historical range of the species. Suitable environments exist at moderate abundance relative to historical conditions. Gaps where suitable environments are either absent or present in low abundance are large enough such that some subpopulations may be isolated, limiting opportunity for intraspecific interactions especially for species with limited dispersal ability. For species for which this is not the historical condition, reduction in the species' range in the assessment area may have resulted. Surrogate species with this outcome are likely well distributed in only a portion of the assessment area.

4. Outcome D—Suitable environments are low to moderately distributed across the historical range of the species. Suitable environments exist at low abundance relative to their historical conditions. While some of the subpopulations associated with these environments may be self-sustaining, there is limited opportunity for population interactions among many of the suitable environmental patches for species with limited dispersal ability. For species for which this is not the historical condition, reduction in species' range in the assessment area may have resulted. These species may not be well distributed across the assessment area.

5. Outcome E—Suitable environments are highly isolated and exist at very low abundance relative to historical conditions. Suitable environments are not well distributed across the historical range of the species. For species with limited dispersal ability there may be little or no possibility of population interactions among suitable environmental patches, resulting in potential for extirpations within many of the patches, and little likelihood of recolonization of such patches. There has likely been a reduction in the species' range from historical conditions, except for some rare, local endemics that may have persisted in this condition since the historical period. Surrogate species with this outcome are not well distributed throughout much of the assessment area.