United States Department of Agriculture

Patrick Vegetation Management Project

Environmental Assessment

Forest Service November 2021 Whitman Ranger District

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Introduction

The Whitman Ranger District of the Wallowa-Whitman National Forest (WWNF) proposes the Patrick Vegetation Management (Patrick) Project to improve forest health, the landscape's resiliency to disturbance, and increase the structural complexity, species diversity of vegetation to provide habitat for a wider range of wildlife species and provide economic benefit to the local economy.

The district prepared this assessment using direction from Council on Environmental Quality's regulations at 40 CFR 1500-1508, Forest Service National Environmental Policy Act (NEPA) Regulations at 36 CFR 220, and Forest Service Manual direction at 1909.15, 41.2. As a project analyzed under the original CEQ regulations, this analysis will not adopt the 2020 revised regulations. In summary, these regulations state that an environmental assessment (EA) must include the (1) Need for the Proposal, the (2) Proposed Action and Alternatives, (3) Environmental Impacts of the Proposed Action and Alternatives and the (4) Agencies and Persons Consulted.

This environmental assessment (EA) has been prepared to determine whether to prepare an environmental impact statement or a finding of no significant impact.

Proposed Project Location

The area being evaluated is approximately 48,794 acres on National Forest System lands. The majority of the project is located in North Fork Burnt River (48,753acres) with small portions in the Bridge Creek-Middle Fork John Day River (17 acres), Granite Creek (16 acres), Camp Creek-Middle Fork John Day River (6 Acres) and Phillips Lake-Powder River (2 acres) watersheds. The project area lies approximately 3 air miles southwest of Sumpter, Oregon and approximately 21 air miles southwest of Baker City, Oregon. See Figure 1 for a vicinity map of the Project Area.

Patrick project falls within portions of the following Legal Descriptions:

Legal location: T9S R35 ½ E, Sec. 25, 35, 36; T9S R36E, Sec. 27, 28, 31-35; T10S R35 1/2E, Sec. 1-4, 9-16, 21-28, 33-36; T10S R35E, Sec 1, 11-14, 21, 23-28, 34-36; T10S R36E, Sec. 1-12, 14-23, 35-36; T11S R 35 1/2 E, Sec. 1-3, 12; T11S R36E, Sec. 3-11, 13-18, 20-28, 34-36; T11S R37E, Sec. 30, 31; T12S R36E, Sec. 1, 2; T12S R37E, Sec. 6.

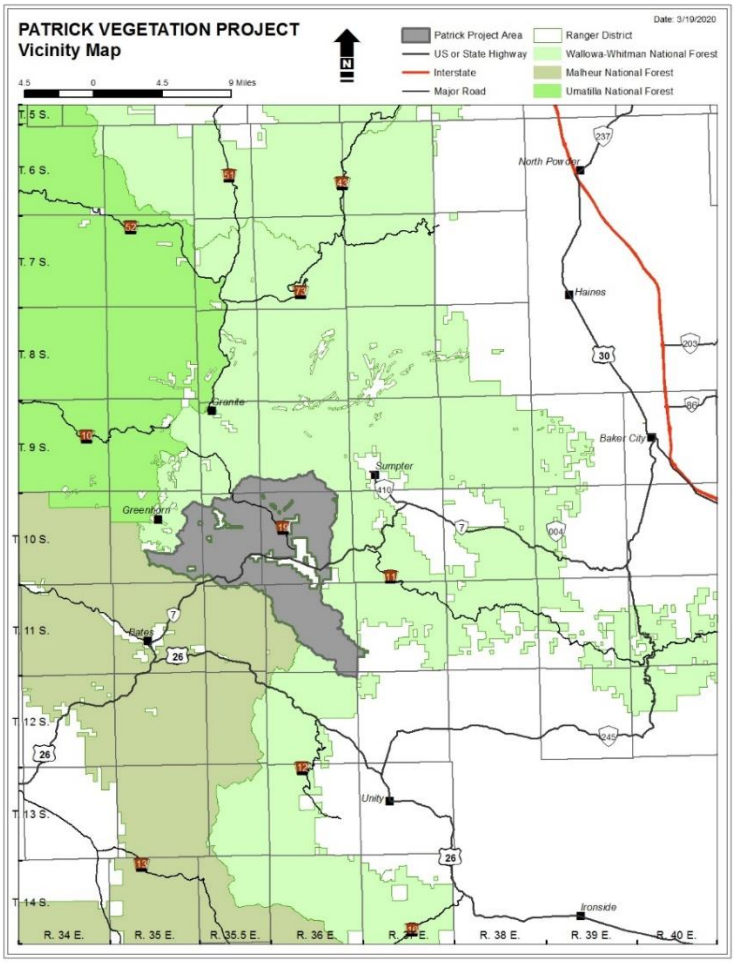


Figure 1.Vicinity map of Patrick Project

Forest Plan Management Direction

This EA is tiered to the Final Environmental Impact Statement (FEIS) for the 1990 Wallowa-Whitman National Forest Land and Resource Management Plan, as amended. Existing plan amendments relevant to this project include: *EA on Continuation of the Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales*, as signed on May 20, 1994, which provides additional standards and guidelines (USDA, 1994, and commonly known as the Eastside Screens); *Interim Strategies for Managing Inland Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana and portions of Nevada Inland Native Fish Strategy*, as signed in 1995, which provides additional standards and guidelines (USDA, 1995, commonly known as INFISH).

The Forest Plan, as amended, includes management goals and objectives and standards and guidelines, both forest-wide and specific to land allocations. All proposed activities in this project are consistent with the management guidance and direction provided in the Forest Plan. Management direction specific to the following management areas (MA) apply to this project area:

MA1/1W – (23,753.16 acres, 48.68%). Emphasis wood fiber on suitable timberlands while providing relatively high levels of forage and recreational opportunities (22,516.91 acres) and meeting identified winter range habitat objectives (1,236.25 acres).

MA3/3A - (21,341.03 acres, 43.73%). These management areas provide a broad array of forest uses and outputs with emphasis on timber production. However, timber management is designed to provide near-optimum cover and forage conditions on big game winter ranges (MA3-10,385.56 acres) and selected summer ranges (MA3A-10,955.47 acres).

MA15– (3,636.26 acres, 7.45%). These areas are intended to maintain habitat diversity, preserve aesthetic values, and to provide old-growth habitat for wildlife.

MA18-(34.61 acres, 0.07%). These areas are intended to achieve and maintain optimum conditions for anadromous fish and provide near-optimum conditions for big game.

Need for the Proposal

The purpose and need for action describe what the desired condition is for the Patrick area and how the existing condition does not meet that desired condition answering the question "why here, why now?"

Desired Condition

Desired conditions are based on goals and management direction provided in the Wallowa-Whitman National Forest Land and Resource Management Plan (USDA 1990). The desired forested conditions are summarized as follows:

Forest Conditions – The structural arrangement of vegetation, both vertically and horizontally, and the size and arrangement of trees, grasses, and shrubs is important for wildlife habitat, reducing insect predation and disease, wildfire hazards, scenic integrity, and potential social and economic products. The range of desired structural conditions should be based on the best available science and meet the needs of the species dependent on each structural stage. Additionally, structural stage conditions and locations should vary across the landscape to buffer the vegetative response to potential changes in climate, provide a diversity of habitat conditions and promote ecologically resilient conditions over time. Desired conditions relative to the forested landscape is evaluated based on a range of tree species, densities and forest structure stages that would be expected under unmanaged disturbance patterns. This expected range is based on an identified Historic Range of Variability (HRV) for each of these forest attributes.

The purpose and need for action is based on conditions within the analysis area, which have departed from HRV, increasing landscape vulnerability to uncharacteristic levels of disturbance severity.

Insect & Disease - Characteristic levels of mortality caused by insect and disease activity contribute to diverse landscape conditions and provide important wildlife habitat components, such as hollow trees, dead wood, and mistletoe brooms. The desired conditions for vegetation structure, stand density, and species composition create stand conditions with largely low to moderate vulnerability to insects and diseases across most of the upland forest potential vegetation groups. These stand conditions result in ecologically resilient forests with composition, structure, and density characteristics that are fully compatible with periodic disturbance occurring at characteristic levels of severity, intensity, size, and spatial distribution.

Watershed and Aquatic Habitat- the desired condition for watersheds and aquatic habitat in the area is to promote processes that control the routing of water, sediment, wood and organic materials at levels which result in self-sustaining riparian and aquatic ecosystems. Riparian vegetation provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems; provide adequate summer and winter thermal regulation within the riparian and aquatic zones; and help achieve

rates of surface erosion, bank erosion and channel migration characteristic of those under which the communities developed.

Wildlife – The desired condition for forested areas is to maintain a mosaic of forage and cover with well distributed security areas where elk and other wildlife can escape from motorized disturbance. Tree species and structure that falls within the historic range of variability will provide greater likelihood that wildlife populations will remain viable. Sensitive and unique habitats such as wet meadows, quaking aspen, and riparian shrubs will occur on the landscape in similar quantities and quality to what occurred historically.

Fire Behavior – The desired condition within the project area is for the historic (pre-suppression) fire regime to return to the landscape. Fire regimes are characterized by the historic frequency (in years), intensity, and behavior of wildfires within a particular vegetation type. The restoration of historic fire regimes for the project area would reduce the risk for loss of key ecosystem components and promote ecologically resilient forest and rangeland conditions.

Economics – The desired future condition for economics includes providing sustainable ecological services and products for resilient communities and American Indian tribes. Lands classified as suitable for timber production, with a regularly scheduled timber harvest program, provide both social and economic benefits. Other forest products, such as berries and mushrooms, are available for gathering in sustainable amounts for the general public, commercial, and tribal use. Outdoor recreational opportunities would also be maintained within the project area to enrich the lifestyles of national forest visitors.

Existing Condition

Forest Conditions – Forest vegetation is delineated into upland forest types or Potential Vegetation Groups (PVG) to evaluate existing conditions and make comparisons to historic ranges. HRV data analysis in the Patrick project area shows declining landscape diversity. Overall forest conditions within the project area include increased multi story stands, elevated densities and an increase in late seral, shade tolerant species. Single story structure stages of stand initiation and stem exclusion are well below desired levels across all three PVGs. Old forest single stratum/story comprises less than 1% of the dry forests and is absent across the rest of the project area. The multi-story stage classified as under story re-initiation is well above desired conditions across all three PVGs.

These conditions greatly increase the landscapes susceptibility to large scale, uncharacteristic disturbance. Higher density predisposes trees to bark beetle attack and competition induced mortality. Multi storied stands and an abundance of late seral species increase susceptibility to defoliating insects such as spruce budworm and Douglas-fir tussock moth. The spread of dwarf mistletoe is enhanced by multi storied stands reducing the vigor of individual trees. Increased mortality levels, high densities and elevated fuel loading all contribute to an increased susceptibility to high intensity, large scale wildfire.

Table 1.Summary of Vegetation Departure from Desired Conditions

PVG	Forest Structure	Species Composition	Stand Density
Dry Upland Forest (DUF)	Over in multi-story/ under in single story	Over in late seral species/ under in early seral species	Over in high density/ under in low density
Moist Upland Forest (MUF)	Over in multi-story/ under in single story	Over in mid seral species/ under in early seral species	Over in low density/ under in high density

Cold Upland Forest (CUF)	Over in multi-story/ under in single story	Over in late seral species/ under in early & mid seral species	Over in low density/ under in high density

All three forest attributes show large departure within the dry upland forest which composes majority of the forested landscape (79%). Lower densities in moist and cold forests may be a consequence of past management activities coupled with insect and disease caused mortality. However, the departure in forest structure and species composition suggests that these forest types are becoming less resilient to disturbance and moving away from desired conditions.

Insect and Disease - The forest vegetation characteristics described above strongly influence the presence of various insects and disease as well as the level of disturbance they create across the forested landscape. As these forest characteristics move away from HRV the level of disturbance and overall affects to the forested environment increases. The elevated stocking levels increase in multi canopy structure and a shift in species composition to more shade tolerant, less resilient tree species increases the susceptibility to large scale disturbance. The following insect and diseases have been observed and documented within the project area through multiple site visits by staff of the Blue Mountains Forest Insect and Disease Center.

- Elevated Mountain pine beetle activity primarily in lodgepole pine.
- Elevated fir engraver populations within grand fir.
- Dwarf mistletoe in Douglas-fir, western larch and to a lesser extent in the ponderosa pine.
- Occurrence of Heterobasidion root disease in both grand fir and ponderosa pine.
- Indian Paint Fungus in grand fir.
- Increase in multi canopy stand structure enhancing the spread and increasing the susceptibility to foliar insects and diseases such as spruce budworm, Douglas-fir Tussock Moth and dwarf mistletoe.

Watershed and Aquatic Habitat- the existing condition for aquatics in the Patrick project has riparian health that has generally declined due to past management (timber harvest and fire exclusion). Riparian forested stands are overstocked with more cover in shade tolerant species and fire intolerant species, or with higher densities of conifers in the understory. Conditions in riparian areas have moved away from their historic vegetation composition and structure due to these impacts. Suppression of fire has created the conditions that are favorable for the growth and expansion of conifers and the loss of riparian shrubs and trees. Resources like light are less available in the understory, which negatively impacts wetland obligate species from establishing and growing. The infilling of conifer cover is providing more connected fuels for a wildfire to burn a larger area, hotter next to the streams in the project area. As a result, wood may be recruited to the streams at time and spatial scales that would be different than historic processes and would negatively affect large wood over the long term. Also, an uncharacteristic wildfire adjacent to the streams would decrease cover that is providing streamside shade functions that maintain water temperatures and could provide higher erosion rates than following a historic wildfire.

Wildlife Habitat - Tree species diversity continues to decline due to the succession of stands to shade tolerant species and the loss of early seral, shade intolerant species as well as declining hardwoods. The number of large trees and snags across the landscape is deficient due to past removal and reduced growth rates resulting from increased competition and lack of moisture. There is also a high risk of habitat loss due to susceptibility of the landscape to large scale disturbance. A landscape with HRV components (tree species, tree density and forest structure) within historic ranges would provide a broad spectrum of wildlife habitat components.

Fire Behavior - Northeast Oregon has a high wildfire occurrence rate, primarily due to lightning activity that occurs during the summer and fall months. The Wallowa-Whitman National Forest has one of the highest wildfire occurrence rates in Oregon and Washington. The project area has experienced 204 documented wildfire starts from 1970 through 2017. Lightning caused 74 percent of the fires (151 fires), with human causes (campfires, smoking, debris burning, equipment use or children) accounting for 24 percent of the fire starts (48 fires), and the remaining 2 percent (5 fires) are considered unknown/other. Fires have occurred as early as May and as late as November within the project area, with the largest number of fires occurring in July and August (61% combined). The largest wildfire recorded in the project area between 1970 until 2017-time frame is 15 acres. Approximately seventy eight percent (78.4%, 160 fires) of the fires were contained at ¼ acre or less, roughly twenty percent (20.1%, 41 fires) were contained between ¼ and 10 acres, and one and a half percent (1.5%, 3 fires) were contained between 10-15 acres. No wildfires over 15 acres have occurred in the project area since 1970. From 1985 until 2017, twenty-three wildfires over 100 acres have occurred within 10 miles of the project area in similar stand and fuel types.

Large wildfires within 5 miles of the project area within the same timeframe were:
1986-Huckleberry fire (8586 acres), Eagle fire (293 acres) and Sunflower fire (8020 acres)
1994-Reed fire (2338 acres)
2005-Burnt River #152 (163 acres) and Burnt River #154 (269 acres)
2015-Vinegar fire (1214 acres)

With the exclusion of wildfires due to suppression activities as well as past harvest activities, the majority of the project area is currently modified from historical normal and have higher stand densities and fuel loadings, which will allow fire intensities to be significantly higher than desired historic levels. This has been shown by the nearby Cornet/Windy (2015), Rail (2016), Dooley Mountain (1989) and Huckleberry (1986) fires that all had similar stand types and conditions and burned with high intensities and severities.

The Baker County Community Wildfire Protection Plan (CWPP) has identified the rural communities of Whitney, Greenhorn, Woodtick Village/Rattlesnake Estates, and Sumpter/McCully Forks as communities at high risk to wildfire. These communities are within Wildland / Urban Interface (WUI) areas that are adjacent to and within the Patrick project area. Factors that were used to assess the risk to these communities were structural vulnerability to wildfire, fire occurrence history, topography, fuels, weather and values at risk.

WUI areas were identified around communities at risk to identify and prioritize projects to reduce the risk to wildfire. The Patrick project area completely encompasses the Whitney WUI area, and contains portions of the Sumpter/McCully Forks WUI area, Greenhorn WUI area, and Woodtick Village/Rattlesnake Estates WUI. These three WUI areas not only have a portion of the project area within in them, but also have larger areas adjacent to the project area. The proposed action will accomplish objectives identified in the CWPP.

Economics - Public lands are an integral part of the high quality of life found in Northeast Oregon providing a variety of social, economic, and ecologic contributions to local residents and the public at large. The communities of northeast Oregon have a strong reliance on the natural resources of the area for providing fuel to heat homes, food for the table, employment opportunities and as a source of recreational enjoyment. Local ranching and agriculture rely on the water produced on the public lands and maintaining a healthy and reliable supply is critical for sustaining these key local industries. Similarly, the established infrastructures (mills, railroad, and roads) benefit from resource management activities on the public lands and the goods and services they provide.

Forestry, ranching, and recreational industries are key contributors to the local and regional economy and resource management opportunities afforded on public lands are an important part of maintaining and sustaining these industries, associated infrastructure, and the overall quality of life.

The Patrick project would promote landscape restoration using methods, such as timber harvest and non-commercial thinning. These activities would provide employment opportunities as well as a supply of materials, including saw logs, to local and regional markets. Wood products play an important role in the local and regional economies by providing employment and revenue. Revenues generated through wood products can also help offset the high costs of restoration.

Purpose and Need

The purpose and need for action is generated by the difference between current conditions and desired conditions. More specifically, the purpose and need for action is generated by conditions within the analysis area, which have departed from the historic range of variability (HRV), creating conditions that have an increased vulnerability to uncharacteristic levels of disturbance severity.

HRV represents the expected range of tree species, tree density and forest structure under natural, unmanaged disturbance patterns. An analysis of existing vegetation indicates these forest characteristics have shifted away from HRV over the past few decades. Fire exclusion and historic harvest methods which removed high value trees are likely major contributors to this shift away from HRV. This departure away from HRV is the basis for determining the purpose and need for treatment.

In order to move conditions in the planning area toward the desired condition, the following objectives have been identified.

- Increase landscape resiliency to risk of uncharacteristic disturbance by moving conditions toward HRV within upland and riparian forest types.
- Reduce threat of Wildfire to local communities within the Wildland Urban Interface (WUI).
- Increase structural complexity and species diversity of vegetation to provide habitat for a wider range of wildlife species within the project area.
    - Maintaining and restoring wet meadows, quaking aspen, mountain mahogany, and deciduous riparian shrubs would provide valuable wildlife habitat.
    - Increase the amount of single-story old forest to provide habitat for sensitive species such as the White-headed Woodpecker and Flammulated Owl that are nearly absent from the project area.
    - Increase the amount and quality of forage, particularly in security areas where it will most benefit elk.
- Contribute to local economy and provide a supply of forest products to the public.

Public Involvement and Tribal Consultation

The Forest Service consulted with numerous individuals and federal, state, tribal, and local agencies during the development of this EA.

The Patrick Vegetation Management Project was published in the Wallowa-Whitman Schedule of Proposed Actions (SOPA), a quarterly publication, in April 2019 and has appeared in each quarterly SOPA since then. This publication is distributed to a mailing list of individuals, organizations, and

agencies and is published on the forest's web page. The project and proposed action have also been published on the Wallowa-Whitman Web page at: https://www.fs.usda.gov/project/?project=55477.

A letter inviting comment on the proposed action was mailed on February 28, 2019 to approximately 50 forest users, adjacent landowners, permittees, local government, and concerned publics soliciting comments and concerns related to this project. A detailed description of the proposed action was posted on the forest website at https://www.fs.usda.gov/project/?project=55477 on February 28, 2019. Eleven comment letters were received.

For this project, a scoping letter was sent to the Nez Perce Tribe, The Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Confederated Tribes of Warm Springs, and Burns Paiute Tribe on February 28, 2019, informing them of the Patrick proposed project and requesting comment or concerns.

The project was included in the Wallowa-Whitman National Forest's program-of-work booklets for 2014 through 2020, and the project was presented during regularly scheduled program-of-work meetings with the CTUIR and the Nez Perce Tribe. The project was also presented at a meeting with the Confederated Tribes of Warm Springs. Dates of meetings are as follows:

03/06/20 USFS & CTUIR Board of Trustees – Government-to-Government Meeting
02/05/20 USFS & Nez Perce Tribe – Staff-to-Staff Meeting
12/17/19 USFS & CTUIR Natural Resource, Wildlife, & Cultural Committees - Staff-to-Staff Meeting
07/10/19 USFS & CTUIR Natural Resource Committee – Staff-to-Staff Meeting
04/18/19 USFS & Nez Perce Tribe – Staff-to-Staff Meeting
08/16/18 USFS & CTUIR Board of Trustees - Government-to-Government Meeting
06/19/18 USFS & CTUIR Wildlife and Cultural Committees – Staff-to-Staff Meeting
03/26/18 USFS & CTUIR Natural Resource Committee – Staff-to-Staff Meeting
09/06/17 USFS & CTUIR Board of Trustees - Government-to-Government Meeting
08/08/17 USFS & CTUIR Wildlife and Cultural Committees – Staff-to-Staff Meeting
05/30/17 USFS & CTUIR Natural Resource Committee – Staff-to-Staff Meeting
05/03/17 USFS & Nez Perce Tribe – Staff-to-Staff Meeting
10/19/16 USFS & CTUIR Board of Trustees - Government-to-Government Meeting
08/23/16 USFS & CTUIR Wildlife and Cultural Committees – Staff-to-Staff Meeting
05/25/16 USFS & CTUIR Natural Resource Committee – Staff-to-Staff Meeting
05/11/16 USFS & Nez Perce Tribe – Staff-to-Staff Meeting
10/13/15 USFS & CTUIR Wildlife and Cultural Committees – Staff-to-Staff Meeting
07/10/15 USFS & CTUIR Natural Resource Committee – Staff-to-Staff Meeting
02/11/15 USFS & Nez Perce Tribe – Staff-to-Staff Meeting
09/19/14 USFS & CTUIR Board of Trustees – Government-to-Government Meeting
07/15/14 USFS & CTUIR Wildlife and Cultural Committees – Staff-to-Staff Meeting
06/04/14 USFS & CTUIR Natural Resource Committee – Staff-to-Staff Meeting
10/30/13 USFS & Confederated Tribes of Warm Springs – Government-to-Government Meeting

An analysis file for this project is available for public review at the Whitman Ranger District. The analysis file includes specialist's reports, data specific to the project, public notifications and their responses, meeting notes, and miscellaneous documentation.

Key Issues

Key issues were identified and subsequently used to develop a range of alternatives. The following section describes the key issues identified for this analysis and the key indicators used to evaluate each key issue.

Key Issue 1: Vegetation Management - General Vegetation Conditions (identified through IDT analysis)

Existing vegetation conditions are outside of the historical ranges of variability (HRV) for species composition, forest structure, and tree density. These factors result in the landscape's increased susceptibility to large scale, high intensity disturbance such as wildfire and insects and disease. Additionally, climate change predictions present an opportunity for the project to improve the landscape resiliency. Silviculture activities proposed for implementation in any action alternative are designed to address these concerns. Insect susceptibility and climate change are also addressed in this section of the analysis.

Indicators

- Tree Species Composition
- Landscape Structure
- Tree Density
- Insect & Disease Susceptibility
    - Unit of Measure for all the above indicators: Change relative to HRV

Key Issue 2: Disturbance associated with open roads, combined with a decrease in forest cover from the proposed harvest treatments, may contribute to poor elk distribution.

Elk are the most popular big game species in northeastern Oregon, are an indicator of the quality and diversity of general forested habitat, the interspersion of cover, and forage areas, and the security habitat provided by cover and low levels of human activity.

Indicators:

- Elk security habitat
    - Units of Measure: HEI value, acres of elk security

Key Issue 3: Riparian Vegetation Restoration (RVR)

Fire exclusion and the encroachment of conifers into hardwood riparian zones have resulted in a reduction of the diversity, complexity and abundance of riparian vegetation. Past timber harvest activities have removed large, old trees and inadvertently doubled and tripled the density of trees and increased risk of high severity fire inside the Riparian Habitat Conservation Areas. Stand characteristics are at risk for maintaining long term shade, episodic wood recruitment and sediment filtering functions due to the current density and structural conditions.

Comments during scoping ranged on doing only non-commercial, or commercial Riparian Habitat Conservation Area treatment. A comment talked about doing treatments to restore favorable flows and another talked about adding the wood to the adjacent stream. Another comment asked to develop a new alternative that does not propose treatments in these specific management areas.

Differences in alternatives would be displayed by the indicators below.

Indicators:

- Water quality (water temperature)

- Units of Measure: Acres of total RHCA treated
- Units of Measure: Acres of Primary Shade Zone (within 50 feet of streambank) treated (RVR units only)

Alternatives Eliminated from Detailed Study

The following alternatives were considered but eliminated from detailed study.

1. *Exclude logging within moist/cold forests*: Would not meet the purpose and need of the project within these PVGs. Effects of commercial harvest within these PVGs is analyzed under alt 2 & 3.
2. *Only allow non-commercial thinning within RHCAs*: Would not fully meet the purpose and need of project within RHCAs. Effects of no treatment within RHCAs is analyzed under alternative 3.
3. *No construction of new temporary roads*: Existing road templates would be utilized to the greatest extent possible. However, not building temporary roads would greatly limit the ability to treat forested areas identified as having a treatment need. The purpose and need for both alternative 2 and 3 would not be met.
4. *Consider removing trees 21" diameter breast height (dbh) or greater:* Analysis of the field data collected within the project area did not identify a specific need to remove trees greater than 21" dbh in order to address the project purpose and need.

Proposed Action and Alternatives Considered in Detail

The Patrick interdisciplinary team developed alternatives based on the purpose and need of the project, as well as key issues and other concerns identified in previous sections of this assessment. Forest Service management objectives are incorporated into alternatives by following the standards and guidelines of the Wallowa-Whitman National Forest Plan as amended.

NEPA requires that the agency study, develop, and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources. The Responsible Official approved the following alternatives for consideration in detail.

Alternative One

This alternative constitutes the "No Action" alternative required by NEPA. Commercial and non-commercial thinning, fuels treatments, road repairs, riparian vegetation restoration and temporary road construction opportunities identified in this analysis would be deferred. This alternative forms the baseline for comparison of the action alternatives.

Alternative Two – Proposed Action

The Proposed Action would respond to the purpose and need to improve forest health and resiliency to disturbance, reduce the risk of wildfire within the wild urban interface, increase structural complexity and species diversity of forest vegetation providing habitat to a wider range of wildlife species and provide economic benefit to the local economy. Forest landscape structure, densities and species composition would be moved toward conditions historically present reducing the risk of high severity disturbance on the landscape, including riparian areas, through a combination of commercial thinning, non-commercial thinning, and prescription burning. Commercial products would be produced through implementation of these activities.

Alternative Three – Proposed Action with no harvest activities in RHCAs

This alternative responds to comments received during the scoping period that requested the Forest analyze an alternative with no activities in the RHCAs (Key Issue 3). The exception to this would be prescribed burning and maintenance or rehabilitation/reconstruction of roads. Prescribed burning would still be allowed to back into RHCAs, but no active lighting would take place within the RHCA under this alternative. General road maintenance and rehabilitation for roads that are located within an RHCA would still take place. Also, the same road relocations within under Alternative 2 (as described in Road-related PDCs) would occur to move roadbeds out of the stream flood plain, provide better drainage and minimize the potential for sedimentation into the adjacent stream.

Elements Common to the Action Alternatives

Silvicultural Treatment Objectives

A full range of silvicultural methods were considered to respond to the identified purpose and need for the project. In general, the prescriptions selected are intermediate harvest using various commercial thinning techniques further defined below. Harvest prescriptions generally manage the 7-inch dbh and greater stand component. The remainder of the stand would be managed by post-harvest prescriptions. Fuels created by harvest and post-harvest treatments, as well as pre-existing debris would be managed by the fuel's prescriptions. Vegetation treatments would favor retention of early-seral species such as ponderosa pine, western larch, and aspen. Trees with 21 inches or greater DBH would be retained throughout the project area regardless of prescription type.

The following describes the treatment objectives, methods and anticipated outcomes for the proposed vegetation management activities within the project area.

Post Treatment Stocking Levels for Forested Stands

Stand density ranges have been developed for each conifer plant association (PAs) as per Powell 1999, "Suggested Stocking Levels for Forest Stands in Northeast Oregon and Southeastern Washington". The range is based, in part, on the growing capacity (or site potential) of each plant association. Tree densities would be reduced to various basal area levels depending on management objectives. The recommended management zone (RMZ) for managing overall forest health is defined by the upper management zone and the lower management zones as described below:

- *Upper Management Zone (UMZ)* – For the Patrick project area the UMZ will be the level of tree stocking that maintains the maximum amount of sustainable tree cover while maintaining high tree vigor and stand health. This level avoids development of suppressed trees and precludes significant amounts of density-related tree mortality.
- *Lower Management Zone (LMZ)* – The lower limit of full site occupancy where a significant portion of site resources can be allocated as tree growth.

Dwarf Mistletoe Management

All prescriptions would manage dwarf mistletoe to reduce stand level infections through removal of infected trees. This activity would increase normal development, diameter growth and survival of residual uninfected trees. Proposed treatments would protect healthy understory trees by removing infected overstory trees of the same species. No trees with 21 inches or greater dbh would be removed based on mistletoe infection. Mistletoe would be retained at endemic levels in order to provide biodiversity on the landscape.

Western Juniper

Juniper would be removed from all conifer treatment sites, outside of true juniper woodlands, by felling with chain saws and/or prescribed fire.

Identification of Old Stands / Trees

Old Forest stands are defined by the Region Six Old Growth definitions (USDA Forest Service, 1993). In this guide, Old Forest stands are defined by the number of live trees that are 21" DBH or greater, and 150 years of age or greater (for the majority of conifer species). The age of an individual tree is determined at 4.5 feet above the ground on the uphill side (Common Stand Exam Field Guide). Trees of 150 years of age and greater would be identified by characteristics, as defined in Van Pelt (Van Pelt, 2008). The typical characteristics of old trees are a combination of visual indicators including limb, crown, and bark characteristics. All commercial harvest prescriptions would be designed to retain as many old trees as possible in order to move stands toward old growth characteristics.

Management of Old Forest Stand Structure

Lack of wildfire due to past suppression policies and efforts as well as a lack of forest management has resulted in old forest structure class being outside of HRV ranges. Old Forest Multi Strata is currently within HRV but at the higher end of the range and the Old Forest Single Strata structure is almost completely absent and drastically below HRV. Commercial and non-commercial treatments are proposed within OFMS under both action alternatives in order to increase resiliency within these stands to insect and disease as well as wildfire. Some OFMS stands receiving commercial harvest would be transitioned to OFSS in order to move toward HRV across the project area. However, OFMS would remain within HRV across the project area and there would be no net loss of Old Forest Structure (OFMS &OFSS combined).

Management within Old Growth Preservation Stands (MA-15)

Lack of management within these stands in combination with fire suppression throughout the surrounding landscape has resulted in elevated stocking, ground and ladder fuels and tree mortality. Non-commercial thinning treatments in combination with prescribed burning would be used within designated MA-15 stands in order to reduce fuel loads, protect surrounding private lands and make stands more resilient to stand replacement wildfire.

Management within Moist Upland and Cold Upland Potential Vegetation Groups (PVG)

Harvest treatments within these PVGs would be used to improve resiliency, lower fuel levels and move conditions toward HRV. Tree removal would create various size openings providing regeneration sites for early seral species and increase the amount of single-story structural stages.

Variability within Stands

Desirable trees will be retained based upon a target basal area leaving the best trees regardless of spacing. Basal area retention is inherently variable in stands of mixed tree sizes. Much of the Patrick stands have had trees spaced by previous treatments making the grouping of overstory trees now difficult, as understories are widespread and dense, facilitating the grouping of understory trees. Concepts of the Individual Clumps and Openings (ICO, Churchill, 2013) research and implementation guide will be implemented within all treatment prescriptions in order to enhance variability across the landscape.

General Prescription Types

Thinning from below (HTH)

An intermediate treatment deigned to reduce stand density of trees of commercial size, primarily to improve growth, reduce fire severity, and to enhance forest health. Objectives are designed to retain the largest, healthiest trees within the stand with an emphasis on retaining trees from the older age classes. Residual basal area retention levels will be dependent on plant association and current condition of the stand. Stands would be managed to within the RMZ. With the exception of identified wildlife connectivity corridors (managed to the UMZ), the majority of stands receiving the HTH prescription would be managed to at or near the LMZ in order to maximize treatment effectiveness.

Group Selection (HSG)

These treatments would consist of two prescription types and objectives. One will be to create openings in the canopy and the other will be to reduce stocking throughout the remainder of the stand in order to increase overall stand vigor. Treatments would create irregularly shaped gaps in the over story canopy to release an existing understory or to establish a new age class and assist in establishing early seral species. These openings would create a stand initiation structure class and increase age class, species and structure variability within the stand. The appropriate opening size for meeting management objectives will change depending on forest type, growing conditions, and management objectives.

For this project, the maximum width of group openings would be approximately twice the height potential of the dominant tree class. This tree height is estimated at 120 feet utilizing LIDAR data. The size of individual group openings would be variable but would not exceed four acres. Openings of this size are expected to provide wildlife habitat represented by the stand initiation structure class. Stand initiation structure stage is deficient in the Patrick project area. Approximately 30% of these units will consist of openings while the remainder of the units will be thinned to within the recommended management zone for the respective plant association. These openings may also be created through management of dwarf mistletoe if there is a high level of infection within the unit.

Post and Pole Thinning (PP)

The life cycle of lodgepole pine is typically driven by disturbance (mountain pine beetle and wildfire) creating even aged patches varying in size dependent on the scale of the previous disturbance. As stands reach an average diameter of 6 inches or greater, have high stocking rates and near the age of 80 years old the threat of stand mortality as a result of mountain pine beetle attack greatly increases.

Post and pole treatments would be utilized to treat smaller diameter, even aged stands. The average size of trees utilized for post and pole material are 8 to 10 inches in diameter at breast height (dbh). These units would be designated within pure lodgepole pine stands and stands dominated by lodgepole pine with a minor component of other conifer species such as western larch or grand fir. The objective of treatment would be to reduce stocking levels and increase variability of age classes as well as species diversity.

Species such as western larch would be favored for retention in these units. Treatments would focus on breaking up even age patches, reducing stocking rates and creating widely spaced open grown conditions. This would be accomplished by creation of openings of 1 to 5 acres in size in combination with thinning to a relatively wide spacing (at least 40 feet) and reducing overall stocking down to the lower management zone for lodgepole pine.

Defensible Fuel Profile Zone (DFPZ)

Defensible Fuel Profile Zones are strategically placed treatments along identified roads where tree densities, canopy base heights, surface fuel loadings and ladder fuels are reduced, in order to modify fire behavior and provide a safe place for firefighters to initiate fire suppression activities. Reduction of tree densities, base heights, ladder and surface fuels within the DPFZ's provide a location that a wildfire would not be able to carry through the overstory canopy and would have limited ladder fuels to initiate crown fires. Surface fuel loadings would produce fire intensities that would generally be confined to a surface fire where firefighters would have a high likelihood of stopping the fire spread safely. DFPZ treatments will be a combination of commercial harvest, NCT/PCT and prescribed burning dependent on the existing condition of vegetation.

Treatments would resemble the adjacent commercial and noncommercial treatments with greater emphasis placed on tree spacing and crown separation (minimum of 25 feet dependent on crown size) as well as reduction of ground and ladder fuels. The width of the DFPZ will vary dependent on terrain and fuel type with a maximum width of 300 feet from either side of the road it is established on.

Non-commercial thinning (NCT)

NCT is a stand tending treatment designed to improve diameter growth rates by reducing the density of non-commercial size trees, improving species composition and reducing risk of high fire severity as well as susceptibility to insects and disease. NCT is accomplished through the use of chainsaws (hand thinning). These treatments would be implemented utilizing variable density prescriptions creating variability in stocking levels, species composition and spatial arrangement of trees. Trees may be cut up to 10 inches dbh dependent on individual tree health, desired retention species and stocking levels. These are standalone units meaning that there will not be a commercial thinning of the over story trees. NCT frequently produces debris accumulations that must be reduced by piling and/or burning. Generally, slopes over 30% would be hand piled and slopes under 30% would be grapple piled.

Pre-commercial Thinning (PCT)

This treatment is essentially the same activity as the non-commercial thinning listed above but will take place within designated commercial harvest units after the harvest activities have been completed. This treatment is designed to reduce stocking and disease in the understory, protect residual large trees from fire by removing ladder fuels and promoting early seral shade intolerant species. Pilling and burning will also be done in a large portion of these units in order to mitigate fuel levels created by the thinning.

Aspen Restoration-Release from conifers (Aspen-REL)

To reverse aspen decline competing conifers would be reduced using non-commercial thinning and/or commercial harvest. Where necessary, sites would be protected from ungulate (deer, elk, livestock) browse pressure until the aspen grow above browse height. All conifer with the exception of trees 21 inches dbh or greater and those meeting old tree characteristics would be removed. This conifer removal for release would be limited to the area where the aspen is growing or sprouting plus one and one half tree heights.

There are two units 518A and 518B that have been designated as aspen treatment units. In addition, there are 10 other smaller aspen patches that have been identified within the project area for treatment. Treatment will vary from commercial harvest (HTH or HTH-PP) to noncommercial (NCT) dependent on the unit that the patches are located in. Restoration treatments of the smaller patches will average approximately 2 acres in size in both the commercial and non-commercial units.

Treatment of smaller, scattered aspen patches would be accomplished prescriptively due to the spatial arrangement and scattered dispersion throughout the project area. An aspen restoration/conifer release treatment specification will be included in all treatment prescriptions in order to capture small areas of aspen that may not have been previously identified.

Aspen Maintenance (Aspen-MTC)

There are currently 7 quaking aspen enclosures of various sizes within the project area that have been previously identified and managed for restoration purposes. Six of the enclosures are 2 acres in size with one larger enclosure of 8 acres located within an open meadow area. These patches were fenced for protection from browsing and managed with various methods intended to enhance regeneration. Success with respect to enhancing regeneration within these previously managed areas is variable. These areas would receive maintenance treatments in the form of prescribed burning, thinning of over story aspen, fence maintenance and thinning of conifer seedlings.

Fuels Reduction

Fuel treatments are proposed to reduce activity generated and existing natural fuels accumulations within the project area. They are designed to reduce the risk of high intensity wildfire and resource damage within the project area, with priority given to identified wildland urban interface areas, in part by reducing ladder and ground fuels.

Fuels treatments proposed within this project are commercial thinning and noncommercial thinning (described in Silvicultural Objectives and Vegetation Treatments section), piling of materials (both mechanical and hand), pile burning, fuels dispersal and removal (FDR), and prescribed burning. In some areas, multiple types of treatments may occur within the same units to accomplish desired fuel conditions.

Landscape Prescribed Fire

This treatment would reintroduce fire to a fire dependent ecosystem, lessening the impact of a future high intensity wildfire and improving forage and browse quality for big game. Fire intensities would be kept low during implementation to minimize fire and fire effects in the overstory canopy. Fire would burn mainly through the surface fuels throughout the majority of the prescribed fire units. Individual or small group torching may occur in areas where there are sufficient ladder fuels, and in timber stands with high occurrences of mistletoe infected trees. Landscape level prescribed fire implementation would include units that have other fuel treatments occurring prior to prescribed fire as well as prescribed fire units that have no other fuel treatments. Roads, constructed fire lines, streams or other natural fuel breaks would be used to control prescribed fire unit edges. Smaller than landscape scale units would be implemented over multiple years in order to complete the landscape scale project. Multiple entries utilizing prescribed fire may be needed in some units to obtain desired fuels reduction levels within the landscape level treatment. Ignition of the prescribed fire units may be by hand ignition, aerial ignition, or with ground-based equipment.

Prescribed underburning (RXF) is proposed within commercial/noncommercial units to reduce fire intolerant understory seedling and sapling densities, raise base canopy height, reduce mistletoe infection and to reduce activity-created and natural surface fuels. These treatments would begin after the

mechanical activities are completed and would take an estimated 7-10 years to finish (based on 2,500 acres treated by Rx fire on average on the district).

Prescribed underburning as a stand-alone treatment is proposed in some areas to reduce the potential fire intensity of future wildfire events by reducing existing woody debris accumulations, ladder fuels, and small fire susceptible species such as grand fir. Prescribed fire would be used to limit mistletoe infection within lower one third of crowns as a result of crown scorch. Prescribed fire would also revitalize certain surface vegetation, recycle nutrients stored in debris and prepare sites for planting or natural regeneration. More than one prescribed fire entry may be needed within the first 10 years of treatment depending upon the success of the initial burn treatment in meeting project objectives. Follow-up maintenance burning is planned on a 10-20 year cycle on the warm and hot dry sites within the analysis area.

Prescribed fire units may require preparatory work (FDR) to protect trees prior to ignition, particularly for areas around large ponderosa pine. This could include reducing ladder fuels and/or physically removing surface fuels from around selected trees. Additionally, brushing out and removal of fuels adjacent to control lines may be completed to reduce risk of spots and decrease the risk of fire burning outside of the prescribed fire unit. Burn prescriptions may also be tailored to reduce surface and ground fire intensity to provide similar protection.

Prescribed fire unit boundaries would use natural fuel breaks whenever possible; however, containment lines may be constructed on some units to provide boundaries for burning and to separate units into manageable sizes. Slopes ranging from zero to 30 percent rise may be lined by tractor (maximum fire line, to mineral soil, width of less than 4 feet) or all-terrain vehicle plow (18 inches width). Slopes with rise exceeding 30 percent are normally fire line by hand (18 inches width). Units are ignited to allow fire to burn through a majority of the area. Underburns will generally occur in the spring or fall, but may occur during other parts of the year, depending on fuels conditions, weather conditions and specific objectives.

Within riparian habitat conservation areas (RHCAs), including riparian vegetation restoration (RVR) units, fire would be allowed to continue to burn and spread into the RHCA, as a backing fire, without influence from ignition sources. The exception to this may be the burning of slash piles that are created within an RHCA to reduce the overall fuel loading in the area. Under circumstances where fire activity threatens to exceed maximum prescription parameters and/or control of the burn is threatened, hand ignition would continue into the RHCA as necessary.

Prescribed fire units would be implemented utilizing one (or both dependent upon unit slash loading) of the following prescribed fire types.

Jackpot burning: the burning of slash concentrations to reduce excess slash generated in harvest and/or non-commercial thinning units. Generally, jackpot burning is used to burn pockets of slash within a unit or to ignite specific targets (such as felled juniper trees) within the unit without spread through the remainder of the unit. Jackpot burning would be accomplished through hand ignition techniques.

Broadcast burning (underburning): Low intensity prescribed fire would be applied to the unit. Broadcast burning is used to reduce fuel loadings and ladder fuels throughout the unit. Under burning would be used to reduce activity and natural fuels in harvest units. Broadcast burning would be used in natural fuel units to reduce natural occurring fuel loading, reduce ladder fuels, and reduce fire intolerant species and compositions where appropriate.

Grapple/Hand Piling

Slash generated by commercial harvest and noncommercial thinning activities would be piled in units where residual levels would exceed those ensuring a low intensity prescribed fire. Both naturally occurring woody debris and activity generated fuels may be piled. Piles may be constructed by machines using grapples on slopes less than 30 percent and by hand on slopes in excess of 30 percent. Piles would be of varying size and density. Chainsaws would be used to compact and trim pile edges for better consumption during burning.

Pile Burning

Manual ignition of landing, grapple and hand piles would occur when the threat of fire spreading from pile locations would be minimal. Pile specifications would ensure that pile burning would have minimal damage to residual trees in the stand. Landing piles that could create a considerable area of bare soil would be replanted using seed from approved sources.

Fuels Treatment Priority Ratings

Each treatment unit (commercial, noncommercial, and prescribed burning) has been prioritized to focus prescribed fire treatments in the highest priority areas first (units within ¼ to ½ mile of structures, adjacent private lands, administrative sites) to be followed by those of lower priority such as post-harvest fuels treatments and maintenance burns greater than ½ mile from structures and private lands. The following show priority levels for prescribed burning and a short definition of each level:

Table 2. Summary of Fuel Activity Priorities

Priority	Short Description	Prescribed Fire Priority Definition
1	Adjacent Structures	Units within ¼ to ½ mile directly adjacent to private lands which contain residences/structures and any other high value private or public holdings.
2	Adjacent Private Lands	Units within ½ mile (approximately) of private lands not meeting priority 1 definitions.
3	Infrastructure Protection	Units adjacent to high value infrastructure such as high voltage power lines, major highways, gas lines, railroad tracks, etc.
4	Administrative Site Buffer	Units adjacent to administrative sites such as designated campgrounds, seed orchards, cabin site, etc.
5	Density Management	Units designated as silviculture density management units utilizing prescribed fire, when no other silvicultural or fuels reduction prescription is designated. Also includes units identified for prescribed fire within selected MA15 (old forest) stands.
6	Fuels Activities	Units designated as prescribed fire units by silviculture as a follow up treatment to other designated treatments.
7	Harvest Activities	Silviculture units where levels of slash are increased above natural fuel loadings for the stand type and are not being treated with other means (i.e. piling of fuels)
8	Maintenance Units	Units designated for prescribed fire to maintain the area in current condition class or continue moving the unit towards desired condition class. These units have been treated under prior projects within the area utilizing prescribed fire and /or other fuel treatments.
9	Natural Fuels Units	Silviculture units that do not meet any of the above treatment priorities and any other areas identified as prescribed fire-natural fuels units (units that have not had previous prescribed fire). Prescribed fire will be utilized to decrease ground fuel loadings to a desired level, reintroduce fire across a larger portion of the landscape, and reduce ladder fuels.
10	No Treatment	These units would not have a fuels treatment associated with them.

Wildlife Connectivity Corridors

The wildlife connectivity network connects, to the extent possible, Old Forest structure stands (OFMS & OFSS) and MA-15 (Old Growth) stands within and outside the project area according to direction in the

Eastside Screens. Silviculture prescriptions were specifically designed within connectivity corridors to reduce tree stocking while retaining additional canopy closure and structural complexity. Treatments would maintain canopy closure within the upper one third of site potential by maintaining basal area retention levels at the Upper Management Zone (UMZ) of Stand Density Index. The density and resulting canopy closure would vary by plant association with the driest types at a lower density. These treatments would accelerate the development of mature and old growth forest characteristics, while improving stand resilience and resistance to insects and diseases, although at a lower rate and effectiveness than the non-connectivity areas.

Snags in Harvest and Fuel Reduction Units

Trees with existing advanced stem disease (exhibiting external indicators) provide a source of habitat for cavity nesting wildlife species. These trees and existing snags would be retained, except those that are a hazard to the public or forest workers. Hazardous trees would be assessed using the Danger Tree guidelines (Toupin, Filip, Erkert, & Barger, 2008). Wildlife trees are identified by visual indicators including broken tops resulting in multiple leaders, Indian Paint conks, weeping frost cracks, or an old wound revealing dry dead inner wood (Aho, 1982). The intention is to leave trees with existing stem rot. Prescribed fire prescriptions would be designed for low intensity fire and lighting techniques would be designed to minimize the loss of existing large down logs and snags (See Fire and Fuels Report). Over time, new snags would occur throughout the landscape by inter-tree competition, weather, fire, insects and disease. With the exception of an occasional snag removed for safety or construction clearing, no snags $\geq$12 inches dbh would be removed within these units.

Logging & Transportation Systems Summary

Proposed harvest treatments would remove approximately 85.4 million board feet of sawlogs using the following yarding systems:

- 1,375 acres skyline based yarding systems
- 21,614 acres ground based yarding systems

The district proposes a road maintenance and reconstruction design criteria that can be found in Appendix B which identifies maintenance and reconstruction activities that likely will take place at various locations across the project area and provide guidelines within which the activities will take place. Activities listed in Appendix B under Transportation are routine treatments that occur on a regular basis across the forest and the effects of these activities are known and quantifiable based on previously implemented projects.

The district proposes to replace three culverts on fish bearing streams in the project areas that do not meet ODFW Fish Passage Policy (2017). Approximately 154 miles of administratively closed roads would be re-opened to facilitate harvest and fuel reduction activities. The project requires approximately 38.5 miles of temporary roads to facilitate harvest systems. Where roads are opened for project use the closure device will be reinstalled at the conclusion of activities. Other roads are identified for storage and will have a closure device installed. These devices will be designed for the safety of the public, to minimize watershed effects, and to ensure long term effectiveness of storage. Types of storage can include berms, gates and barricades. Prior to storage roads will be placed into good hydrologic condition which could include the removal of culverts and installation of dips and water bars.

The district does not propose any new construction of permanent roads.

Post-Harvest Road Management Changes

The Wallowa Whitman National Forest utilizes the INFRA database to inventory Forest Service Roads and track changes to maintenance and use levels.

Maintenance levels are assigned for each road in the transportation system. Each road is identified by both an operational maintenance level (reflecting existing conditions) and an objective maintenance level (identifying a long-term maintenance level that has been analyzed and approved, which may still need to be implemented). Operational maintenance level is defined as "the maintenance level currently assigned to a road considering today's needs, road condition, budget constraints, and environmental concerns." (FSH 7709.59, 62.31). In this report maintenance levels will be presented as the operational maintenance unless otherwise noted. Maintenance Levels (ML) assigned in this project area are ML 1, ML 2, ML 3, ML 4, and ML 5:

- ML 1: Roads that have been placed in storage between intermittent uses;
- ML 2: Roads open for use by high-clearance vehicles;
- ML 3: Roads open and maintained for travel by a prudent driver in a standard passenger car;
- ML 4: Roads that provide a moderate degree of user comfort and convenience at moderate travel speeds.
- ML 5: Roads that provide a high degree of user comfort and convenience.

Tables 3, 4 and 5 below display proposed changes to these maintenance levels as well as system status.

A road inventory was conducted within the Patrick project area as part of the North Fork Burnt River Watershed Roads Analysis completed in 2002. Through this analysis existing non-system roads were identified and added to the Infra database with a label of undetermined with respect to system status. These inventoried non-system roads were to be evaluated on a project level basis to determine the need to remove the roads from our system or add them as official system roads. Under this project, 10.52 miles of inventoried non-system roads (existing road templates, not included in Forest road system) will be added to the system, as they are determined necessary for planned and future management activities. At the conclusion of use under this project, the roads will be placed in an Objective Maintenance Level 1 status and will have a closure device installed.

Table 3. Inventoried Non-System Roads to be Added

Non-system Road Numbers	Segment Length (mi.)	Non-system Road Numbers	Segment Length (mi.)
1000362	0.36	1055115	0.66
1000365	0.05	1065196	0.15
1000378	0.18	1900083	0.14
1035050	0.38	1900097	0.39
1035060	0.14	1900161	0.27
1040231	0.41	1900164	0.13
1040245	0.20	1900204	0.28
1044103-two segments (.04/.22)	0.26	1900207	0.21

1044143	0.12	1900336	0.89
1044144	0.02	1900365	0.54
1044145	0.02	1900399	0.80
1046164	0.27	1900424	0.87
1046178	0.10	7350161	0.61
1046218	0.45	7380231	0.29
1046221	0.20	7380283	0.31
1046224	0.12	7386415	0.15
1055031	0.20	7386520	0.37
Grand Total Undetermined Road Miles from both columns=10.52 miles			

In the following table the changes are proposed for the existing open road system. The changes listed below will not affect the effectiveness or efficiency of the transportation system and does not affect access to dispersed camping, mining claims or private property. The changes listed below would benefit elk and other wildlife as well as help to prevent resource damage.

Table 4. Recommended Roads for Change Post-Harvest

Road Number	Segment Length (mi.)	Current Management		Recommended Future Management	Reason
		Objective	Operational		
1000340	1.42	Objective ML 2	Operational ML 2	Objective ML 1	Seasonal public traffic is causing resource damage. Road is unimproved with no surfacing. Does not access dispersed camping, mining or private property. Benefit for Elk and other Wildlife.
1000375	0.79	Objective ML 2	Operational ML 2	Objective ML 1	Seasonal public traffic is causing resource damage. Road is unimproved with no surfacing. Does not access dispersed camping, mining or private property. Benefit for Elk and other Wildlife.
1940040	2.22	Objective ML 2	Operational ML 2	Objective ML 1	Road is closed on Malheur end. Recommendation is based on wildlife concerns. Road segment has been operational ML 1 for 10 years.
1035125	3.36	Objective ML 2	Operational ML 2	Objective ML 1	Does not access dispersed camping, mining, or private property. Benefit for Elk and other Wildlife.
1035310	.07	Objective ML 2	Operational ML 2	Objective ML 1	Tributary to 1035125. Very short segment. Implement storage with project. Does not access dispersed camping, mining, or private property. Benefit for Elk and other Wildlife.
Total	**7.86 miles**				

The roads and associated proposed changes listed in Table 5 below were analyzed under previous NEPA decisions but never implemented. These roads were moved to an Objective level of ML1 under the past decisions but remained open. These changes would be implemented under this project to comply with past decisions and provide for resource protection and benefits.

Table 5. Recommended Roads for Change Post-Harvest

Road Number	Segment Length (mi.)	Current Management		Recommended Future Management	Reason
		Objective	**Operational**		
1046065	0.69	Objective ML1 Geiser TS.	Operational ML 2	Objective ML 1	Road will be needed for future resource management. Road does not access any public or private interests (ie. mining, camping, private land)
1055100	1.22	Objective ML 1 Jack TS	Operational ML 2	Objective ML 1	Road will be needed for future resource management. Road does not access any public or private interests (ie. mining, camping, private land) Benefit for Elk and other Wildlife.
1055113	1.15	Objective ML 1 Jack TS	Operational ML 2	Objective ML 1	Road will be needed for future resource management. Road does not access any public or private interests (ie. mining, camping, private land). Benefit for Elk and other Wildlife.
7380120	.80	Objective ML 1 Jack TS	Operational ML 2	Objective ML 1	Road will be needed for future resource management. Road does not access any public or private interests (ie. mining, camping, private land).
7380160	2.10	Objective ML 1 Jack TS	Operational ML 2	Objective ML 1	Road will be needed for future resource management. Road does not access any public or private interests (ie. mining, camping, private land). Benefit for Elk and other Wildlife.
Total	**7.80 miles**				

The district proposes the following elk security enhancement measure:

- Extend the Patrick Creek Cooperative Travel Management Area (TMA) closure 3 days prior to archery season. This closure currently operates annually from 3 days prior to opening Rocky Mountain bull elk first season through the close of Rocky Mountain bull elk second season. Motorized use has become more prolific during archery season, compromising the purpose and need for the existing TMA.

Alternative Descriptions

The following is a brief description of the proposed action and alternative(s) that meet the need for action.

Alternative 1 - No Action

The No-Action Alternative forms the basis for a comparison between meeting and not meeting the project needs. This alternative provides baseline information for understanding changes associated with the action alternative and expected environmental responses as a result of past management actions.

With the implementation of this alternative, no activities would occur in the Patrick project area. Commercial and non-commercial thinning, fuels treatments, road repairs, riparian vegetation restoration and temporary road construction would not be authorized.

Previously approved ongoing activities such as domestic cattle grazing, fire exclusion, firewood cutting, recreation, and road maintenance (including danger tree removal) would continue to occur. Current key forest roads would be retained, and the existing road network (opened, closed, and decommissioned roads) would remain unchanged, with no changes in management objectives. Other roads would be evaluated and managed by reacting to individual events—such as slides, road slippage, or culvert failures—that make roads impassable or affect natural resources. Current aquatic and riparian habitat conditions may continue to degrade. Except for the methods associated with wildland fire, forest management would rely on natural processes. No additional projects at the landscape scale are anticipated for the next 10 years in this planning area, unless a catastrophic event such as a flood or fire occurs.

Because the existing environment is not static, environmental consequences from selecting this alternative are expected. Current biological and physical processes would continue their present trajectories along with associated risks and benefits. This alternative would allow forest stands, identified at this time as needing treatment, to progress through successional processes resulting from fire exclusion and past management. Natural fuels would not be treated to reduce the risk of wildfire within the wildland urban interface, which would decrease the chances of uncharacteristic wildfire intensity, and allow for a safer environment for firefighting personnel during fire suppression.

Alternative 2 - Proposed Action

The Proposed Action would respond to the purpose and need to improve forest health and resiliency to disturbance, reduce the risk of wildfire within the wild urban interface, increase structural complexity and species diversity of forest vegetation providing habitat to a wider range of wildlife species and provide economic benefit to the local economy. Forest landscape structure would be moved toward conditions historically present and reduce the risk of high severity disturbance on the landscape, including within riparian areas, through a combination of commercial thinning, non-commercial thinning, and prescription burning. Commercial products would be produced by these activities.

To meet the project needs, this alternative would implement the management actions listed below.

Treatment types are delineated individually within the associated tables below in order to clearly display acres proposed for treatment by each prescription or treatment type. Many treatment activities would receive follow up treatments in the form of PCT and prescribed burning. Therefore, the discrete acres listed in each table would share common acres (multiple treatments on the same acre) with the other treatment tables. For example, all PCT acres would be included within the commercial harvest tables since PCT is a post-harvest activity.

Upland Vegetation Restoration Treatments

Upland Commercial Harvest

Table 6 below displays a summary of treatment acres for commercial harvest activities outside of RHCAs. These activities have been developed in response to meeting the identified purpose and need. A portion of the commercial harvest units will receive post-harvest PCT and prescribed burn treatments.

Table 6. Alternative 2 – Summary of Commercial Thinning Activities Outside of RHCAs

Upland Treatments (Prescription)	Acres
Commercial thinning from below (HTH)	18,639
Group Selection (HSG)	1,916
DFPZ-HTH	1,241
DFPZ- PP	3
Aspen Restoration-Release from conifers (Aspen-REL)	33[1]
Post & Pole (PP)	1,157
Commercial Thinning Total	22,989
Skyline	1,375
Ground Based	21,614

1. This 33 acres is a combination of two delineated treatment units totaling 19 acres and individual, small aspen patches that have been identified within the project area. These smaller aspen patches were estimated at 2 acres each. The actual acreage will vary between individual patches but are expected to average approximately 2 acres based on field observations and past management.

Upland Harvest Methods

Commercial harvest would include ground-based harvesting utilizing tractor logging (feller buncher and rubber tired or tracked skidder) that would operate on designated trails with selected spacing criteria in combination with whole tree yarding on slopes up to and including 30 percent. A forwarder processor or in woods cutting and processing system may be used within areas identified as having sensitive soil conditions (see soils section for detailed descriptions). Skyline cable yarding would use leave tops attached yarding on slopes exceeding 30 percent. Logs would be either partially or fully suspended to reduce soil disturbance.

Upland, Non-commercial / Pre-commercial Thinning

As described in the Treatment Prescriptions section NCT activities would take place outside of commercial harvest units and PCT would be implemented as a follow up treatment within commercial harvest units. A portion of the NCT units will receive post-harvest prescribed burn treatments.

Table 7. NCT/PCT outside of RHCAs

Upland Treatments (Prescription)	Acres
Grapple Pile	8,802
Hand Pile	2,119
NCT Total	10,921
Grapple Pile	18,173
Hand Pile	1,329
PCT Total	19,502

Riparian Vegetation Restoration Treatments (RVR)

The increase in coniferous tree species within riparian areas has resulted in a reduction of hardwood brush and tree species. In addition, the elevated stocking levels within these areas has increased fuel loads and the risk of an uncharacteristic wildfire. Combinations of non-commercial thinning, commercial harvest, and prescribed burning would be used to meet the desired condition of each area selected for treatment.

RVR Commercial Harvest

Treatments would be designed to reduce conifer stocking levels within the overstory and shift species composition to an earlier seral state. Residual stocking would be within the RMZ with an emphasis on creating openings around areas with a hardwood component in the understory in order to encourage release of these species.

Table 8. Alternative 2 – Summary of Commercial Thinning Activities within RHCAs

Vegetation Treatments within RHCA's	Acres
Commercial thinning from below (HTH)	481
Skyline	216
Ground Based	265

RVR Harvest Methods

No-treatment buffers for commercial harvest would be implemented for category 1 and 2 streams. The width of the no-treatment buffers would be 100 feet for a category 1 stream and 75 feet for a category 2 stream (on either side of stream). No commercial harvest would be permitted within the RHCA of a category 3 or 4 stream (50 feet on either side of channel or pond). In addition, ground based harvest activities would only take place above an existing road outside of the no treatment buffers. In woods processing harvest systems would be required for any ground based harvest within Riparian Conservation Areas (RHCA). Ground based harvest activities would utilize existing landings where available and designated skid trails. Piles associated with log processing for cable yarding systems would be burned on landing sites.

RVR Non-Commercial/Pre-commercial Thinning

NCT treatments would be designed to reduce conifer competition and assist in releasing hardwood species outside of commercial treatment areas. PCT would be utilized to treat the understory non-commercial trees after completion of the commercial treatments within the RHCA. These treatments would reduce the density of young conifer trees (10” dbh or less) within the riparian areas. Emphasis would be placed on enhancing existing hardwood species present in the understory by reducing the conifer competition and increasing the availably of soil moisture and sunlight within the understory. PCT activities will be within commercial harvest units and would therefore have the same buffer width as the commercial unit. Some trees may be felled and left on site to improve large down wood and to reduce ungulate (deer, elk, livestock) browse pressure.

Table 9. NCT/PCT within RHCAs

NCT/PCT within RHCA’s			
NCT	**Acres**	**PCT**	**Acres**
Grapple Pile	0	Grapple Pile	253
Hand Pile	3,745	Hand Pile	213
Total	**3,745**	**Total**	**467**

Piling and Burning within RVR Units

Lighting of hand and machine piles or jackpot fuels is permitted within the RHCA if slash is placed into piles approximately four feet high and six feet in diameter. Machine piling is permitted within the portion of the RHCA that ground based harvest will take place; Above a road at least 100 feet away from the channel for a category 1 stream and at least 75 feet away from the channel for a category 2 stream. All NCT units would be hand piled as they are outside of proposed commercial harvest units.

Prescribed Burning RVR & Upland Units

Prescribed fire would revitalize certain surface vegetation, recycle nutrients stored in debris and prepare sites for planting or natural regeneration. More than one prescribed fire entry may be needed within the first 10 years of treatment depending upon the success of the initial burn treatment in meeting project objectives. Follow-up maintenance burning is planned on an average 10-year cycle within the project area.

Table 10. Prescribed Burning Activities

Prescribed Burning Activities	Acres
Post-Harvest Burning	17,565
Post NCT Burning	9,949
Stand Alone Burning	8,518
Total	36,032

Alternative 3 – Proposed Action with no harvest activities in RHCAs

This alternative responds to comments received during the scoping period that requested the Forest analyze an alternative with no activities in the RHCAs (Key Issue 3). The exception to this would be prescribed burning and maintenance or rehabilitation/reconstruction of roads. Prescribed burning would still be allowed to back into RHCAs, but no active lighting would take place within the RHCA under this alternative. General road maintenance and rehabilitation for roads that are located within an RHCA would still take place. Also, the same road relocations within Alternative 2 (as described in Road-related PDCs, above) would occur to move roadbeds out of the stream flood plain, provide better drainage and minimize the potential for sedimentation into the adjacent stream.

Like Alternative 2, this alternative would respond to the purpose and need to improve forest health and resiliency to disturbance, reduce the risk of wildfire within the wild urban interface, increase structural complexity and species diversity of forest vegetation providing habitat to a wider range of wildlife species and provide economic benefit to the local economy. However, these identified purpose and needs would only be met outside of RHCAs. Vegetation treatments outside of RHCAs would be identical to those listed under Alternative 2. Outside of riparian areas, forest landscape structure, species composition and densities would be moved toward conditions that are closer to historical ranges (HRV) reducing the risk of high severity disturbance on the landscape. These activities would include a combination of commercial thinning, non-commercial thinning, and prescribed burning.

Table 6, Table 7, and Table 10, along with the associated implementation methods listed above for alternative 2 (Upland commercial and non-commercial & prescribed burning) treatments display the treatment activities that would take place under Alternative 3. The same project design features and monitoring requirements for Alternative 2 would be included in this alternative.

Aspen enclosures proposed for maintenance treatments (*Aspen-MTC)* would be treated under this alternative. However, portions of the enclosures that fall within an RHCA would only be treated with prescribed burning and fence maintenance where needed.

Table 11. Alternatives at a glance

Alternative Elements	Alt 1	Alt 2	Alt 3
Project Area Boundary (PAB) Acres		48,794 Acres	
Subwatersheds Headwaters North fork Burnt River Patrick Creek-North Fork Burnt River Petticoat Creek-North Fork Burnt River Camp Creek Trout Creek Antelope Creek		 13,055 acres 8,101 acres 9,078 acres 17,060 acres 566 acres 888 acres	
WUI Acres Whitney WUI Sumpter/McCully Forks WUI Greenhorn WUI Woodtick Village/Rattlesnake Estates WUI Total WUI Acres		 7,836 acres 57acres 810 acres 3,004 acres 11706 acres	
Upland Vegetation Restoration			
Harvest – Upland			
Commercial thinning from below (HTH)	0	18,639	18,639
Group Selection (HSG)	0	1,916	1,916
Defensible fuel profile zone- Commercial thinning from below (DFPZ-HTH)	0	1,241	1,241
Defensible fuel profile zone- Post & Pole (DFPZ-PP)	0	3	3
Aspen Restoration-Release from conifers (Aspen-REL)	0	33[1]	33[1]
Post & Pole (PP)	0	1,157	1,157
Harvest Total	0	22,989	22,989
Harvesting Systems –Upland			
Ground based (includes harvest in aspen)	0	21,614	21,614
Skyline/cable	0	1,375	1,375
Prescriptions connected to harvest – Upland			
Pre-Commercial thinning-thinning from below (PCT)	0	19,502	19,502
Grapple Pile	0	18,173	18,173
Hand Pile	0	1,329	1,329
Prescriptions not connected to harvest – Upland			
Non-commercial thinning-thinning from below (NCT)	0	10,915	10,915
NCT-Aspen-REL		6[2]	6[2]
Grapple Pile	0	9,060	9,060
Hand Pile	0	1,861	1,861
Riparian Vegetation Restoration (RVR) – Treatments within RHCAs			
Commercial Harvest -RVR			
Riparian Vegetation Restoration (RVR)	0	481	0

Alternative Elements	Alt 1	Alt 2	Alt 3
Harvesting Systems-RVR			
Ground Based	0	265	0
Skyline/cable	0	216	0
Prescriptions connected to harvest - RVR			
Pre-commercial thinning-thinning (PCT)	0	467	0
Grapple Pile	0	253	0
Hand Pile	0	213	0
Prescriptions not connected to harvest- RVR			
Non-commercial thinning-thinning(NCT)	0	3,743	0
NCT-Aspen REL	0	2	0
Grapple Pile	0	0	0
Hand Pile	0	3,745	0
Road Work Miles			
Temporary Roads-Total	0	38.5	38.5
Temp new constuction		34.54	34.54
Temp existing roads		3.96	3.96
Miles of Stored Roads Opened		154	154
Old Forest Structure Treatments by Acres			
OFMS			
HTH-PCT		987	937
HTH-PCT-PP		10	10
HTH-PCT-RXburn		1,778	1,720
HTH-RXburn		144	144
NCT		315	106
NCT-RXburn		1,837	1,529
Total OFMS Acres		**5,072**	**4,446**
OFSS			
NCT		8	2
NCT-RXburn		17	15
Total OFSS Acres		**25**	**17**
Grand Total Old Forest Treatment Acres		**5,098**	**4,463**
Treatments by Potential Vegetation Groups (PVG)			
Moist Upland Forest			
HTH (includes Aspen-REL & PP)		1,663	1,566
HSG		0	0
NCT		1,201	611
Dry Upland Forest			
HTH (includes Aspen-REL & PP)		16,163	15,880
HSG		1,885	1,885

Alternative Elements	Alt 1	Alt 2	Alt 3
NCT		11,131	8,433
Cold Upland Forest			
HTH (includes Aspen-REL & PP)		3,458	3,378
HSG		13	13
NCT		1,882	1,508
***Non Forest Veg Types**			
HTH (includes Aspen-REL & PP)		270	248
HSG		19	18
NCT		451	369
Total Acres Treatments by PVG			
HTH (includes Aspen-REL & PP)		21,554	21,072
HSG		1,916	1,916
NCT		14,666	10,921

1. This 33 acres is a combination of two delineated treatment units totaling 19 acres and individual, small aspen patches that have been identified within the project area. These smaller aspen patches were estimated at 2 acres each. The actual acreage will vary between individual patches, but are expected to average approximately 2 acres based on field observations and past management.

Project Design Criteria Common to All Alternatives

Project Design Criteria (PDCs) are actions designed for a specific project to reduce or prevent undesirable effects from proposed activities. PDCs can include avoiding the effect, minimizing the effect by limiting the action, rectifying the effect, reducing the effect through maintenance, or compensating for the effect. Unless otherwise noted, these PDCs would be incorporated with any action alternative selected for implementation.

Appendix B lists project design criteria to minimize the effects of proposed management activities. Effectiveness of implementing these measures is high for this project. Appendix B also identifies implementation monitoring (determines if actions are implemented as designed) and effectiveness monitoring (determines the effectiveness of the design criteria). Monitoring and observations of past, similar actions indicate that the design criteria are effective in protecting natural resources. Many of these measures have been used successfully for implementation of past projects on the Wallowa-Whitman National Forest.

Environmental Impacts

To facilitate the reader's understanding of the effects analysis, this chapter describes the current resource conditions to provide a baseline for assessing effects associated with proposed activities. The No Action Alternative (Alternative 1) and Action Alternatives (Alternatives 2 and 3) are described in detail in Proposed Action and Alternatives section, and a comparison of the alternatives is presented in the Alternatives at a Glance table (Table 11).

This discloses the anticipated environmental consequences of the No Action and the Action Alternatives on various resources for which there are potential direct, indirect and cumulative impacts. The effects analysis forms the basis of comparison of the alternatives through evaluation of the key issues and select non-key issues.

The duration and geographic scale of direct, indirect, and cumulative effects varies, and is addressed by each resource and subject area. In addition, the type of projects considered under the cumulative analysis varies according to the resource and nature of project being considered. Key indicators will be used to measure how each alternative respond to key issues. The effects will be discussed by resource or subject area, with key issues and indicators addressed as appropriate.

For the purposes of this EA, the cumulative impacts are the sum of all past and present actions, and reasonably foreseeable future actions. Past activities are considered in the existing condition baseline for this project. Present and reasonably foreseeable future activities on Forest Service, BLM, and private lands are described in Appendix A of this EA. The purpose of the cumulative effects analysis in the EA is to evaluate the significance of the No Action's and Action Alternatives' contributions to cumulative impacts. A cumulative impact is defined under federal regulations as follows:

> "...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

The best available science is considered in preparation of this EA; however, what constitutes best available science might vary over time and across scientific disciplines. As a general matter, we show consideration of the best available science when we ensure the scientific integrity of the discussions and analyses in the project NEPA document. Specifically, this EA and the accompanying Project Record identifies methods used, references reliable scientific sources, discusses responsible opposing views, and discloses incomplete or unavailable information, scientific uncertainty, and risk (See 40 CFR, 1502.9 (b), 1502.22, 1502.24).

The Project Record references all scientific information considered: papers, reports, literature reviews, review citations, academic peer reviews, science consistency reviews, and results of ground-based observations to validate best available science. This EA incorporates by reference (as per 40 CFR 1502.21) the Project Record, including specialist reports and other technical documentation. Analysis was completed for the following resource areas: Silviculture, Fire/Fuels, Wildlife, Socio-Economics, Water Resources, Aquatics, Proposed, Endangered, Threatened, and Sensitive (PETS) Species, Transportation, Soils, Invasive Species, Range, Wilderness/IRAs and Undeveloped Areas, Recreation/Visuals, Minerals and Cultural/Heritage. Information from these reports has been summarized below in this Chapter. The Project Record is located at the Whitman District Office.

This section summarizes the potential impacts of the proposed action and alternatives for each impacted resource.

Silviculture

This section describes the existing forest vegetation conditions in the Patrick Vegetation analysis area and the effects of the project alternatives, including direct, indirect, and cumulative effects to forest vegetation. Analysis framework that includes statutes, regulatory environment, Forest plan and other direction can be found in the Silviculture Specialist report.

Range of Variation Analysis

Desired conditions for insect and disease susceptibility, structure stage, species composition and stand density are represented by the desired Range of Variation (RV) associated with each forest type or Potential Vegetation Group (PVG). This desired range of variation is not a static condition tied to a set point in time. This represents a range of conditions that are believed to exist when the landscape is exposed to historic disturbance regimes or patterns. The premise of this type of analysis is that native species have evolved and adapted with historical disturbance regimes of a specific area or landscape. If ecosystem components are within a range of conditions that would occur under these historic disturbance regimes they represent a more sustainable, resilient system.

In order to clearly tie this analysis to these historical disturbance regimes and analysis requirements outlined in the 1993 Eastside Screens the term Historical Range of Variability (HRV) is used to describe our Range of Variation values.

Existing Conditions

Potential Vegetation Groups (PVG)

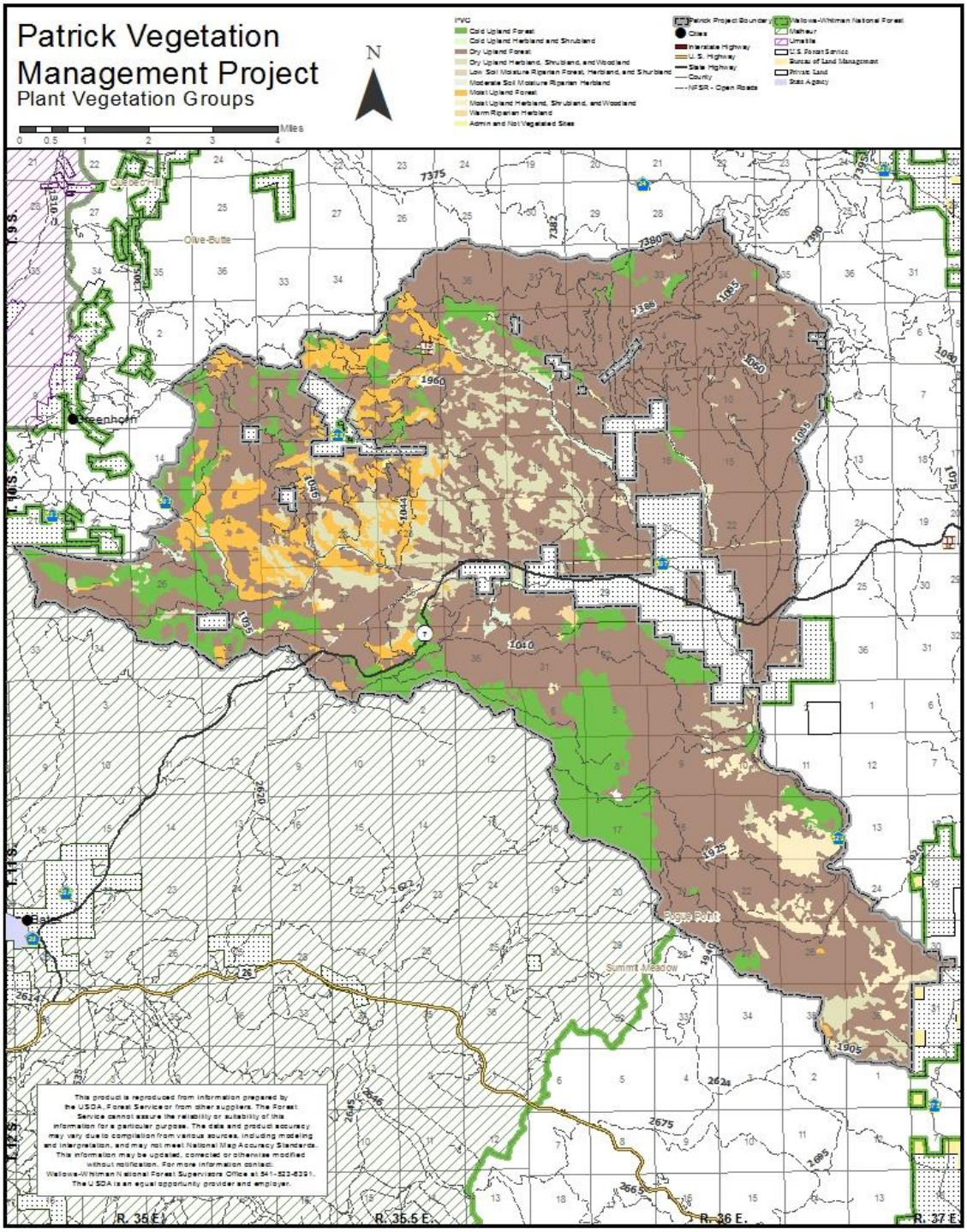
In order to compare the existing condition to HRV forest vegetation is delineated into potential vegetation groups (PVG). The PVG concept is simply an aggregation of plant association groups delineated by similar environmental conditions or regimes in combination with dominant plant species.

Each PVG is typically composed of plant association groups that occur as a result of the predominant influence of temperature or moisture (Powell 2012). These plant association groups represent the "potential vegetation" that would eventually dominate the site in the absence of disturbance (typically the most shade tolerant species that can occur and eventually dominate the site). Coniferous Potential Vegetation is displayed in Table 12 and Figure 2. It is comprised of Dry Upland Forest (DUF) 33,636 acres, Moist Upland Forest (MUF) 3,090 acres, and Cold Upland Forest (CUF) 6,095 acres. Eighteen stands of quaking aspen were also located including those on upland and riparian sites.

Table 12. Patrick Vegetation Classification (acres)

Forested Potential Vegetation Groups	Acres	Percent of the forested landscape	Predominant Tree Species
Dry Upland Forest (DUF)	33,636	79	Ponderosa pine, Douglas-fir, western larch, and grand fir
Moist Upland Forest (MUF)	3,090	7	Ponderosa pine, Douglas-fir, western larch, lodgepole pine. and grand fir
Cold Upland Forest (CUF)	6,095	14	Subalpine fir, lodgepole pine, grand fir, western larch, Douglas-fir

Figure 2. Potential Vegetation Groups.



Wildfire History

Northeast Oregon has a high wildfire occurrence rate, primarily due to lightning activity that occurs during the summer and fall months. The Wallowa-Whitman National Forest has one of the highest wildfire occurrence rates in Oregon and Washington. The project area has experienced 204

documented wildfire starts from 1970 through 2017. From 1985 until 2017, twenty-three wildfires over 100 acres have occurred within 10 miles of the project area in similar stand and fuel types.

Due to the spatial arrangement of vegetation types across the project area (79% DUF surrounding small scattered pieces of MUF and CUF) fire severity, frequency and return intervals will typically have little variance from what would be expected within the Dry Upland Forest PVG. However, in order to effectively analyze the existing condition and compare to historical conditions, each PVG is evaluated separately. Within the Dry Upland Forest areas and the intermixed/adjacent MUF and CUF, low to mixed severity fires would have historically maintained stand densities at appropriate levels, as well as kept surface fuel loadings appropriate for the stands across the project area. With the exclusion of wildfires due to suppression activities as well as past harvest activities, the majority of the project area is currently modified from historical normal and have higher stand densities and fuel loadings, which will allow fire intensities to be significantly higher than desired historic levels. This has been shown by the nearby Cornet/Windy (2015), Rail (2016), Dooley Mountain (1989) and Huckleberry (1986) fires that all had similar stand types and conditions and burned with high intensities and severities.

Quaking Aspen

There are currently 7 quaking aspen enclosures of various sizes within the project area that have been previously identified and managed for restoration purposes. Six of the enclosures are 2 acres in size with one larger enclosure of 8 acres located within an open meadow area. These aspen stands were fenced for protection from browsing and managed with various methods intended to enhance regeneration. Success with respect to enhancing regeneration within these previously managed areas is variable. In addition, 11 other aspen stands have been identified for restoration within the project area. There are also occurrences of small aspen patches scattered throughout the project area that will be evaluated for treatment need on a stand basis.

The health and distribution of quaking aspen has declined from the lack of disturbance over the past several decades (Bartos, 2001). Due to its extreme shade intolerance conifer invasion has reduced survival, growth, and development of quaking aspen. Healthy root systems are the means by which aspen regenerate and persist at a particular site. Once the root system of an aspen stand dies out it is unlikely that it would return naturally. The strict requirements for aspen seed germination (Maini, 1968) make the establishment of new aspen sites unlikely. A stand reinitiating disturbance is necessary to restore the existing aspen sites (Sheppard, 2001).

Riparian Vegetation

Conditions within riparian areas also show a departure from HRV with respect to tree density, species composition and stand structure. Shade intolerant hardwoods, shrubs, grasses and forbs are declining principally as a result of conifer competition that has occurred as a result of fire exclusion and browsing by ungulates. This shift from hardwood to conifer over the past several decades is resulting in a reduction in vegetation diversity within these stream reaches. A large portion of these RHCAs are within the understory re-initiation stage and currently have a high density of small diameter conifer trees (seedlings and saplings) occupying the understory as well as an overstocked overstory. These high conifer densities elevate fuel loads, occupy sites that would typically be dominated by hardwood species and reduce bank stability due to the smaller, less prolific root systems. The elevated fuel loading increases the risk of losing key ecosystem components such as streamside trees, down wood and snags in an uncharacteristic fire. A high intensity fire would also increase erosion potential.

Western Juniper

Western juniper has been observed throughout the analysis area in increasing numbers. Juniper woodlands (true juniper habitat) comprise 4,166 acres in the project area (Figure 2). Juniper woodlands experienced a longer fire return interval than the surrounding forest types due to the lack of surface fuel. The ground surface of these areas is typically dominated by bare mineral soil and rock allowing the species to persist within these stands with little damage from fire. However, the lack of fire over the past few decades within the surrounding lands has allowed this species to expand it's range into areas that it was not historically found.

Past Management

A majority of the forested landscape within the Patrick project area has experienced past timber management. See silviculture report for details of past management activities.

Forest Landscape Structure

The Patrick Analysis area at 48,794 acres is greater than the minimum size recommendation of 15,000 to 35,000 acres for a Range of Variability (RV) analysis (USDA Forest Service 1995; Powell, D.C. 2010). A Range of Variability (RV) analysis was conducted for landscape structure.

The results are shown in Table 13 and displayed on Figure 3

The analysis shows the following:

- Old Forest Single-stratum (OFSS) is below HRV in all PVGs
- Old Forest Multi-strata (OFMS) is within HRV, but at the upper end of the range
- Stand initiation (SI) is below HRV in all PVGs
- Stem Exclusion (SE) is below HRV in all PVGs
- Understory Re-initiation (UR) is above HRV in all PVGs

The data reflects the past removal of large trees and fire exclusion resulting in a lack of single-story structure (OFSS, SI & SE) and an excess multi-story structures in the form of UR far exceeding HRV levels. Developing seedling and sapling understories are extensive throughout the area.

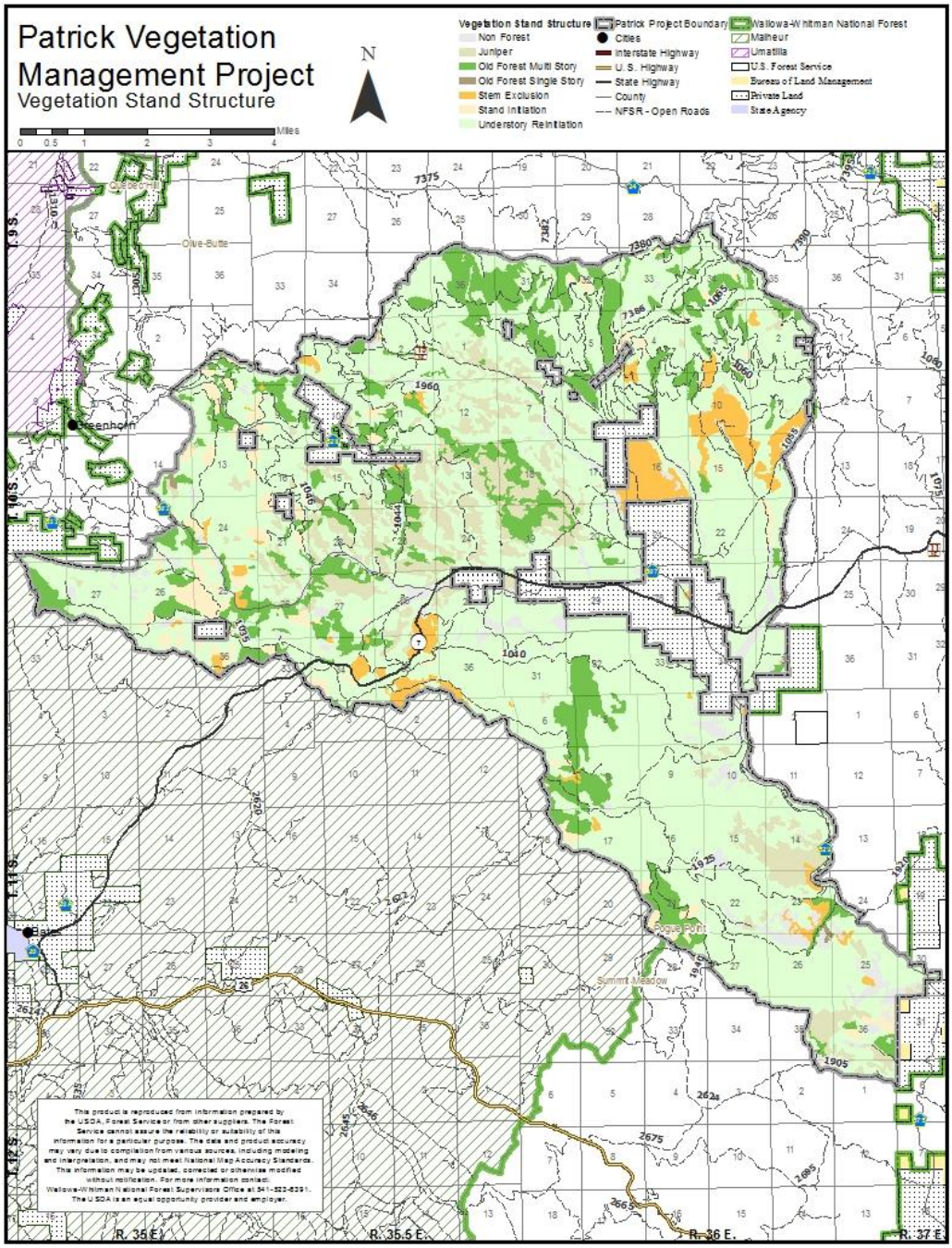
Old Forest

Stands comprised of Old Forest structure are delineated as Old Forest Multi Strata (OFMS) or Old Forest Single Strata (OFSS) based on the current structure with respect to single story versus multi story canopy layers. Table 13 below displays the current distribution of forest old forest structure stages by PVG relative to HRV across the project area.

Table 13. Landscape structure (Project Area) - Historic Range of Variability compared to existing condition.

PVG		DUF		MUF		CUF	
Structure Stage	**Description**	**HRV %**	**Existing %**	**HRV %**	**Existing %**	**HRV %**	**Existing %**
Stand Initiation	Following a stand-replacing disturbance growing space is occupied rapidly by vegetation that either survives the disturbance or colonizes the area. A single canopy stratum of tree seedlings and saplings is present in this stage.	15-25	4	20-30	2	20-45	6
Stem Exclusion	Trees initially grow fast and quickly occupy all of their growing space, competing strongly for sunlight and moisture. Because trees are tall and reduce light, understory plants (including smaller trees) are shaded and grow more slowly. Species needing sunlight usually die; shrubs and herbs may go dormant. In this stage, establishment of new trees is precluded by a lack of sunlight or by a lack of moisture.	10-20	5	20-30	3	10-30	5
Understory Reinitiation	As the forest develops, a new age class of trees eventually gets established after overstory trees begin to die or because they no longer fully occupy their growing space. Regrowth of understory seedlings and other vegetation then occurs, and trees begin to stratify into vertical layers. This stage consists of a low to moderate density overstory with small trees underneath.	5-10	76	10-20	79	10-25	75
Old Forest Multi Stratum	Multi-layer stands with old trees in the uppermost stratum. Snags and decayed fallen trees may also be present, leaving a discontinuous overstory canopy.	5-15	15	15-20	16	10-25	15
Old Forest Single Stratum	A dominant single-layer with old trees in the uppermost stratum. A low stocking of understory trees may be present.	40-60	< 1	10-20	0	5-20	0

Figure 3. Vegetation Stand Structure



Tree Density

The Dry Upland Forest PVG has an abundance of overly dense, closed canopy stands and a corresponding deficiency of open density stands in comparison to HRV. Data analysis indicates that approximately 56% of the Dry Upland PVG is currently considered to be in a high density or closed canopy condition. In contrast, only 44% of this PVG is currently in an open condition compared to the estimated HRV range of 80-90%.

The predominance of Dry Upland Forest types across the project area (78%) elevates the potential effects of departure in density levels across the project area. In high density stands, individual tree diameter growth is suppressed due to competition for site resources, primarily sunlight. Slow diameter growth pre-disposes trees to successful bark beetle attacks, delays reaching diameters that are fire resistant, and delays the attainment of old forest conditions. Shade intolerant, early seral species are at a competitive disadvantage within high density mixed species stands.

Table 14 below exhibits the proportion (on an acreage basis) of each PVG that is currently in a closed versus open condition in comparison to the proportions predicted through RV analysis.

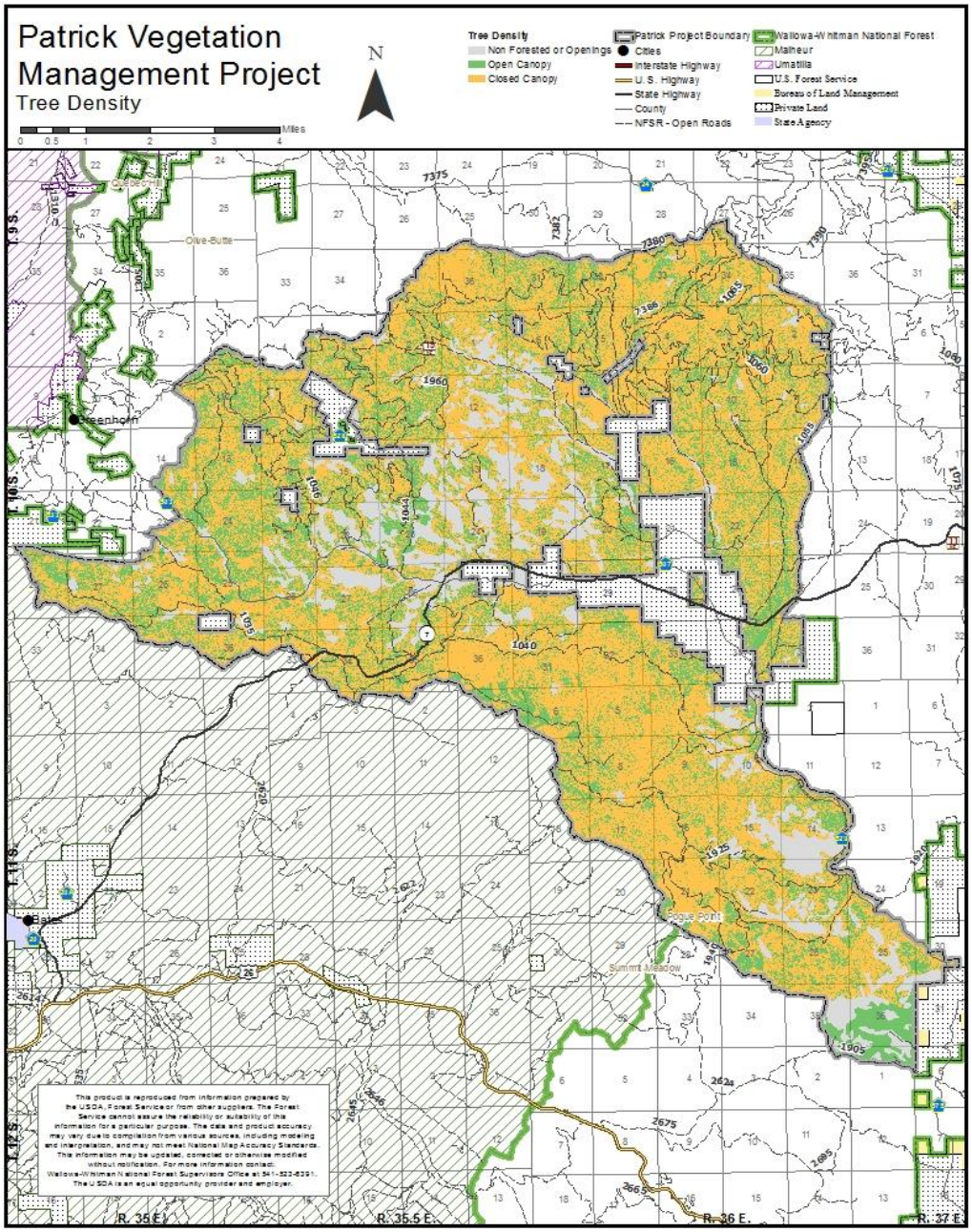
Table 14. Forest Density Levels by PVG

Vegetation Cover Condition	Percent of Dry Upland Forest PVG		Percent of Cold Upland Forest PVG		Percent of Moist Upland Forest PVG	
	HRV (%)	Existing (%)	HRV (%)	Existing (%)	HRV (%)	Existing (%)
Open	80-90	43	20 - 30	64	30 -40	68
Closed	5-20	57	65 - 80	36	60 - 80	32

Existing canopy cover percentages were derived through analysis of Light Detection and Ranging (LIDAR) data with the exception of approximately 1% of the area that was not covered by LIDAR. Aerial photo interpretation was utilized for these additional acres. Dry upland forest closed canopy is 40 percent canopy cover or greater. Cold and moist upland forest closed canopy is 60 percent canopy cover or greater.

Lower densities in moist and cold forests may be a consequence of past management activities coupled with insect and disease caused mortality. However, the departure in forest structure and species composition suggests that these forest types are becoming less resilient to disturbance and moving away from historic conditions.

Figure 4.Tree Density



Tree Species Composition

A Range of Variability (RV) analysis was completed for species composition of the forest vegetation in the project area (Table 15). The analysis describes species composition as seral stages. Seral stages were adapted to describe tree species. The concept of "seral species" here is described in terms of tolerance, to shade, fire, drought, and the relative ability of a species to regenerate and establish new plants and survive in a forested environment.

For example, ponderosa pine and western larch are very intolerant to shading and considered early seral species. These species simply do not thrive if the crowns are shaded. Grand fir a late seral

species on the other hand is very tolerant to shade but can also thrive in full sunlight. Douglas-fir is a mid to late seral species and considered intermediate in shade tolerance but will out compete larch and ponderosa pine over time.

Conversely, at a young age, grand fir and Douglas-fir are intolerant of repeated surface fire, while ponderosa pine and western larch are much more tolerant. Ponderosa pine and western larch establish most successfully following a disturbance where there is some level of bare mineral soil, or less organic matter, and good access to light. Such conditions can be created by fire or logging. These species do not regenerate well in forest environments that have deep organic layers on the soil and are at moderate to high forest density. These are characteristics of forests that have not had a disturbance for long periods of time. Grand fir, on the other hand, establishes and thrives in open or shaded areas, bare mineral soil or deep organic layers.

In the grand fir vegetation series grand fir will eventually succeed to dominance with the absence of disturbance due to differences in tolerance to environmental factors. Likewise, on Douglas-fir sites, Douglas-fir will eventually become the dominant species. The succession of grand fir and Douglas-fir would result in ponderosa pine and western larch eventually disappearing or becoming very minor components of the ecosystem. Due to the long history of disturbance on the landscape, particularly fire, this has not occurred prior to human intervention. The primary form of human intervention affecting tree species has been fire exclusion.

In an environment of high frequency disturbance, primarily fire, ponderosa pine and western larch have a competitive advantage over grand-fir and to some extent Douglas-fir. This is why the forests of the Blue Mountains were extensively dominated by ponderosa pine before European settlement (Munger, 1917).

Early seral species, in this context ponderosa pine, western larch, and Douglas-fir on some sites, are able to form stable, long lasting, large tree dominated stands referred to as Old Forest Structure (OF). Historically on these sites frequent disturbance, usually fire, prevented the succession to grand fir.

Moist upland forest in the Patrick project area occurs as relatively small islands surrounded by Dry Upland Forest (Figure 4). These islands would have similar fire occurrence and severity as the surrounding dry upland forest.

The species composition analysis below is a way to look at the landscape and determine its degree of departure. Table 15 shows that the Late Seral stage is well above HRV within the DUF and CUF PVGs and the mid seral stage is well above HRV in the MUF PVG indicating that the forested landscape, without disturbance, is succeeding to late seral species.

Table 15. Tree species composition- Historic Range of Variability compared to existing condition.

Potential Vegetation Group (PVG)	Shade-intolerant Early Seral Species		Intermediate-tolerant Mid Seral Species		Shade-tolerant Late Seral Species	
	Existing %	HRV %	Existing %	HRV %	Existing %	HRV %
Dry upland forest	33	75-90	NA	NA	67	5-20
Moist upland forest	22	30-60	67	20-40	11	10-30
Cold upland forest	36	40-60	0	5-20	64	25-50

Insects and disease

The forest vegetation characteristics described above strongly influence the presence of various insects and disease as well as the level of disturbance they create across the forested landscape. As these forest characteristics move away from HRV the level of disturbance and overall affects to the forested environment increases. The elevated stocking levels, increase in multi canopy structure and a shift in species composition to more shade tolerant, less resilient tree species increases the susceptibility to large scale disturbance. The following insect and diseases have been observed and documented within the project area through multiple site visits by staff of the Blue Mountains Forest Insect and Disease Center. The resulting reports are located in the analysis file.

- Elevated Mountain pine beetle activity primarily in lodgepole pine.
- Elevated fir engraver populations within grand fir.
- Dwarf mistletoe in Douglas-fir, western larch and to a lesser extent in the ponderosa pine.
- Occurrence of Heterobasidion root disease in both grand fir and ponderosa pine.
- Indian Paint Fungus in grand fir.
- Increase in multi canopy stand structure enhancing the spread and increasing the threat of foliar insects and diseases such as western spruce budworm, Douglas-fir Tussock Moth and dwarf mistletoe.

Susceptibility is defined as a set of conditions that make a forest stand vulnerable to substantial injury by insects or diseases. Susceptibility assessments do not predict when insects and diseases might reach damaging levels; rather, they indicate whether stand conditions are conducive to declining forest health and increasing levels of tree mortality caused by insect and disease organisms. (Hessburg, et al., 1999), (Lehmkuhl, Hessburg, Everett, Huff, & Ottmar, 1994).

Defoliating Insects

Principal defoliators in the Patrick project area are Spruce Budworm (SPBW) and Douglas-fir Tussock Moth (DFTM). Conditions favoring these species are directly related to presence of host species, multi-story structure and tree density (Stoszek, Mika, Moore, & Oorne., 1981) (Kegley, Livingston, & Gibson, 1997).

Host species- The data in Table 18 indicates that the number of stands dominated by grand fir and Douglas-fir, the primary hosts for SPBW and DFTM, are above HRV across all PVGs contributing to defoliator susceptibility.
Multi-story structure- The data in Table 16 shows that Understory Re-initiation is above HRV across all PVGs contributing to defoliator susceptibility.

Tree density- The data in Table 17 indicates that Closed Density is above HRV within the DUF PVG which comprises 79 % of the project area contributing to defoliator susceptibility.

Adding the factors together, stands dominated by host species, in multi-strata structures at high densities across the majority of the project area, demonstrates that there is a significant potential for large scale defoliator outbreaks within the project area.

Bark Beetles

Principal bark beetles in the Patrick project area are Western Pine beetle, Pine Engraver beetle, Mountain Pine beetle, Douglas-fir beetle, and Fir Engraver beetle. Conditions favoring these species are directly related to an abundance of host species, high stand densities and tree size for specific species (Miller & Keen, 1960) (Berryman & Ferrell, 1988) (Schmitz & Gibson, 1996).

Host species- The data in Table 16 suggests that the stands dominated by grand fir and Douglas-fir are above HRV across all PVGs indicating that this portion of bark beetle susceptibility is also above HRV for Douglas-fir and Fir Engraver beetles.

Tree density- The data in Table 16 suggests that Closed Density is above HRV within the DUF PVG indicating that this portion of bark beetle susceptibility is above HRV across 79% of the forested landscape of the project area. These high density levels will have an effect on all tree species that have a susceptibility to bark beetle attack regardless of seral state or PVG.

Table 16, Table 17, and Table 18 below display bark beetle susceptibility by host species and associated type of beetle. The large percentage in Moderate susceptibility across the majority of bark beetle hosts indicates a landscape developing into high susceptibility. If left untreated susceptibility levels would be expected to continue to move into the high category increasing the risk of widespread outbreaks.
Due to the limited amount of ponderosa pine found within the cold and moist upland forest PVGs within the project area susceptibility for ponderosa pine bark beetles was assumed to be low within these areas and not displayed on the associated tables for those PVGs. Due to the limited amount of lodge pole pine within the Dry Upland Forest PVG no susceptibility to mountain pine beetle was assumed within that PVG.

Disease

The presence of dwarf mistletoe is common throughout the project area affecting western larch, Douglas-fir, and ponderosa pine. It occurs as low, moderate, and severe severity. Dwarf mistletoe severity consists of its ability to *spread* from tree to tree and from stand to stand and to *intensify* with a single tree. The presence of host species, multi-story structure, and closed densities facilitates spread and intensification (Hessburg, et al., 1999), (Alexander & Hawksworth, 1975) (Roth, 1971) (Hawksworth, 1965).

Fire is the only natural control of dwarf mistletoe in the Dry, Moist and Cold Upland forest. Prior to fire exclusion, fire reduced spread by reducing susceptible tree densities and multi-strata structures and reduced Intensification by pruning lower crown infections. Lower crown brooms are more susceptible to ignition due to density of foliage and the tendency of needle fall to accumulate in them. Lower broom ignitions increased the chance of torching and therefore mortality of the infected tree (Koonce, 1980), (Conklin & Armstrong, 2001).

Table 16, Table 17, and Table 18 below show that more of the landscape was historically in low susceptibility across all disease and insect vectors. The large percentage in Moderate susceptibility indicates a landscape developing into high susceptibility. If left untreated susceptibility levels would be expected to continue to move into the high category increasing the risk of widespread outbreaks.

Douglas-fir dwarf mistletoe (DFDMT)- Douglas-fir is found in all plant associations except in the ponderosa pine vegetation type. A portion of the Low susceptibility is due to this fact. Over time, without disturbance, the spread and intensification of DFDMT can be expected to increase as Douglas-fir increases.

Western larch dwarf mistletoe (WLDMT)- Larch is found in some Douglas-fir and grand fir plant associations. However, due to the fact that larch does not occur in the ponderosa pine plant associations and is seldom the dominant species throughout the entire project area susceptibility is difficult to determine. Therefore, WLDMT susceptibility was not included within the HRV analysis for disease. However, WLDMT was identified as increasing in intensity during multiple site visits from the Forest Health and Protection services. Over time, without disturbance or management, the

presence of WLDMT can be expected to decrease as larch becomes less prevalent due to conversion to more shade tolerant species.

Ponderosa pine dwarf mistletoe (PPDMT)-This mistletoe occurs in all plant associations. A portion of the Low susceptibility is due to the reduced presence of ponderosa pine in the grand fir plant associations. This is a result of the increased grand fir due to fire exclusion and selective removal of ponderosa pine. Due to the scattered distribution of ponderosa pine within the moist and cold upland forest PVGs, susceptibility was assumed to be low in those areas, and is not displayed in the tables below. Over time, without disturbance, the presence of PPDMT can be expected to increase in the ponderosa pine plant associations due to spread and intensification and decrease in the Douglas-fir and grand fir plant associations as ponderosa pine becomes less prevalent.

Table 16, Table 17 & Table 18 Insects and Disease Susceptibility- Historic Range of Variability compared to existing condition.

Table 16. Susceptibility of Dry Upland Forest

Insect/Disease	Susceptibility of Dry Upland Forest (DUF)					
	Low		Moderate		High	
	HRV %	Existing %	HRV %	Existing%	HRV %	Existing%
Bark Beetles-ponderosa pine	35 - 75	20	15 - 35	57	10 - 20	23
Fir Engraver Beetle - Grand fir	45 - 95	31	10 - 25	16	5 - 10	53
Douglas-fir Beetle	35 - 75	31	15 - 30	16	10 - 25	53
Defoliators	40 - 85	14	15 - 30	76	5 - 15	10
Douglas-fir Dwarf Mistletoe	30 - 60	30	10 - 35	57	20 - 35	13
Ponderosa Pine Dwarf Mistletoe	71	20	19	78	10	2

Table 17. Susceptibility of Moist Upland Forest

Insect/Disease	Susceptibility of Moist Upland Forest (MUF)					
	Low		Moderate		High	
	HRV %	Existing%	HRV %	Existing%	HRV %	Existing%
Fir Engraver Beetle - Grand fir	30 - 70	10	10 - 20	46	20 - 40	44
Douglas-fir Beetle	30 - 60	10	20 - 40	46	10 - 30	44
Mountain pine beetle - lodgepole pine	30 - 60	6	25 - 40	79	5 - 30	15
Defoliators	5 - 20	39	20 - 30	61	35 - 80	0
Douglas-fir Dwarf Mistletoe	30 - 65	24	20 - 45	60	10 - 20	16

Table 18. Susceptibility of Cold Upland Forest

Insect/Disease	Susceptibility of Cold Upland Forest (CUF)					
	Low		Moderate		High	
	HRV %	Existing %	HRV %	Existing %	HRV %	Existing %
Fir Engraver Beetle - Grand fir	35 - 75	19	20 - 45	41	5 - 10	40
Douglas-fir Beetle	45 - 95	19	10 - 25	41	5 - 10	40
Mountain pine beetle - lodgepole pine	30 - 50	28	15 - 40	53	15 - 40	19
Defoliators	40 - 95	23	15 - 25	67	5 - 10	10
Douglas-fir Dwarf Mistletoe	40 - 90	38	20 - 30	47	0 - 10	15

Direct, Indirect, and Cumulative Effects of the Management of Coniferous Vegetation

Scale of effects analysis: All effects analysis contained in this section pertain to all National Forest System lands within the Patrick Analysis Area.

Alternative 1 No Action

There are no effects resulting from proposed activities under this alternative. The existing condition description describes the effects of No-action.

Because the existing environment is not static, environmental consequences from selecting this alternative are expected. Current biological and physical processes would continue on their present trajectories along with associated risks and benefits. This alternative would allow forest stands, identified at this time as needing treatment, to progress through successional processes resulting from fire exclusion and past management. Natural fuels would not be treated to reduce the risk of wildfire within the wildland urban interface, which would decrease the chances of uncharacteristic wildfire intensity, and allow for a safer environment for firefighting personnel during fire suppression.

The major silvicultural stand characteristics of density, structure and species composition would be expected to continue moving away from the Historic Range of Variation (HRV) under a no action alternative. As these stand/forest characteristics move away from HRV the risk of large-scale disturbance increases. Overall stand density, multistory stand structures and late seral, shade tolerant species would increase while single story stand structure and early seral, shade intolerant species would decrease until conditions reach a point that is predisposed for a large-scale disturbance

Under this alternative, existing management would remain unchanged. Fire suppression can be expected to continue and be successful at keeping fires small. Large fires would result when susceptible vegetation, fuels, weather conditions, and multiple ignition events exceed initial attack capabilities. Current stand processes could be expected to continue until a large-scale natural disturbance of insects or fire alters conditions. The most likely large-scale event would create larger areas of stand replacement effects at scales not seen in recent times (Fire and Fuels report – project file).

Consideration of Potential Effects of Climate Change

Under the No-action alternative, the project area is predicted, under internationally accepted climate change scenarios, to experience a suite of effects including:

- Extended growing seasons- more soil moisture demand by vegetation
- Lower soil moistures- less available to vegetation
- Increased late-season moisture stress on vegetation- increased susceptibility to disturbance.

If no action is taken, the effects of climate change in the project area are highly uncertain. A warm and dryer climate in western North America will likely affect forests directly through soil moisture stress and indirectly through increased extent and severity of disturbances (McKenzie, 2009). Increases in fire disturbance superimposed on forests with increased stress from drought and insects may have significant effects on growth, regeneration, long-term distribution and abundance of forest species, and short- and long-term carbon sequestration. The effects of stress complexes will be magnified given a warm and drying climate (McKenzie, 2009). Although higher CO2 levels stimulate plant growth, the effects of disturbance (like fire and insect infestations) also become more frequent due to the generally hotter, drier climatic conditions and may offset increased growth (Mote et al 1999).

Alternative 2 & 3

In addition to the identified key issues, vegetation specific issues were also analyzed in response to concerns identified through the scoping and IDT process. These issues as well as the key issues relevant to forest vegetation are analyzed below.

The description of direct, indirect, and cumulative effects for Alternatives 2 and 3 on forested vegetation are generally the same. The alternatives differ only in the number of acres each would implement. The direct and indirect effects are a consequence of implementing the silviculture activities described within both action alternatives.

Vegetation Issue 1: Management of Old Forest Structure & Old Forest Preservation Stands (MA-15) - Alternatives 2 and 3

Indicators-Current Conditions

Lack of wildfire due to past suppression policies and efforts as well as a lack of forest management has resulted in old forest structure class being outside of HRV ranges. Old Forest Multi Strata is currently within HRV but at the higher end of the range and the Old Forest Single Strata structure is almost completely absent and drastically below HRV. Lack of disturbance (natural or manmade) has resulted in an excess of stands with multi canopy layers and a lack of stands with a more even aged, over story dominant structure. The resulting conditions consist of elevated understory fuel levels (ladder fuels), increases in shade tolerant, late seral species and a lack of more drought tolerant early seral species. These stand conditions have increased the risk of wildfire and insect and disease outbreaks within the remaining old forest habitat. Proposed harvest and fuels reduction treatments have the potential to reduce fire risk as well as insect and disease susceptibility and accelerate the development of old forest single story within the project area.

Direct and Indirect Effects of Management in Old Forest Structure – Alternatives 2 and 3

Proposed treatments are expected to result in improved resiliency to disturbance. Insect and disease susceptibility would be reduced by reducing tree density, improving species composition, and reducing dwarf mistletoe infection. Fire severity would be reduced by reducing the multi-story canopy profiles and the depth of the duff layer, and by reducing competing understory trees.

The current structural condition of old forest stands can be improved by moving the landscape towards HRV particularly in the Old Forest Single Story (OFSS) structure class. This is expected to occur as a result of retaining the remaining old trees, managing for early seral tree species, improving the landscape's resiliency and reducing the amount of multi-story, over stocked stands. The time it takes the landscape to reach HRV can be reduced by accelerating the diameter growth of the largest trees on a sufficient number of acres.

Approximately 13 % of the Patrick project area is currently in Old Forest Multi-Story (OFMS) structure stage and approximately 0.1% is in the OFSS structural stage (across all PVGs). This equates to approximately 6,523 and 52 acres respectfully. Approximately 5,098 and 4,463 acres of current old forest stands for Alternative 2 and 3 respectively would be enhanced by treatment creating conditions that would be more resilient to disturbance increasing sustainability of old forest conditions for a longer timeframe.

Alternatives 2 and 3 would improve conditions across non-old forest stands as well as the current old forest stands. Approximately 22,129 and 21,647 acres of non-old forest stands for Alternatives 2 and 3 respectively would be improved by treatment and put into a condition that would move them into old forest conditions over time.

Effects Measures for Old Forest Structure

- Acres treated/Restored
- Change relative to HRV - See effects to General Vegetation Conditions

Table 19 below displays acres of old forest structure restoration as direct effect of management within the old forest structure stands in addition to acres of improved conditions in non-old forest stands which as an indirect effect of treatment that would move these stands into old forest structure over time. The General Vegetation Conditions section below provides a description of effects to stand characteristics relative to HRV.

Table 19. Measurement of Treatment for old forest structure

Measurement Indicator	Alternative 2	Alternative 3	Description
Acres of old forest restoration	5,098	4,463	Combination of commercial and non-commercial thinning as well as prescribed burning to reduce stocking levels, disease and susceptibility to fire. Treatments also increase growth rates of residual trees creating more large trees across the landscape over time.
Acres of improved conditions for stand development into old forest.	22,129[1]	21,647[1]	Managing tree density to improve resiliency to disturbance and the rate of large tree development. Managing tree species composition to improve resiliency to disturbance.

1. Acres of improved conditions for stand development into old forest is based on commercial thinning acres with the exception of 1/3 of the group selection acreage which would be shifted to Stand Initiation (SI) structure stage. Non-commercial Thinning (NCT) treatments will improve conditions within the identified stands but were excluded from these acreage estimates due to the size and age class of trees proposed for treatment.

Direct and Indirect Effects of Managing MA-15 Stands (Old Growth Preservation)

These stands were identified for old growth preservation by the 1991 Wallowa Whitman Land and Resource management Plan (Forest Plan). Management opportunities are limited within these designated areas as per Forest Plan direction. These stands have also moved away from HRV due to a lack of fire and ability to actively manage vegetation conditions.

Proposed treatments include NCT and prescribed burning. Although these treatments would have little effect on moving these stands closer to HRV, the treatments would reduce fuel loading. The proposed treatments would increase resiliency to stand replacement fire and assist in protecting adjacent private lands by reducing ladder fuels (trees 10" dbh and less). There may be some effect on overstory trees in the form of mortality. However, current direction is to limit overstory tree mortality to 10% within the overstory trees. This in combination with the parameters of a prescribed burning prescription would make the effects of burning on the overstory trees negligible. Table 20 below displays the acres that would be affected by this treatment under both action alternatives.

Effects Measures for MA 15 Stands

- Acres treated/Restored

Table 20. Measurement Indicators for Stands in Management Area-15

Treatment Type	Alternative 2 (Acres)	Alternative 3 (Acres)
NCT	16	16
NCT-Rxburn	2,564	2,304
No Treatment	1,056	1,316
Total Acres	3,636	3,636

Vegetation Management Issue 2: Management within Moist Upland and Cold Upland Potential Vegetation Groups (PVG)

Indicators-Current Conditions

Existing vegetation conditions are currently outside of HRV for species composition, structure stage and insect and disease susceptibility within the Moist Upland Forest (MUF) and Cold Upland Forest (CUF) PVGs. Proposed treatments would move conditions toward HRV for all three of these silvicultural characteristics making these forest types more resilient to disturbance (see effects on General Vegetation Conditions and insects and disease susceptibility below).

Direct and Indirect Effects

Table 21 below shows total acres of restoration within these two PVGs. Because proposed treatments would move conditions toward HRV, there are no measurable negative effects to conifer vegetation. Therefore, the direct and indirect effects to conifer vegetation within these PVGs is measured by the acres treated or restored within each alternative.

Effects Measures

- Acres treated/Restored
- Change relative to HRV – See effects to General Vegetation Conditions

Table 21. Measurement indicators for Moist and Cold Upland Forest

	Alternative 2 (Acres)		Alternative 3 (Acres)	
	Moist Upland Forest	Cold Upland Forest	Moist Upland Forest	Cold Upland Forest
Commercial Thinning	1,663	3,471	1,566	3,391
Non- commercial thinning	1,201	1,882	611	1,508
Total Acres Restored	2,864	5,353	2,177	4,899

Key Issue 1- General Vegetation Conditions

Existing vegetation conditions are outside of their historical ranges of variability (HRV) for species composition, forest structure, and tree density. These factors result in the landscape's increased susceptibility to insects and disease. Climate change predictions present an opportunity for the project to improve the landscape resiliency. Silviculture activities proposed for implementation in any action alternative are designed to address these concerns.

Five indicators are used to assess pre-treatment and post-treatment trends for vegetation conditions: species composition, forest structural stages, tree density classes, insect and disease susceptibility and aspen restoration. Species composition, forest structural stages, and tree density factors combine to affect susceptibility of the landscape to insects and diseases.

Direct and Indirect Effects

The direct and indirect effects on species composition, forest structural stages, and tree density are a consequence of implementing the silviculture activities reported in Table 22, Table 23, Table 24, and Table 25: commercial thinning from below, group selection, post and pole thinning, aspen release, and pre/non-commercial thinning. Alternatives 2 and 3 are discussed together because the silviculture activities proposed for implementation are the same for both alternatives only varying in acres treated.

Effects Indicators & Measures

- Effects indicators: structural stage, tree density, species composition and insect and disease susceptibility
    - Unit of Measure is percent change relative to HRV.
- Effects indicators: Aspen health and occurrence
    - Unit of Measure is acres treated/restored

Effects to Structural Stages by PVG

There is currently a large abundance of acreage in the Understory Reinitiation (UR) stage and a large deficit in the Stand Initiation (SI), Stem Exclusion (SE) and OFSS stages across all PVGs. OFSS is almost non-existent comprising only 51.5 acres or less than 1% of the Dry Upland Forest (DUF) PVG. Treatments included in Alternatives 2 and 3 will assist in moving these structural stages toward HRV across the landscape.

Table 22, Table 23, and Table 24 show the direct effects of implementing silviculture activities associated with Alternatives 2 and 3 in the DUF, MUF and CUF PVGs. The data exhibits the effects approximately 20 to 30 years after implementation in order to capture recovery and growth post treatment. In addition to increasing overall landscape resiliency, the proposed treatments would be designed to mimic low to moderate intensity disturbances such as low intensity ground fire with occasional pockets of overstory mortality as well as insect and disease mortality. Therefore, most of the changes to structural stages will be due to increased tree growth and recovery and would not be an immediate shift post treatment. Immediate changes in structural stage resulting from treatment would occur within any stands that are currently in the stem exclusion stage. Portions of stem exclusion and understory re-initiation stands would be shifted to the stand initiation stage immediately post treatment through group selection and post and pole treatments.

Table 22. Direct and Indirect changes in dry upland forest PVG structure stages with implementation of the alternatives (Acres)

Alternative	Percentages by Stand Structure (DUF)				
	SI	SE	UR	OFMS	OFSS
HRV	15 - 25	10 - 20	5 - 10	5 - 15	40 - 60

Alternative	Percentages by Stand Structure (DUF)				
	SI	SE	UR	OFMS	OFSS
Existing Condition	4	5	76	15	<1
Alternative 1	1	4	76	18	0
Alternative 2	2	4	33	20	41
Alternative 3	2	4	34	20	40

Table 23. Direct and Indirect changes in moist upland forest PVG structure changes with implementation of the alternatives (Acres)

Alternative	Percentages by Stand Structure (MUF)				
	SI	SE	UR	OFMS	OFSS
HRV	20 - 30	20 - 30	10 - 20	15 - 20	10 - 20
Existing Condition	2	3	79	16	0
Alternative 1	1	2	77	19	0
Alternative 2	0	2	39	23	36
Alternative 3	0	2	41	23	34

Table 24. Direct and Indirect changes in moist upland forest PVG structure changes with implementation of the alternatives (Acres)

Alternative	Percentages by Stand Structure (CUF)[1]				
	SI	SE	UR	OFMS	OFSS
HRV	20 - 45	10 - 30	10 - 20	10 - 25	5 - 20
Existing Condition	6	5	75	15	0
Alternative 1	2	6	74	18	0
Alternative 2	4	8	40	28	20
Alternative 3	3	8	41	28	20

1. SI: Stand Initiation, SE: Stem Exclusion, UR: Understory Re-initiation, OFMS, Old Forest Multi-stratum, OFSS: Old Forest Multi-Strata. Source of existing conditions: FSVeg database. Source of HRV data for all three PVGs: Powell 2012.

Proposed treatments under both alternative 2 and 3 would have overall beneficial effects across all PVGs and a majority of structural stages within the project area compared to Alternative 1. OFMS would increase to slightly above HRV by approximately 3% - 5% across all three PVGs under alternative 2 and 3. This effect would provide a slight abundance of OFMS conditions and would be expected to reduce back down to HRV levels over time as conditions continue to shift in response to disturbance (insect and disease and wildfire) or lack of disturbance.

OFSS levels would be shifted to within HRV in the DUF and CUF PVGs (approximately 93% of forested land within the project area) under both alternative 2 and 3. OFSS levels would be shifted to above HRV levels within the MUF PVG under both action alternatives. This would provide an abundance of old forest conditions within the MUF PVG. This would also be expected to reduce over time. Risk of large-scale mortality due to wildfire or insect and disease would be greatly reduced with treatment (fire and fuels report, 2017 Insect Review of Patrick Project Area), however no forest condition is completely immune to disturbance, therefore a portion of all stand structures would be expected to suffer some mortality and shift in condition as a result of disturbance over time. Lack of disturbance in the form of low intensity ground fire within these stands would eventually result in the establishment of shade tolerant species in the understory and a shift to OFMS or UR conditions as overstory trees incur mortality. Therefore, a slight abundance in either of the old forest structure stages would be considered beneficial due to the long period of time it takes to reach this condition and the alignment of conditions it takes to maintain the proper proportion of old forest across the landscape.

Under Alternative 1, OFMS would increase slightly across all PVGs as stands continue to grow and mature over time. However, the increase would be approximately 3% across all PVGs compared to an increase of 5%, 7% and 13% across the DUF, MUF and CUF PVGs respectively for Alternatives 2 and 3. The effects of treatment are evident within the OFSS structure stage. OFSS does not increase under the no action alternative while treatments proposed under alternatives 2 increase this structure stage by 41%, 36% and 20% across the DUF, MUF and CUF PVGs respectively. Alternative 3 increases OFSS by 40%, 34% and 20% across the DUF, MUF and CUF PVGs respectively.

The UR structure stage would be moved closer to HRV across all PVGs under the action alternatives. The current large abundance of UR across the project area makes it difficult to reach HRV in any time period that is relative to this analysis. However, effects of treatment would decrease the level of UR conditions by almost 50% across all PVGs. Any movement toward HRV would be beneficial and increase resiliency to disturbance. In contrast Alternative 1 has little effect on moving the UR structure stage toward HRV. With no treatment this structure stage would continue to depart from HRV. Alternative 1 results in departure rates of approximately 66%, 57% and 49% across the DUF, MUF and CUF PVGs respectively.

Both the SI and SE stand structures show very little change with treatment under both action alternatives. This is primarily due to the lack of these stages currently on the landscape and the shift to old forest, stem exclusion or understory re-initiation stages over time after treatment. The Stand Initiation structure stage is created through disturbance that removes all or most of the overstory tree component. This can occur through wildfire, insect and disease mortality, wind events or silvicultural treatments. Without treatment the existing SI stands would typically grow into the SE stage reducing the amount of this structure stage through natural tree growth and stand evolution. Therefore, a lack of existing SI structure inherently results in a lack of SE structure over time. The only proposed treatments that would create small areas of SI are the group selection and post and pole treatments. However, these would equate to a small proportion of the landscape. Alternative 1 also has little effect on these structure stages over time. SI acres reduce slightly by approximately 2% to 3% post treatment across all PVGs for both action alternatives. Under Alternative 1 this structure stage reduces by approximately 1% - 4% across all PVGs.

SE increases from 5% to 8% moving slightly toward HRV in the CUF but drops by 1% in the DUF and MUF PVGs. This slight decrease is a result of some SE stands moving into old forest structure or under story re-initiation stage post treatment and the lack of SI structure stage available to grow into the SE structure stage. However, these slight reductions or movements away from HRV would be outweighed by the benefits of the relatively large shifts toward HRV for the UR and old forest structure stages. Alternative 1 would reduce the amount of SE structure stage at the same rate of 1% in the DUF and MUF PVGs without the benefit of moving the UR and old forest structure stages toward or within HRV.

Effects to Tree Density by PVG

Tree density classes are expected to change in response to implementation of silviculture activities proposed for Alternatives 2 and 3. Implementing the silviculture activities would cause a direct effect of reduction in tree density for the treatment units. Therefore, effects of proposed activities are analyzed for conditions immediately following treatment with respect to change in density levels. Table 25 below shows the direct effects of implementing Alternatives 2 and 3 on tree density when spread across the entire forest vegetation affected environment.

Density levels within the DUF PVG would move closer to HRV under alternatives 2 and 3 increasing resiliency to disturbance.

Density levels within the MUF and CUF PVGs are currently below HRV for closed densities. Therefore, treatment within these PVGs would temporarily move density levels further away from HRV. However, both PVGs are currently outside of HRV for species composition, structure stage and multiple insect and disease susceptibility factors in which alternatives 2 and 3 would move closer to HRV. The need for treatment within these PVGs is driven by the forest characteristics that are currently outside of HRV and would be shifted toward or within HRV after treatment.
Although the proposed activities under alternatives 2 and 3 would temporarily move tree density levels away from HRV in the MUF and CUF PVGs the overall benefit to stand structure, species composition and insect and disease susceptibility would have a greater positive effect on forest health and resiliency than any negative effects on forested vegetation produced by moving away from HRV for open density. Density levels would begin to move toward HRV post treatment as a result of increased growth rates and overall healthier forest conditions.

Moving away from HRV for open density within these PVGs would affect the proportion of forested area that is currently fully occupied and maximizing overall stand growth. However, there is no negative effect to vegetation resiliency caused by having a larger proportion of forested land in the open density stocking level. Although overall stand growth or biomass production may be reduced, individual tree growth would be increased due to reduced inter tree competition for resources. This increase in tree growth would subsequently increase stand resiliency and vigor. These lower densities play a major factor in lowering over all susceptibility to insect and disease agents as well as risk of stand replacement wildfire (Cochran 1994, Powell 2012). Due to the increased tree growth and vigor the increase in open density would be temporary across these PVGs. The increased growth would accelerate development of large trees and associated crown size creating closed canopy conditions over time.

Table 25. Tree Density by PVG compared to HRV by Alternative

Dry Upland Forest Density		
Alternative	**Open**	**Closed**
HRV	80 - 90	5-20
Alternative 1	43	57
Alternative 2	77	23
Alternative 3	77	23
Moist Upland Forest Density		
Alternative	**Open**	**Closed**
HRV	30 -40	60 - 80
Alternative 1	68	32
Alternative 2	88	12
Alternative 3	87	13
Cold Upland Forest Density		
Alternative	**Open**	**Closed**
HRV	20 - 30	65 - 80
Alternative 1	64	36
Alternative 2	85	15
Alternative 3	84	16

Effects to Species Composition by PVG

Table 26 shows that the direct effects of implementing Alternatives 2 and 3 has indirect effects on species composition when spread across the entire forest vegetation affected environment. The data

exhibits the effects approximately 10 to 20 years after implementation to capture recovery and growth post treatment in comparison to no treatment over the same time period.

Dry Upland Forest
Within the DUF PVG both early and late seral stages would shift back into HRV levels under alternative 2. Alternative 3 would shift the early seral stage into HRV and the late stage would remain slightly above HRV. These movements closer to or within HRV would greatly increase resiliency to disturbance within this PVG.

Alternative 1 shows no change from the existing condition. This is due to the early seral stages being comprised of ponderosa pine plant associations within the DUF portions of this project area. In theory ponderosa pine is the climax species for a ponderosa pine plant association, therefore there would not be movement into later seral stages such as Douglas-fir or grand fir dominated stands due to the limiting environmental conditions within these sites. The stands that are currently in late seral stages would remain as late. Species composition would remain highly departed from HRV in the absence of treatment or major disturbance.

Moist Upland Forest
Within the MUF PVG the abundance of existing mid seral stage would be shifted to early moving it above HRV by 1% under alternative 2 and within HRV under alternative 3. The late seral stage drops below HRV by one percent under alternative 2 and falls within HRV under alternative 3. Mid seral decreases from 67% to 29% in alternative 2 and 67% to 24% in alternative 3 moving into HRV under both alternatives. These shifts closer to HRV greatly increases vegetation resiliency to disturbance and prevents this PVG from making a major shift to late seral dominance in the near future.

Alternative 1 shows major shifts from early to mid seral and mid to late seral stages. Early seral exhibits a reduction to 10% of the PVG creating a departure of 20% from HRV. Mid seral reduces and actually shifts toward HRV as portions of these plant associations shift to the late seral stage. Mid seral moves to 57% of the PVG remaining departed from HRV by 17%. Late seral exhibits a large shift to 33% of the PVG moving this seral state above HRV by 3%. It can be assumed that this trend would continue in the absence of treatment or disturbance.

Cold Upland Forest
Within the CUF PVG alternative 2 and 3 shift a large amount of the late seral acreage into the early and mid-seral stages. Mid seral moves within HRV while early would shift to slightly above HRV under both action alternatives. Late seral would drop below HRV under both alternatives. This shift would mimic disturbance setting the successional time scale back. Although alternatives 2 and 3 would not move the late and early seral stages into HRV (abundance in early and deficit in late) these shifts would allow for a buffer in the successional timeframe. Both action alternatives move conditions closer to HRV than the no treatment Alternative 1. After treatment these forested systems will continue to move back toward later seral stages in the absence of another disturbance.

Alternative 1 moves further away from HRV in the early and late seral stages. Early seral shifts to 29% of the PVG creating a departure of 11% from HRV. Late seral would shift to approximately 70% of the PVG creating a departure of 20% from HRV. Mid seral would shift from 0% to 1% showing a slight movement toward HRV.

Due to the physiological adaptations of late seral, shade tolerant species it is assumed that all three forest types will continue to exhibit an increase in late seral species and continue to have a reduction in early seral species in the absence of disturbance. The activities proposed in the action alternatives would assist in maintaining conditions at or near HRV for a much longer time period than Alternative

1 across all PVGs. The existing condition is comprised of a large abundance of acreage in the late seral stage within the DUF and CUF PVGs and an abundance of mid seral stage within the MUF PVG. If left unmanaged these landscapes would become highly vulnerable to large scale, uncharacteristic disturbance. Under the action alternatives the tree species composition across these landscapes would be closer to conditions found under historic disturbance regimes improving the landscape's resilience to future disturbance.

Table 26. Direct and Indirect change in Tree Species Composition by seral stage with implementation of the alternatives

Percent Change by PVG			
Dry Upland Forest PVG			
Seral Stage	**Early**	**Mid**	**Late**
HRV	**75-90**	**NA**	**5-20**
Existing Condition	33	NA	67
Alternative 1	33	NA	67
Alternative 2	87	NA	13
Alternative 3	78	NA	22
Moist Upland Forest PVG			
HRV	**30-60**	**20-40**	**10-30**
Existing Condition	22	67	11
Alternative 1	10	57	33
Alternative 2	61	29	9
Alternative 3	53	24	23
Cold Upland Forest PVG			
HRV	**40-60**	**5-20**	**25-50**
Existing Condition	36	0	64
Alternative 1	29	1	70
Alternative 2	70	18	11
Alternative 3	65	20	14

Effects to Susceptibility to Insects and Disease

Susceptibility refers to the potential occurrence of a disturbance event (wildfire, insect outbreak, disease epidemic, etc.) as related to inherent stand or vegetation characteristics such as species composition, tree density, and forest structure (Schmitt and Powell 2005).

Existing susceptibility is relatively high in the Patrick project area for bark beetles. In addition, bark beetles, defoliators, and dwarf mistletoe all have a high percentage of area that is rated as moderate susceptibility across all forested PVGs showing a landscape that is moving toward a high risk level for all of these insect and disease vectors.

Susceptibility amounts would be expected to change, by rating factor of high, moderate, or low as a result of implementing the proposed silviculture activities.

The effects of no treatment acres under both action alternatives were also considered in respect to changes in vegetation characteristics over time and the associated effects to susceptibility levels. High susceptibility levels in ponderosa pine dwarf mistletoe in the DUF and defoliators in the CUF actually increased slightly under both action alternatives due to acres of no treatment or acres only receiving a prescribed burn treatment.

Having an ecologically appropriate representation of insect and disease susceptibility well distributed throughout the Patrick project area is a desired condition for forest vegetation. The information presented in Table 27, Table 28 and Table 29 suggest that implementing alternatives 2 or 3 would

move a substantial proportion of the treated acreage from a high or moderate susceptibility condition (the pre-treatment condition) to a low condition (the post-treatment situation). These results suggest that the proposed silviculture activities would reduce overall susceptibility.

Susceptibility is typically measured by a forested systems' vulnerability to sustaining substantial injury from insects or disease agents. When the pattern, extent or intensity of disturbances exhibit significant changes over the landscape there may be an indication of an impaired system (Sampson & Adams 1994). Reducing overall susceptibility to ranges that are within or closer to HRV increases the ability of a stand or landscape to withstand or respond to periodic disturbances more effectively (Powell 2010 & Johnson et al. 1994).

Changes to the stand dynamics tree density, species composition and structural stage (multi or single canopy layer) all act as direct influences to the susceptibility of the landscape to disturbance in the form of insects and disease.

In addition, each insect and disease agent listed below continues to contribute to the level of susceptibility or conversely the level of resilience of this landscape to disturbance. Each factor may act as a form of disturbance alone or in combination with one another. Combining these factors intensifies the magnitude of the disturbance and its effects on the landscape. The further away from HRV the landscape moves the more susceptible it becomes to significant injury during the disturbance process.

Bark Beetles

The changes to tree density, species composition, and structure will have a positive effect on the susceptibility to insects and disease. Table 27, Table 28 and Table 29 display the Direct and Indirect effects of the alternatives.

Although not all susceptibly levels would move to within HRV with treatment, overall susceptibility would be greatly reduced across all forested PVGs under both action alternatives. Alternative 3 would shift susceptibility levels to within HRV for more of the identified insect vectors and susceptibility levels. This is purely a function of the greater proportion of area being treated and moved into low susceptibility under alternative 2. Alternative 2 would shift more of the project area into low susceptibility from the high and moderate levels landing outside of HRV in some scenarios. However, because these are not static conditions the overall lower susceptibility levels created under alternative 2 would have a greater positive effect on forest resiliency over time. As forests continue to grow and regenerate much of the susceptibility levels that would fall within the upper end of HRV for moderate and high under alternative 3 would soon move above HRV while the abundance of low susceptibility under alternative 2 would continue to move into HRV within those moderate and high levels.

Under both action alternatives, lowering susceptibility and movement toward HRV would increase the resiliency of the forested areas to bark beetles in comparison to the no action alternative which would continue to move conditions away from HRV and increase susceptibility levels. Tree density would have the greatest influence on bark beetle susceptibility. Under the no action alternative, tree densities would continue to increase over time increasing the susceptibility to beetle attack.

Defoliators

Defoliator infestations do not always cause mortality within the stand or individual tree. However, repeated attacks (successional years) on a large scale can cause mortality or reduce the vigor of the stand and predispose to disease or attack by other insects.

Alternatives 2 and 3 would reduce the host tree species for defoliating insects. Grand fir would be reduced in the warm/dry grand fir and cool/moist grand fir types. Douglas-fir would be reduced in the above grand fir types as well as in the warm/moist Douglas-fir and warm/dry Douglas-fir types. A reduction in host tree species would reduce the severity and extent of future defoliator outbreaks. A characteristic tree species composition across the landscape would allow for endemic populations of defoliators. Management through time would be required to maintain shade intolerant tree species.

The acres of multistory stand structure (UR) would be reduced, as well as the contiguous area of multistory conditions. This would reduce the spread of insects and limit the extent of future outbreaks, as multistory stands are more susceptible to defoliation then single-story stands. (Wickman, 1978) (Williams, 1980) (Carlson C. E., 1987)

Thinning would reduce the ability of insects to travel from tree to tree by increasing the distance between trees. This would reduce the spread of insects and therefore limit the extent of future outbreaks (Carlson C. E., 1989).

Table 27, Table 28 and Table 29 display the direct and indirect effects of the alternatives on susceptibility to defoliators. Currently the moderate susceptibility level is well above HRV across all three PVGs. Left untreated, a large portion of the entire project area would move into the high susceptibility category.

Both action alternatives would move conditions toward HRV across all three PVGs with the exception of the low susceptibility level in the MUF. However, the reduction of the high and moderate susceptibility levels would play the most crucial role in increasing the landscape's resilience to disturbance, and this would be the most prominent effect of treatment across all PVGs. Both action alternatives would reduce susceptibility in the moderate and high categories, with the exception of minor increases in the high category within the CUF and MUF PVGs. However, this increase in high susceptibility would be a result of no treatment acres or areas that would only receive prescribed fire treatments shifting over time, and not a direct result of proposed activities.

As current forest conditions continue to transition and evolve over time the levels of overall susceptibility would continue to increase under Alternative 1. See comparison of effects to species composition and stand structure across alternatives 1, 2 and 3 for movement of forest characteristics relative to HRV over time.

Ponderosa pine (PP) and Douglas-fir (DF), Dwarf Mistletoe (DMT)

Stand susceptibility to dwarf mistletoe, spread, and inter-tree and stand intensification is expected to be reduced through removal of moderate to severely infected trees, spacing crowns, and releasing understories from infected over-stories. Table 27, Table 28 and Table 29 show the direct effect of treatments. It also shows the indirect effects of the treatments as they affect the landscape reduction of high to moderate susceptibility and corresponding increase to low susceptibility that would be achieved with implementation of Alternatives 2 and 3.

Reduction of dwarf mistletoe within the high and moderate susceptibility levels would have the greatest impact on reducing the overall susceptibility and level of disturbance while increasing resiliency of the landscape to this disease. This would be accomplished thru both action alternatives. Susceptibility is not moved to within HRV for all host species and susceptibility levels. However, susceptibility proportions are moved closer to HRV throughout the majority of susceptibility ratings across all PVGs. In the absence of treatment, it is expected that the disease would continue to spread

and climb above HRV levels, posing a threat to forest stand health and predisposing trees to other disease, insect agents or wildfire.

Table 27. Direct and Indirect effects to Insect and Disease susceptibility in DUF (L=low, M=Moderate, H=High)

Insect and Disease	Existing %			HRV %			Alternative 2 %			Alternative 3 %		
	L	M	H	L	M	H	L	M	H	L	M	H
Bark Beetles- pp	20	57	23	35 - 75	15 - 35	10 - 20	81	10	8	74	10	16
Fir Engraver Beetle - gf	31	16	53	45 - 95	10 - 25	5 - 10	70	21	9	65	20	15
Douglas-fir Beetle	31	16	53	35 - 75	15 - 30	10 - 25	70	21	9	65	20	15
Defoliators	14	76	10	40 - 85	15 - 30	5 - 15	83	7	10	75	7	18
DF DMT	30	57	13	30 - 60	10 - 35	20 - 35	64	28	9	60	25	15
PP DMT	20	78	2	71	19	10	63	29	8	61	23	16

Table 28. Direct and Indirect effects to Insect and Disease susceptibility in MUF (L=low, M=Moderate, H=High)

Insect and Disease	Existing %			HRV %			Alternative 2 %			Alternative 3 %		
	L	M	H	L	M	H	L	M	H	L	M	H
Fir Engraver Beetle - gf	10	46	44	30 - 70	10 - 20	20 - 40	76	15	9	63	10	27
Douglas-fir Beetle	10	46	44	30 – 60	20 - 40	10 - 30	76	15	9	63	10	27
Mountain pine beetle-lp	6	79	15	30 - 60	25 - 40	5 - 30	56	35	8	52	20	28
Defoliators	39	61	0	5 - 20	20 - 30	35 - 80	70	26	4	61	20	19
DF DMT	24	60	16	30 - 65	20 - 45	10 - 20	63	29	8	54	23	23

Table 29. Direct and Indirect effects to Insect and Disease susceptibility in CUF (L=low, M=Moderate, H=High)

Insect and Disease	Existing %			HRV %			Alternative 2 %			Alternative 3 %		
	L	M	H	L	M	H	L	M	H	L	M	H
Fir Engraver Beetle - gf	19	41	40	35 – 75	20 - 45	5 - 10	80	8	12	74	9	17
Douglas-fir Beetle	19	41	40	45 - 95	10 - 25	5 - 10	80	8	12	74	9	17
Mountain pine beetle-lp	28	53	19	30 - 50	15 - 40	15 - 40	56	35	9	54	31	15
Defoliators	23	67	10	40 - 95	15 - 25	5 - 10	87	2	11	80	4	17
DF DMT	38	47	15	40 - 90	20 - 30	0 - 10	72	17	11	67	19	14

Quaking Aspen

The health and viability of quaking aspen is expected to change as a result of the treatments implemented in Alternatives 2 and 3. Table 30 shows the acres of aspen treated. Reduction of competing conifers will immediately reduce competition for sunlight and soil moisture. As a result, the existing aspen trees are expected to survive and release. The extent of the aspen is also expected to increase as the aspen root system responds and spreads laterally occupying additional suitable area and increasing the overall health of the root system. A healthy viable root system is expected to respond to future fire with abundant reproduction.

Area of Aspen (acres)
Aspen would fill in any gaps within the present stand. In addition, aspen would spread laterally colonizing adjacent ground. The area immediately around the aspen stems would be expected to be fully occupied by aspen sprouts by the third growing season following conifer removal. During this period, lateral expansion of the aspen stand would begin to occur. The extent of this expansion is site specific, depending on local soil and moisture conditions. However, experience on the Whitman Ranger District shows that that there is up to a 100% increase in stand size. Assuming a modest 50% lateral expansion, the alternatives would result in an additional 20 acres of aspen in Alternative 2 and 19 acres in Alternative 3.

Table 30. Effects to Quaking Aspen

Aspen Restoration	Alternative 2 (acres)	Alternative 3 (acres)
Direct improvement of health and viability	41	39
Indirect additional acreage	20	19

Key Issue 3: Management within RHCAs

Proposed treatments include commercial thinning, non-commercial thinning, piling of slash, and burning of the piles. Prescribed fire would occur over time to maintain desirable conditions.

Direct and Indirect Effects

The proposed treatments are expected to result in reduced fire severity by spacing conifer crowns and reducing ladder and surface fuels (Fire and Fuels Report). Treatments are expected to result in reduced canopy closure by removing conifers. The reduction in conifer competition is expected to result in an increased density and coverage of riparian vegetation. The indicator for this key issue is water quality and is analyzed in detail within the water resources report.

Effects Measures

- Acres treated/Restored

Overall vegetation conditions would be improved and shifted closer to HRV as described in General Vegetation Conditions section above. Alternative 2 would restore 481 acres of RCHA with commercial thinning and 3,743 acres with non-commercial thinning. Alternative 3 would have no treatment within the RHCAs, therefore the effects would be the same as alternative 1.

Cumulative Effects on Forest Vegetation – Alternatives 2 and 3

Past actions and processes, including timber harvest, tree planting, prescribed fire, noncommercial thinning, and the exclusion of wildfire, helped create existing conditions in the project area. Proposed actions are designed to address the project purpose and need by improving forest health, vegetation vigor, and ecosystem resilience to fire, insects, and disease. Proposed silviculture activities respond to the purpose and need by helping to move species composition, forest structure, and tree density towards their historical ranges of variability and setting back the time scale for elevated risk to uncharacteristic disturbance.

There are no present (ongoing) or reasonably foreseeable future activities that overlap in time and space with the Patrick project which would produce a measurable cumulative effect on forest vegetation in the project area; therefore, there would be no cumulative effects.

Consideration of Potential Effects of Climate Change

Alternative 1 – No-Action Alternative

Under the No-action alternative, the project area is predicted, under internationally accepted climate change scenarios, to experience a suite of effects including:

- Extended growing seasons- more soil moisture demand by vegetation
- Lower soil moistures- less available to vegetation
- Increased late-season moisture stress on vegetation- increased susceptibility to disturbance.

The effects of climate changes if no action is taken in the project area are highly uncertain. A warm and dryer climate in western North America will likely affect forests directly through soil moisture stress and indirectly through increased extent and severity of disturbances (McKenzie, 2009). Increases in fire disturbance superimposed on forests with increased stress from drought and insects may have significant effects on growth, regeneration, long-term distribution and abundance of forest species, and short and long-term carbon sequestration. The effects of stress complexes will be magnified given a warm and drying climate (McKenzie, 2009). Although higher CO2 levels stimulate plant growth, the effects of disturbance (like fire and insect infestations) also become more frequent due to the generally hotter, drier climatic conditions and may offset increased growth (Mote et al 1999).

Alternatives 2 and 3

The Patrick project would affect a total of 46,653 acres of land on the Wallowa-Whitman National Forest through a combination of commercial thinning, non-commercial thinning and prescribed fire. This scope and degree of change would be minor, affecting roughly 3 percent of the 1,411,925 acres of forested land in the Wallowa Whitman National Forest. In addition, the effect of the proposed action focuses on above ground carbon stocks, which typically comprise a fraction of the total ecosystem carbon stocks in the proposed managed area; 50 percent or more of the ecosystem carbon is in the soils, a very stable and long-lived carbon pool (McKinley et al. 2011, Domke et al. 2017).

Climate change is a global phenomenon, because major greenhouse gasses (GHGs)1 mix well throughout the planet's lower atmosphere (IPCC 2013). Considering emissions of GHGs in 2010 were estimated at 49 ± 4.5 gigatonnes2 carbon dioxide (CO2) equivalent3 globally (IPCC 2014) and 6.9 gigatonnes CO2 equivalent nationally (US EPA 2015), a project of this size makes an extremely small contribution to overall emissions. Because local GHGs emissions mix readily into the global pool of GHGs, it is difficult and highly uncertain to ascertain the indirect effects of emissions from single or multiple projects of this size on global climate. Therefore, at the global and national scales, this proposed action's direct and indirect contribution to GHGs, and climate change would be negligible. In addition, because the direct and indirect effects would be negligible, the proposed action's contribution to cumulative effects on global GHGs and climate change would also be negligible. Lastly, carbon emissions during the implementation of the proposed action would have only a momentary influence on atmospheric carbon concentrations, because carbon will be removed

[1] Major greenhouse gases released as a result of human activity include carbon dioxide (CO_2), methane, nitrous oxide, **hydrofluorocarbons, and perfluorocarbons.**
[2] Gigatonne is one billion metric tons; equal to about 2.2 trillion pounds.
[3] Equivalent CO_2 (CO_2e) is the concentration of CO_2 that would cause the same level of radiative forcing as a given type and concentration of greenhouse gas. Examples of such greenhouse gases are methane, perfluorocarbons, and nitrous oxide.

from the atmosphere with time as the forest regrows, further minimizing or mitigating any potential cumulative effects.

The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) summarized the contributions of global human activity sectors to climate change (IPCC 2014). From 2000 to 2009, forestry and other land uses contributed just 12 percent of the human-caused global CO2 emissions4. The forestry sector's contribution to GHG emissions has declined over the last decade (IPCC 2014, Smith et al. 2014, FAOSTAT 2013). The largest source of GHG emissions in the forestry sector globally is deforestation (Pan et al. 2011, Houghton et al. 2012, IPCC 2014), which is defined as the removal of all trees to convert forested land to other land uses that do not support trees or allow trees to regrow for an indefinite period of time (IPCC 2000) (e.g., conversion of forest land to agricultural or developed landscapes). However, forest land in the United States has had a net increase since the year 2000, and this trend is expected to continue for at least another decade (Wear et al. 2013, USDA Forest Service 2016).

The Patrick project is not considered a major source of GHG emissions. Forested land would not be converted into a developed or agricultural condition or otherwise result in the loss of forested area. In fact, forest stands would be retained and managed with thinning and prescribed burning, mimicking natural fire effects to maintain a vigorous condition that supports enhanced tree growth and productivity, thus contributing to long-term carbon uptake and storage. In 2010, forests in the United States removed about 757 megatonnes5 of CO2 from the atmosphere after accounting for natural emissions (e.g., wildfire and decomposition) (US EPA 2015).

Some assessments suggest that the effects of climate change in some United States forests may cause shifts in forest composition and productivity or prevent forests from fully recovering after severe disturbance (Anderson-Teixeira et al. 2013), thus impeding their ability to take up and store carbon6 and retain other ecosystem functions and services. Climate change is likely already increasing the frequency and extent of droughts, fires, and insect outbreaks, which can influence forest carbon cycling (Kurz et al. 2009, Allen et al. 2010, Joyce et al. 2014). In fact, reducing stand density, one of the goals of this proposed action, is consistent with adaptation practices to increase resilience of forests to climate-related environmental changes (Joyce et al. 2014). This proposed action is consistent with options proposed by the IPCC for minimizing the impacts of climate change on forests, thus meeting objectives for both adapting to climate change and mitigating GHG emissions (McKinley et al. 2011).

Forests have a "boom and bust" cycle with respect to carbon, as forests establish and grow, experience mortality with age or disturbances, and regrow over time. Forest management activities such as harvests and hazardous fuels reduction have characteristics similar to disturbances that reduce stand density and promote regrowth through thinning and removal, making stands and carbon stores more resilient to environmental change (McKinley et al. 2011). The relatively small quantity of carbon released to the atmosphere and the short-term nature of the effect of the proposed action on the forest ecosystem are justified, given the overall change in condition increases the resistance to wildfire, drought, insects and disease, or a combination of disturbance types that can reduce carbon storage and alter ecosystem functions (Millar et al. 2007, Amato et al. 2011). Furthermore, any initial

[4] Fluxes from forestry and other land use (FOLU) activities are dominated by CO_2 emissions. Non-CO_2 greenhouse gas emissions from FOLU are small and mostly due to peat degradation releasing methane and were not included in this estimate.
[5] A megatonne is one million metric tons; equal to about 2.2 billion pounds.
[6] The term "carbon" is used in this context to refer to carbon dioxide.

carbon emissions from this proposed action will be balanced and possibly eliminated as the stand recovers and regenerates, because the remaining trees and newly established trees typically have higher rates of growth and carbon storage (Hurteau and North 2009, Dwyer et al. 2010, McKinley et al. 2011).

In the absence of commercial and non-commercial thinning, the forested areas where the action alternatives would take place would thin naturally from mortality-inducing natural disturbances and other processes resulting in dead trees that would decay over time, emitting carbon to the atmosphere. Conversely, the wood and fiber removed from the forest in the action alternatives would be transferred to the wood products sector for a variety of uses, each of which has different effects on carbon (Skog et al. 2014). Carbon can be stored in wood products for a variable length of time, depending on the commodity produced. It can also be burned to produce heat or electrical energy or converted to liquid transportation fuels and chemicals that would otherwise come from fossil fuels. In addition, a substitution effect occurs when wood products are used in place of other products that emit more GHGs in manufacturing, such as concrete and steel (Gustavasson et al. 2006, Lippke et al. 2011, McKinley et al. 2011). In fact, removing carbon from forests for human use can result in a lower net contribution of GHGs to the atmosphere than if the forest were not managed (McKinley et al. 2011, Bergman et al. 2014, Skog et al. 2014). The IPCC recognizes wood and fiber as a renewable resource that can provide lasting climate-related mitigation benefits that can increase over time with active management (IPCC 2000). Furthermore, by reducing stand density, managing stand structure and species composition toward HRV and reducing susceptibility to insects and disease the action alternatives may also reduce the risk of more severe disturbances, which may result in lower forest carbon stocks and greater GHG emissions.

In the absence of prescribed fire to reduce stand density and fuel loads, the fire-adapted forest where the action alternatives would take place may be more at risk to a high-severity wildfire, resulting in decreased ecosystem services and potentially increased carbon emissions. Prescribed fires typically target surface and ladder fuels and are typically less severe than wildfires (Agee and Skinner 2005), because they are conducted only when weather conditions are optimal and fuel moisture is high enough to keep combustion and spread within predetermined limits. Thus, prescribed fires result in minimal overstory tree mortality and typically combust less than 50 percent of the available fuel (Carter and Foster 2004, Hurteau and North 2009), producing lower GHG emissions than might be emitted if the same area were to burn in a high-severity wildfire (Wiedinmyer and Hurteau 2010). Also, a large portion of the emissions associated with prescribed fires is from duff, litter, and dead wood which comprise carbon pools that would otherwise decay quickly over time, releasing carbon to the atmosphere. Hazardous fuels reduction and restoration treatments can help reduce the severity of wildfires in forests where fire exclusion has resulted in high fuel loadings and high tree densities (Agee and Skinner 2005, Stephens et al. 2013). High-severity fires, especially when they occur repeatedly, can affect human health and safety, infrastructure, and ecosystem services, and can cause a transition of forests to non-forest ecosystems in some areas (Roccaforte et al. 2012, Anderson-Teixeira et al. 2013). By reducing the threat of high-severity wildfire, the action alternatives would create conditions more advantageous for supporting forest health in a changing climate and reducing GHG emissions over the long term.

In summary, action alternatives would affect a relatively small amount of forest land and carbon on the Wallowa-Whitman National Forest and, in the near term, might contribute an extremely small quantity of GHG emissions relative to national and global emissions. The action alternatives would not convert forest land to other non-forest uses, thus allowing any carbon initially emitted from the project activities to have a temporary influence on atmospheric GHG concentrations, because carbon

would be removed from the atmosphere over time as the forest regrows. The action alternatives are consistent with internationally recognized climate change adaptation and mitigation practices.

Consistency with Laws, Regulations, and Policy

Forest Plan Compliance

Alternatives 2 and 3 comply with the goals for timber in the 1990 Wallowa-Whitman National Forest (WWNF) forest plan as amended by providing for production of wood fiber to satisfy National needs and benefit local economies consistent with multiple resource objectives, environmental constraints, and economic efficiency. Opportunities for fuelwood gathering for personal and commercial uses would be available within the project area. These alternatives meet the forest plan standards and guidelines for timber because prescriptions have been prepared and reviewed by a certified silviculturist, meet the silvicultural needs of the stands being treated including stand structure and species composition, limit created opening sizes, utilize the appropriate yarding system for stand and ground conditions, and call for pre-commercial thinning of young stands to accelerate their growth. All action alternatives also propose to harvest timber only on lands suitable for timber management.

Fire and Fuels

Hazardous Fuels and Treatment Objectives

The following describes existing and desired conditions relative to fire management for the Patrick project area, objectives for fuels management as described in the Wallowa-Whitman National Forest Plan, and the effects of implementing the alternatives relative to fire management.

A primary fire management challenge of this project is to reduce the current fuel loadings (both live and dead) to established standards for the specific environments that exist within the project area. Fuel loading and the vegetative composition of those fuel loads are a primary contributing factor influencing fire risk. Implementing treatments that will reduce these components will begin moving the project area toward the historic range of variability for the various environments in the project area, and substantially reduce the risk of high intensity/high severity wildfires to natural resources, adjacent private property, and the public. Fuel loadings, both surface and aerial, is one of the key components of fire risk and one of the two most effectively influenced by management actions (the other is ignition hazard).

The National Fire Plan was developed in August 2000, following a catastrophic wildland fire season, with the intent of actively responding to severe wildfires and their impacts to communities, while ensuring sufficient firefighting capacity for the future. The National Fire Plan addressed five key points: Firefighting, Rehabilitation, Hazardous Fuels Reduction, Community Assistance, and Accountability.

Hazardous fuels reduction is a key part of the National Fire Plan. Hazardous fuels reduction treatments are designed to reduce the risks of high intensity/ high severity wildland fire to:

- Fire Fighters and the Public
- Private Lands
- Structures
- Communities

- Infrastructure
- Natural Resources

Treatments are designed to restore forest ecosystems by moving them towards or matching historical structure, function, diversity, and dynamics. Treatments accomplish these goals by removing or modifying wildland fuels to reduce the potential for high severity/high intensity wildland fire behavior, lessen the post-fire damage, and limit the spread or proliferation of invasive species and diseases. Treatments are accomplished using commercial and non-commercial thinning, whip felling, pruning, mechanical and hand piling, grazing, prescribed fire, or combinations of these and other methods.

Because of the prolonged absence of periodic surface burning, low and moderate severity fire regimes in the analysis area have developed multi layered tree densities, changed species composition proportions, and accumulated live and dead vegetation outside the range of historical fire regimes. These areas will support intense, stand replacing fire events which could result in a loss of old forest stands, existing mid-seral stands, current wildlife habitat, water quality, and ecosystem diversity at scales outside historic levels.

Climate Change

The earth has entered an era of rapid environmental changes. The warming and drying trend predicted under the climate change scenarios will also increase the likelihood of intense large fires. These fires will be larger and more severe, especially at higher elevation. There will be fewer trees regenerating after a fire due to increased regeneration mortality from higher insect and pathogen activity (Forest, Insect & Pathogens and Climate Change: Workshop Report, Beukema 2007).

Resource managers will need to integrate adaptation strategies (actions that help ecosystems accommodate changes adaptively) and mitigation strategies (actions that enable ecosystems to reduce anthropogenic influences on global climate) into project design (Climate change and Forest of the Future: Managing in the Face of Uncertainty, Milar et al., 2007).

A review of available information relative to the analysis area indicates the following fire/fuel related climate trends that are possible or likely (Salo, 2010).

- Increase in the percentage of winter precipitation that falls as rain, rather than snow
- Earlier snowmelt
- Increased potential for higher peak stream flows and extensive droughts
- Extended growing seasons
- Lower soil moistures
- Increased late-season moisture stress on vegetation
- Potential effects on plant growth due to increased levels of atmospheric CO2 (“fertilization”)

Adaptive strategies include:

1. Resistance options- manage forest ecosystems and resources so that they are better able to resist the influence of climate change or to stall undesired effects of change.
2. Promote resilience to change- resilient forests are those that not only accommodate gradual changes related to climate but tend to return toward a prior condition after disturbance either

naturally or with management assistance. Promoting resilience is the most commonly suggested adaptive option discussed in a climate-change context (Dale et al. 2001, Spittlehouse and Stewart 2003). Forest management techniques such as prescribed burning or thinning dense forest, can make forest more resilient to wildfire and decrease fire emissions.

3. Enable forest to respond to change- This group of adaptation options, intentionally accommodates change rather than resist it, with a goal of enabling or facilitation forest ecosystems to respond adaptively as environmental changes occur (Milar, 2007).

Existing Condition

Communities/Private Lands

Baker County and its' cooperators have prepared a community wildfire protection plan in compliance with the National Fire Plan, the 10-year Comprehensive Strategy, and the Healthy Forest Restoration Act. The Patrick Project Area contains portions of four Wildland Urban Interface areas identified by the Baker County Wildfire Protection Plan (Figure 5); Whitney, Woodtick Village/Rattlesnake Estates, Greenhorn, and Sumpter/McCully WUI's. The Whitney WUI is almost completely within the project (area not within the project area is private land surrounded by the project area). Woodtick Village/Rattlesnake Estates covers a portion of the southern end of the project area as well as an adjacent area to the south of the project area. The Greenhorn WUI covers a small part of the western edge of the project area and the area adjacent to the western edge of the project area. The Sumpter/McCully Forks WUI takes in a small sliver of the project area along the northeast edge and encompasses a large section of the land to the northeast and east of the project area. Three of these WUI areas have been established around communities and residential areas identified as "High Risk" for loss or damage from wildfires and one is identified as "Moderate Risk". "High Risk" communities in and adjacent to the project area are: Woodtick Village/Rattlesnake Estates, Greenhorn, and Sumpter Valley/McCully Forks. The "Moderate Risk" community in the project area is Whitney. All of these are within or directly adjacent to project area and would be negatively affected (either by fire itself or by dense smoke) by any large size or high intensity wildfire within or adjacent to the project area. The Baker County CWPP calls for fuel reduction activities as one of the actions necessary to lessen the wildfire risk on all of these communities (Baker County Community Wildfire Protection Plan, 2006, revision 2012)

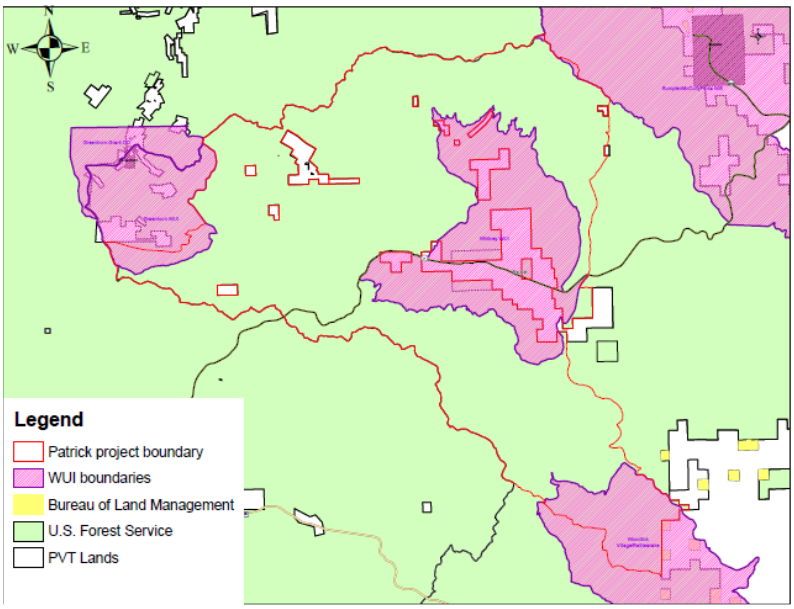


Figure 5. Patrick Project Area and CWPP Boundaries

Fire Environment

The fire environment includes available fuels (vegetation and surface), existing topography, and weather. These elements together define fire behavior. Of these, only fuels can be altered by management actions. Many elements of fuels work together to influence fire behavior including vertical and horizontal distribution and continuity, moisture and chemical content, compaction, size and shape of fuels, and fuel loading. These elements of the fire environment can be modified to reduce potential fire behavior.

Primary Vegetation Conditions

Higher elevations and northern slopes of the analysis area consist of Moist Upland Forest (mixed conifer-grand fir) stands, Cold Upland Forest (lodgepole pine and mixed conifer-grand fir) stands, and some Dry Upland Forest (mixed conifer-grand fir/Douglas-Fir) stands that transition to Dry Upland Forest (mixed conifer-grand fir/Douglas-Fir and ponderosa pine) stand types as slopes change, elevation decreases, and/or aspects align towards a more southerly direction. Dry Upland Forested stands throughout the project area are considered overstocked, while Cold Upland Forest and Moist Upland Forest stands are at the high ends of desired stocking levels or are just over desired stocking levels. See Silvicultural report for detailed vegetation conditions.

Fuels Type Description

Fire suppression and past management practices over the last 100+ years has resulted in ground fuel loadings being elevated above desired levels as well as forest vegetative conditions that are over stocked with surface, ladder and canopy fuels. These overstocked and elevated loadings across the landscape allow for an easy transition of fire from the surface into the overstory canopy of the trees. With these elevated fuel loadings, both live and dead, fire behavior makes direct attack fire suppression difficult or impossible as well as produces fireline intensities that result in non-typical high severity stand replacement fires.

Fuel Models within the Project Area

Two different fuel model sets were used for this analysis. The first, the Northern Forest Fire Laboratory (NFFL) fuel models were used to query data and categorize the landscape based upon previous survey information. These models are broken into four categories. These are grass, brush, timber, and slash as described in Aids in Determining Fuel Models for Estimating Fire Behavior (Anderson, INT-GTR-122). The fuel models identified in the area were FM-2, FM-9, and FM-10. FM-2 generally has a high rate of spread with a high intensity, FM-9 is characterized by low intensity and low rate of spread, and FM-10, which makes up the majority of the analysis area, has flame lengths above which fire suppression personnel may safely do direct attack when weather conditions are typical of mid-July to late August. Fire behavior under these conditions poses suppression challenges and in general presents a higher level of risk to suppression personnel.

The second set of fuel models used, Scott and Burgan's Standard fire behavior fuel models (RMRS-GTR-153), contains 40 fuel models. This set of models was used in fire behavior modeling to estimate potential fire behavior. Combining database information with field verification, fuel models; TL05 (representing High Load, Conifer litter), TL07, (Large Down logs), and TU02, representing Moderate load, humid timber/shrub; were identified as the primary, pretreatment models within the analysis area. All of these fuels models are of concern given the ladder fuels and overstory densities. These fuel models would compose the majority of the acreage within the analysis area. It is important to note that fuel models are used to depict the ground and surface fuel loadings within a stand and do not account for understory (Regeneration) fuels or overstory fuels (Canopy, Snags and Dominant/Co-dominant trees).

Topography

Topography within the project area has a variety of influences on fire behavior. These influences include varying slopes, elevation changes, aspect alignment to the wind as well as solar radiation, and numerous other micro influences. Topography within the project area is generally characterized by rolling mountainous terrain (0-30% slope) in the lower elevations, valley bottoms, and along ridge tops, that transition to moderate slopes (30-60%) along the slopes above many of the drainages at the mid to upper elevations of the project area. The northern portions of the project area have primarily southern aspects within the drainages that flow to the North Fork Burnt River and the southern portions of the project area have northern or eastern aspects that also flow into the North Fork Burnt River. Multiple aspects occur throughout the project area dependent upon location within the drainages.

Slope increases fire behavior by preheating fuels upslope of the fire and enabling spotting from rolling materials and aerial fire brands. Flame length and rate of spread both increase with increasing slope. All aspects are represented within this analysis area with primary aspects being Southerly or Northerly. Southeast to Southwest aspects typically experience the more intense fire behavior due to duration of sun exposure. The Patrick Project area frequently experiences down-slope, down drainage wind switches late in the evening and overnight with the diurnal wind switch.

Weather

Summers are typically hot and dry with daytime temperatures in the 80's and 90's Fahrenheit with relative humidity in the teens (with poor overnight recovery). Lightning caused fires primarily occur in the months of July and August. These storms produce lightning and strong winds, often with no precipitation or localized light rainfall within the center of the storm cells. Of particular concern to this project area are the strong gusty winds often associated with a frontal passage, especially dry cold fronts. The following table shows weather data for the Blue Canyon Remote Automated Weather

Station (RAWS) which is located approximately 18 miles to the east of the project area at 4,200 feet elevation which is the closest RAWS site to the project area.

Table 31. Blue Canyon RAWS Weather (2002-2017 Data)

95th Percentile Weather			
	High Temperature	**Low Relative Humidity**	**20' Wind (mph-10 min avg)**
June	88	16	15
July	96	12	12
August	94	8	15
September	88	10	14

Fire History and Occurrence

Since the late 1800's, changes have occurred in the Patrick project area. Commercial timber harvest selectively removed many of the large ponderosa pine, grazing practices modified the understory fuels, fire suppression interrupted the historic fire return intervals and the overall climate has changed. This is similar to changes that have occurred in many areas throughout the western United States (Arno et al. 1997, Parsons and DeBenedetti 1979, Skinner and Chang 1996). Dramatic alterations have resulted from successional changes that have occurred because of surface fire exclusion. Fire exclusion has enabled shade-tolerant species to expand their coverage into sites previously maintained by fire (Hall 1976). This has resulted in profound changes in stand composition and structure, tree vigor, and fuel accumulations. Surface and aerial fuel loadings have increased providing more continuity within the vertical and horizontal fuel profiles. Competition from overstocking has reduced the vigor of trees and increased the risk for insect and disease outbreaks. Stocking levels, which were historically between 25 and 50 trees per acre, have now increased to between 400 and 1200 trees per acre in some places. Disease and Insect infestations within the conifer species are present within the project area. The result has been a gradual decline of forest health and an increase in available fuel. These changes have caused a deterioration in forest ecosystem integrity and an increased probability of large, uncharacteristically high-severity stand replacing wildfires (Dahms and Geils 1997, Stephens 1998, Weatherspoon and Skinner 1996).

Project Area Wildfire Data

The Patrick project area had 204 ignitions (fire starts) from 1970 through 2017. Of these fire starts, 160 were contained at under ¼ acre in size, 41 were contained at between 1/4-9.9 acres, and 3 were contained between 10-20 acres with the largest being 15 acres.

Figure 6: Number of fires by Fire Size Class

Most fire starts were caused by lightning within the project area, but human causes (campfires, smoking, debris burning, and children) also started fires.

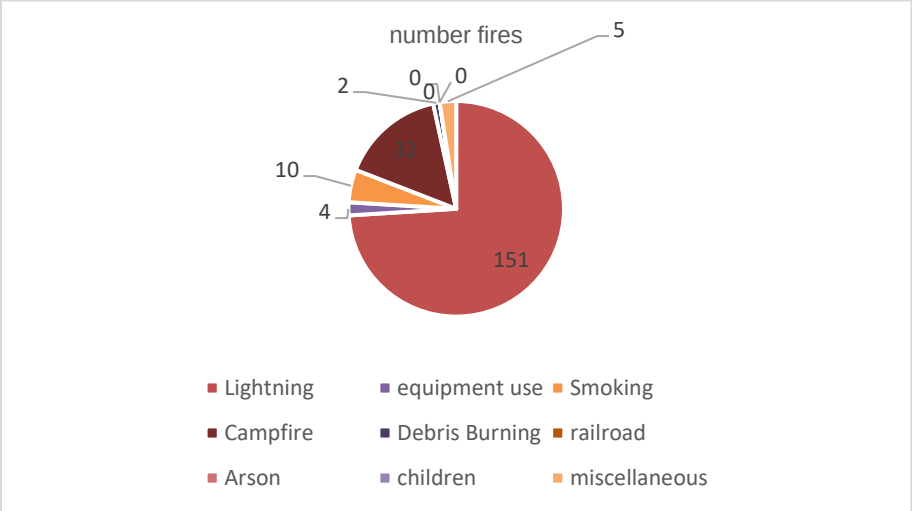


Figure 7: Number of Fires by Cause

While the majority of fire starts within the project occurred in July and August, wildfires have occurred as early as May and as late as November. The following chart shows the distribution of fire starts by month for May through November from 1970-2017. No fire starts outside of the May-November timeframe have been recorded.

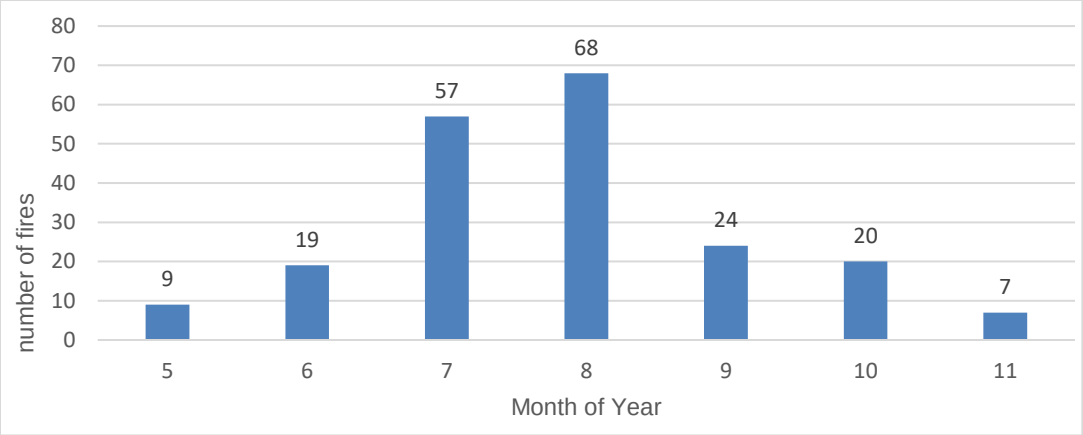


Figure 8: Fire Starts by month

While no large fires have occurred within the project area in recent history, the Sunflower Fire in 1986 (8,170 acres), Vinegar Fire in 2013 (1,214 acres), Eagle Fire in 1986 (293 acres), and the Huckleberry Fire in 1986 (8,586 acres) are near the project area. Large fires (over 100 acres) that have occurred within 10 air miles of the project area since 1970:

Table 32: Past Large Fire History

Wildfire Name	Year	Acres
Rail	2016	41,635
Summit	1996	37,986
Sloans Ridge	1996	10,513
Huckleberry	1986	8,586
Sunflower	1986	8,020
Easy	2002	5,842
Lost Lake	1986	2,805
Reed	1994	2,338
Indian Rock	1994	1,411
Vinegar	2013	1,214
Ten Cent	1986	451
South Fork	1986	319
Eagle	1986	293
Burnt River 154	2005	269
Baldy	1994	217
Boulder Beetle	2013	208
Baldy Creek	1986	197
Burnt River 152	2005	163
Tabor	1986	152
Sunshine	2008	144
Congo Gulch	1986	111
Wolsey	1995	107
Burnt River 171	2005	100

Several of these large fires burned well above historical intensities and severities. These large fires have left long term impacts on soil productivity and stability, water quality, riparian habitat, wildlife habitat, and timber productivity.

The following charts compare the project area to the Whitman Ranger District and Wallowa Whitman National Forest (including the Hells Canyon NRA and Eagle Cap Wilderness) in regard to fire starts, causes, and fire sizes from 1970 through 2018.

Table 33: Fire Starts by Cause

	Fire Starts by cause		Patrick	Whitman	WWNF
	Cause Code	General Cause	#	#	#
Fire Starts by Cause	1	Lightning	151 (74%)	1,730 (70%)	4,995 (79%)
	2	Equipment	4 (2%)	39 (1.5%)	74 (1%)
	3	Smoking	10 (5%)	64 (2.5%)	156 (2%)
	4	Campfire	32 (16%)	359 (14%)	811 (13%)
	5	Debris Burn	2 (>1%)	30 (1%)	72 (1%)
	6	Railroad	0	0	6 (>1%)
	7	Arson	0	25 (1%)	33 (>1%)
	8	Children	0	7 (>1%)	14 (>1%)
	9	Other	5 (2%)	92 (4%)	194 (3%)
	Totals		204	2,476	6,355

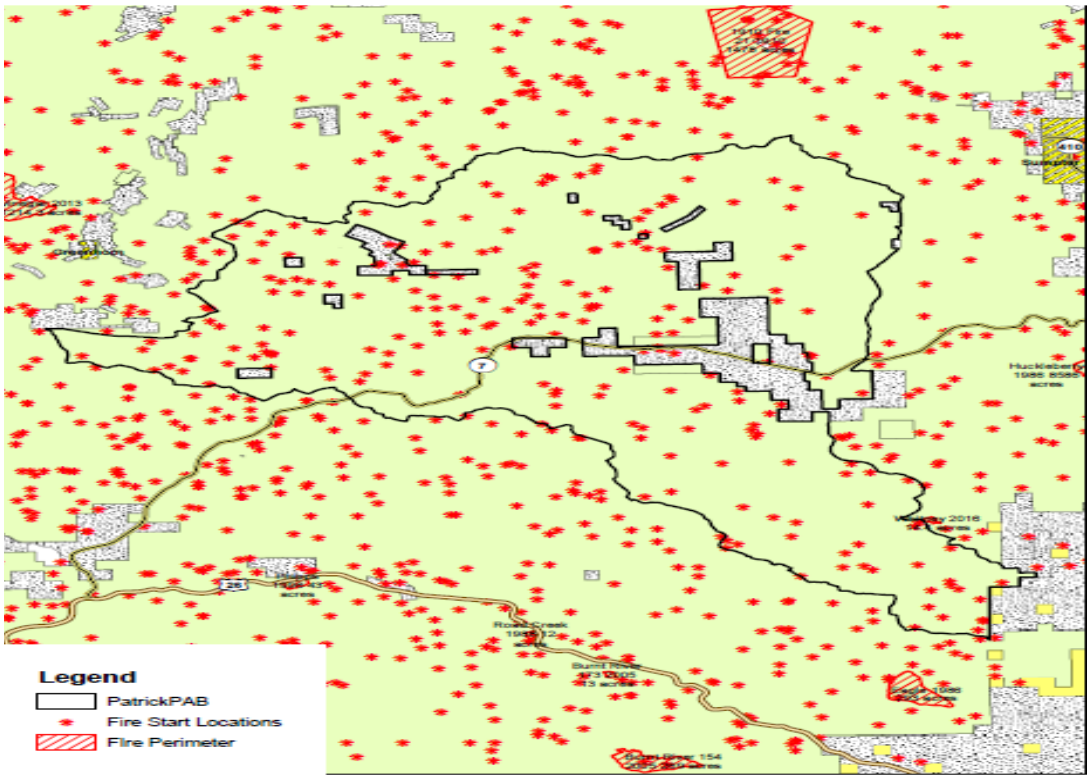


Figure 9: Fire Start Location Map

Table 34: Fire Frequency Comparison

Years 1970-2018 (48 Years)	Total Fires	Avg Annual Fire Frequency	Fire Occurrence Rate per 1,000 Acres/year[1]
WWNF 2,404,888 acres	6355	132.39	0.055
Whitman Ranger District 638,118 acres	2476	51.58	0.081
Patrick Project Area 48,794 acres	204	4.25	0.087

1. The Fire Occurrence rate equals the number of fires per year per 1000 acres. The rate is used to compare average fire occurrence per year on a relative basis.

From the above tables, we can see that the Patrick project Area has a fire occurrence rate that is 158% of the Wallowa Whitman National Forest as a whole and is 108% of the Whitman Ranger District's rate since 1970. These fires were all contained at 15 acres or less. The vast majority of the fires have been started by lightning, but human causes are also common within the project area (26% of the fire starts). The project area has a higher than the forest and district human caused fire start record (equipment, smoking, and campfires) Lightning caused fire starts are hard to predict where and when starts may occur, but human caused starts are generally adjacent to highways or roads within the project area. One area that is of particular concern in the project area is Highway 7, both as a potential ignition source and as something that wildfire could have a large impact upon should one occur in the area.

Fire Behavior: Existing Condition

Fire behavior modeling was used to predict fire behavior in the project area for the vegetation condition that exists. Weather condition inputs were obtained from weather records at the Blue Canyon Remote Automated Weather Station (RAWS) and fuel models were assigned based on existing vegetation types and fuel loadings. Stand data was utilized to create stands that were "average" for the stand types. Stands modeled were based on data from all similar stands within the project area using a middle level stocking from the data. Within the project area, stands would exist that have a much higher fuel and vegetation loading as well as stands that have a much lower fuel and vegetation loading than the average one modeled for each forest type. Modeling was completed to determine the following fire behavior and fire impacts when a fire occurs within the project area. Modeling used approximate 95th percentile weather (5% of days can be expected to be "worse" conditions). The following are the fire behavior and impacts that were looked at:

- Expected flame lengths of a fire (surface fire) and their effect on suppression efforts
- Expected flame lengths of a fire (with crown fire)
- Expected rate of spread for a fire start (surface fire) and its effect on suppression efforts
- Expected rate of spread for a fire start (with crown fire)
- Estimated scorch height within overstory canopy for the stands
- Predicted mortality within the stands by species
- Fire type-Surface, Passive Crown, Active Crown
- Spotting Distance from surface fire
- Spotting Distance from a torching tree
- Fire size at 1 hour from start

Modeling programs were used to show various aspects of the above listed items. Modeling was done using the following program:

- FMA Plus 3 (Fuels Management Analyst Plus, version 3)

FMAPlus3 was utilized to develop an approximation of an average stand for each of the different stand types based on data from the Forest Oracle Data Base. Using data derived from stand exams as well as personal visits to the project area, ground and surface fuel loadings were estimated using photo series for the various different fuel sizes. These photo series estimations were entered into the DDWoodyPC application within FMAPlus3. Utilizing stand data for the different stand types found in Patrick Project area, the Crown Mass application was then used to create an "average" stand for each stand type and associated with the corresponding DDWoodyPC estimation for the stand. FMAPlus3 inputs include overstory (size, species, density, etc.), understory (size, species, density, etc.), ground fuel loading (size, composition, etc.), duff fuel loading, shrub loading, herb loading, and numerous other inputs. These inputs allow for a representative stand to be constructed for modeling. Once inputs for the ground fuel loadings, canopy structure and size, duff, shrub, and other stand characteristics are completed, weather parameters can be chosen from a list of parameters or can be customized for specific conditions. Weather input used for the models were 95th percentile weather conditions from the Blue Canyon RAWS site:

95th Percentile weather from Blue Canyon RAWS (2002 -2017)

Temperature:	95 degrees	
Relative Humidity:	10 percent	
Wind (20 foot):	15 mph	
Wind (Mid-flame):	5 mph	(calculated from 20 foot winds)
Slope (Average):	20%	(average slope for stands in project area)
Shrub FM (%):	90	(estimated for a normal July/August)
Foliar Moisture Content (%)	105	(estimated for a normal July/August)
1 hr. woody FM (%):	2	(calculated from weather inputs)
10 hr. woody FM (%):	3	(calculated from weather inputs)
100 hr. woody FM (%):	4	(calculated from weather inputs)

Modeling was completed for stands representing the six major stand types within the three primary forest types that exist within the project area identified for treatments. These six stand types were determined utilizing stand exam data to identify average stand conditions within the forest. The three forest types and six stand types modeled are as follows:

- Dry Upland Forest (33,421 acres/68.5% of project area)
    - Ponderosa Pine Stands
    - Douglas-Fir Stands
    - Grand Fir Stands
- Cold Upland Forest (6,096 acres/12.5% of project area)
    - Grand Fir Stands
    - Lodgepole Stands
- Moist Upland Forest (3,306 acres/6.8% of project area)
    - Grand Fir Stands

Stand data shows there are multiple other potential veg groups that occur within the project area. The largest group not modeled was Dry Upland Woodlands which data shows occupy 3,516 acres or 7.2% of the project area. This group was not modeled due to the area(s) that it occurs in have largely been identified as areas that would not be treated utilizing prescribed fire except when the area(s) border the Dry Upland Forest areas. The vegetative composition and densities of the DUW would minimize fire spread under most conditions except in those borderlands previously mentioned. The remaining potential Vegetation Groups that occur within the project area are all small acreage areas. These 16 Groups combined comprise 5% of the project area. Due to the small size and intermixing of these groups with the larger vegetation groups, it is expected that fire behavior within these groups would be similar to the adjacent group fire behavior and these groups would have little influence on fire behavior within the project area as a whole.

Summary of existing condition and response to wildfire and effects of wildfire:

Dry Upland Forest- Ponderosa Pine Stands

Fuel loadings within the DUF-Ponderosa Pine stands are such that ground fuel loadings would be considered light to moderate fuel loadings. Limited ladder fuels exist in the form of regeneration (0 – 8” DBH) and intermediate overstory (8-18” DBH). Ground fuels are a combination of grasses, shrubs, and limited brush species with some small to moderate sized logs/limbs. This is largely due to the recent past activities that have occurred within these stand types (prescribed burning). Spotting from the fire would be limited in range due to lack of torching or crown fires lofting embers. Given the low surface fuel loading over most of the Ponderosa Pine stands and the low levels of ladder fuels, fire behavior within these stands would consist of a ground or surface fire, with flame lengths that average around 2.8 feet in height. With this level of flame length as well as fireline intensities being put out by the fire front, direct attack by hand crews or engine crews would be possible. Wildfire crews should have the ability to contain wildfires in these stands under the modeled weather conditions. With the flame lengths and amount of fuels being consumed, modeled scorch heights would be 12 feet. Mortality of the overstory conifer trees would be low, with the majority of trees greater than 8” DBH surviving the fire, while the understory trees less than 8” DBH would have fairly high mortality in all species, with an average of around 20-25 percent of understory surviving.

Dry Upland Forest- Douglas-fir Stands

Fuel loading within the DUF-Douglas-fir stands are such that ground fuels would be considered a moderate fuel loading. Ladder fuels exist within most of these stand types in the form of brush species, conifer regeneration, and intermediate overstory. Ground fuels are a combination of grasses, shrubs, brush species, and small to moderate sized logs/limbs. Some of these stands have been treated with recent past activities similar to the ponderosa pine stands, which has lowered the ground fuels and ladder fuels within those stands. However, due to the limited amount of treatment that has occurred within the stand types, fire behavior would exhibit passive crown fire characteristics. Surface fire would have flame lengths averaging around 4.4 feet in height, with consistent torching of individual trees or small groups of trees. This passive crown fire would create a resultant flame length of around 9.7 feet in height. With the surface fire being above 4 feet, hand crews would be ineffective at controlling the fire using direct attack methods. Engines, dozers, and aircraft would be needed to effectively control the fire edges or resources would have to use indirect tactics to attempt to secure the fire edge. Spotting distances from the torching of trees would create spot fires downwind of the main fire up to .42 miles, creating additional difficulty in containing and controlling the fire. Mortality within the understory and overstory would be high in all species. Ponderosa Pine, Western Larch, and Douglas-fir in the stands that are large diameter (17”+ DBH) would have a chance of

survival with the larger the tree the greater the chance for survival However, due to the limited amount of these large diameter trees across the stands, there would be limited survival as a result of expected fire behavior. With the flame lengths and amount of fuels being consumed, modeled scorch heights would be 60 feet. With the overstory canopy having a top end height of around 100 feet, tree survival would be expected to mainly be within scattered large diameter trees with a high tolerance to heat (western larch, ponderosa pine, Douglas-fir) within the stands.

Dry Upland Forest-Grand Fir Stands

Fuel loading within the DUF-Grand fir stands are such that ground fuels would be considered a moderate fuel loading. Like the DUF-Douglas-fir stands, ground fuels consist of grasses, brush species, small diameter logs/limbs, and a higher loading of needle/duff layer materials. This surface loading, combined with the regeneration of conifers and intermediate overstory, creates stands that would have fire behavior that consists of a passive crown fire under modeled weather conditions. Surface fire would have a flame length of 4.4 feet on average, with frequent torching of trees or clumps of trees. This torching would have create a resultant flame length of 24.2 feet. Given this type of fire behavior, handcrews would not be able to do direct attack on the fire edge. Equipment such as aircraft, dozers, and engines would be required to work along the fire edges and would likely have limited success doing any type of direct attack methods due to the fire intensities caused by the torching and the frequent spotting that would be occurring. Spotting from the torching trees would be out to .42 miles from the fires edge. Indirect attack methods would likely be utilized to attempt control of the fire. Control of a wildfire under the modeled weather conditions and fuel conditions would likely be difficult and costly regardless of method of suppression used. Mortality within the stands would also be high in the understory and overstory with nearly all diameters of trees being killed of all species. With the flame lengths and amount of fuels being consumed, modeled scorch heights would be 163 feet. With the overstory canopy having a top end height of around 100 feet, minimal tree survival would be expected within the stands.

Cold Upland Forest- Grand fir stands

Fuel loading within the CUF-Grand fir stands are such that ground fuels would be considered a moderate fuel loading. The ground fuels consist of brush species, small logs/limbs and a moderate level of needle/duff layer materials. This surface loading, combined with the regeneration of conifers and intermediate overstory, creates stands that would have fire behavior that consists of a passive crown fire under the modeled weather conditions. Surface fire would have a flame length of 2.8 feet on average, with frequent torching of trees or clumps of trees. This torching would create a resultant flame length of 21.3 feet. Given this type of fire behavior, hand crews could possibly be able to do limited direct attack methods along the surface fire edge, but would be continually overpowered by the torching of the understory/overstory that would create multiple spots ahead of the fire edge as well as produce intensities that would make direct attack unfeasible by hand crews. Fire behavior would necessitate that equipment such as dozers and engines with assistance from aircraft would be needed to contain the fire spread. Direct attack methods would likely be unsuccessful, so indirect attack methods would need to be utilized. Spotting distances would be up to .53 miles from the fire edge when trees torched and loft ember into the air. Control of a wildfire under the modeled weather conditions and fuel conditions would likely be difficult and costly regardless of method of suppression used. Mortality within the stands would also be high in the understory and overstory with nearly all diameters of trees being killed of all species. With the flame lengths and amount of fuels being consumed, modeled scorch heights would be 143 feet. With the overstory canopy having a top end height of around 100 feet, minimal tree survival would be expected within the stands.

Cold Upland Forest- Lodgepole Stands

Fuel loading within the CUF-Lodgepole stands are such that ground fuels would be considered a moderate fuel loading. The ground fuels consist of small logs/limbs and a moderate level of needle/duff layer materials. This ground/surface loading, combined with the regeneration of conifers and intermediate overstory, creates stands that would have fire behavior that consists of a passive crown fire under the modeled weather conditions. Surface fire would have a flame length of 2.7 feet on average, with frequent sustained torching of trees or clumps of trees. This torching would create a resultant flame length of 16.8 feet. Given this type of fire behavior, hand crews would not be able to do direct attack along the fire edges due to the intensities of the fire edge and the fuel loadings on both the ground and the ladder fuels that would need to be moved to construct fire line. Engines may have some success in direct attack methods, but it would be limited to those areas that understory and overstory trees were open enough that equipment could get through. Dozers may have success along the fire edge, but fireline intensities as well as spotting from the fire would make direct attack difficult if not impossible. Indirect tactics using equipment would likely be needed to contain the fire. Control of a wildfire under the modeled weather conditions and fuel conditions would likely be difficult and costly regardless of method of suppression used. Mortality within the stands would also be high in the understory and overstory with nearly all diameters of trees being killed of all species. With the flame lengths and amount of fuels being consumed, modeled scorch heights would be 111 feet. With the overstory canopy having a top end height of less than 100 feet, minimal tree survival would be expected within the stands.

Moist Upland Forest-Grand Fir Stands

Fuel loading within the MUF-Grand fir stands are such that ground fuels would be considered a moderate fuel loading. The ground fuels consist of small logs/limbs and a moderate level of needle/duff layer materials. This ground/surface loading, combined with the regeneration of conifers and intermediate overstory, creates stands that would have fire behavior that consists of a passive crown fire under the modeled weather conditions. Surface fire would have a flame length of 4.4 feet on average, with frequent sustained torching of trees or clumps of trees. This torching would create a resultant flame length of 23.3 feet. Given this type of fire behavior, hand crews would not be able to do direct attack along the fire edges due to the intensities of the fire edge. Engines and dozers may have some success in direct attack methods, but it would be limited to those areas that understory and overstory trees were open enough that equipment could get through. Indirect tactics using equipment would likely be needed to contain the fire. Control of a wildfire under the modeled weather conditions and fuel conditions would likely be difficult and costly regardless of method of suppression used. Mortality within the stands would also be high in the understory and overstory with nearly all diameters of trees being killed of all species. With the flame lengths and amount of fuels being consumed, modeled scorch heights would be 157 feet. With the overstory canopy having a top height around than 100 feet, minimal tree survival would be expected within the stands.

Table 35 displays expected fire behavior based on modeling. Flame lengths in excess of 4 feet limit suppression activities and effectiveness and place firefighting personnel at high levels of risk due to extreme fire behavior. Fire behavior was modeled using 95th percentile weather observations from the Blue Canyon RAWS and input into FMAPlus3.

Table 35: Fire Behavior for Existing Condition

PVG	Stand Type	Ground Fuel Model	Description	Surface Flame Length ft	Fire Type	Resultant Flame Length ft	Rate of Spread (chains per hour)	Size at 1 Hours (acres)
Dry Upland Forest	Ponderosa Pine	TL05	High load Conifer Litter	2.8	Surface Fire	2.8	6.5	1.69
	Douglas-fir	TU02	Moderate load, humid climate timber-shrub	4.4	Passive Crown Fire	9.7	22.3	20.0
	Grand Fir	TU02	Moderate load, humid climate timber-shrub	4.4	Passive Crown Fire	24.2	33.1	44.1
Cold Upland Forest	Grand Fir	TL05	High load Conifer Litter	2.8	Passive Crown Fire	21.3	28.1	31.7
	Lodgepole Pine	TL07	Large downed logs	2.7	Passive Crown Fire	16.8	22.7	20.4
Moist Upland Forest	Grand Fir	TU02	Moderate load, humid climate timber-shrub	4.4	Passive Crown Fire	23.3	32.1	41.5

Table 36: Existing Condition Probability of Mortality

Probability of Mortality (%)							
		DUF			CUF		MUF
	size classes	PIPO	PSME	ABGR	ABGR	PICO	ABGR
Fir, Grand	0-8" DBH	78	100	100	100	100	100
Fir, Grand	9-16" DBH	35	98	99	99	99	98
Fir, Grand	17-21" DBH	17	n/a[1]	97	97	97	97
Fir, Grand	22+" DBH	n/a	n/a	94	94	94	93
Larch, Western	0-8" DBH	87	100	100	99	100	100
Larch, Western	9-16" DBH	27	98	98	98	98	98
Larch, Western	17-21" DBH	n/a	57	94	95	94	95
Larch, Western	22+" DBH	n/a	n/a	n/a	93	91	n/a
Pine, Lodgepole	0-8" DBH	86	100	100	100	100	100
Pine, Lodgepole	9-16" DBH	53	100	100	100	100	100
Pine, Lodgepole	17-21" DBH	n/a	n/a	99	99	99	99
Pine, Lodgepole	22+" DBH	n/a	n/a	n/a	n/a	99	n/a
Pine, Ponderosa	0-8" DBH	79	100	100	100	100	100
Pine, Ponderosa	9-16" DBH	19	97	98	98	98	98
Pine, Ponderosa	17-21" DBH	8	60	94	95	95	96
Pine, Ponderosa	22+" DBH	4	11	90	90	90	90

Probability of Mortality (%)							
Douglas-fir	0-8" DBH	77	100	100	100	100	100
Douglas-fir	9-16" DBH	22	95	98	98	98	98
Douglas-fir	17-21" DBH	9	59	93	95	95	94
Douglas-fir	22+" DBH	4	31	90	90	92	90
Crown Scorch Height (feet)		12.2	60.2	163.8	143	111.6	157.6
Resultant Flame Length (feet)		2.8	9.7	24.2	21.3	16.8	23.3
Fire Type		Ground	Passive Crown	Passive Crown	Passive Crown	Passive Crown	Passive Crown

1. n/a indicates that species and size class did not exist in modeling/stand data

Fire Behavior Summary:

The majority of the analysis area under current stand conditions has moderate to high fuel loadings and densely stocked canopies when compared to historical loadings for the fire regime that it occurs in. When a fire starts under hot/dry conditions, we can expect that flame lengths will be over 4 foot in length due to torching and spread rates would be in excess of 10 chains/hour. Within most of the stands throughout the analysis area, a passive crown fire would be expected (torching of overstory with short crown fire runs). This scenario would be difficult for ground based firefighting resources to control in a timely manner due to the inability to do direct attack on the fire edge and the increased likelihood of spotting from passive crown fire. With the inability to do direct attack, fire size would have the capability to grow to over 20 acres within an hour. Spotting around the edges of the fire would likely occur due to the passive crown fire, making control of the fire more difficult. Intensities would be at a level that the majority of the overstory would be killed either by the fire itself or by secondary fire effects. The majority of ground fuels and duff would be consumed by the fire, leaving exposed soils. In areas where recent past activities have treated stands, flame lengths would be such that ground resources would be able to do direct attack along the fire edge. However, mortality resultant from these fires would be higher than desired for the stand type due to the overstocked nature of many of the stands.

Vegetation Composition and desired fire behavior for stand types

Throughout the dry upland forested stands within the project area, conifer species are considered overstocked for the various stand types that exist. Within the cold upland and moist upland forested stands, conifer species are not considered overstocked when compared to historical levels. See Silvicultural Report for information on vegetative structure and stocking levels and comparison to historical levels.

Fire Behavior within dry upland forested stands that is desired would be for stands where a low intensity/low severity wildfire occurs. These types of fires would be surface fires with little to no fire extending into the overstory. Mortality within the overstory would be minimal, and within the understory would create gaps in the regeneration and keep ladder fuels at a minimum. Current vegetation within the majority of stands within the dry upland forest would not allow for this type of desired fire behavior to occur.

Fire behavior within cold upland and moist upland forested stands that is desired would be for stands where a mixed severity wildfire would occur. These types of fire would be surface fires with occasional torching or scorching of the canopy creating small patches of mortality. Overall, mortality within the overstory would vary with areas of little to no mortality and areas of small patch mortality. Understory mortality would be similar to that of the overstory, but with higher mortality rates due to

the smaller diameters of the understory trees. Current vegetation conditions within these stands do not show that a mixed severity wildfire would occur. With the passive crown fire predictions that models show, mortality in the stands would not leave much if any live overstory. Mortality rates for the stands would leave few, if any live overstory or understory trees.

Air Quality

The Patrick project area is located near the following communities/areas: Whitney, Sumpter, Sumpter Valley, Black Mountain, McEwan, Phillips Lake, and is in proximity to Baker City. Baker City, approximately 23 air miles to the northeast, is a community with a history of air quality concerns. Wilderness areas within proximity to the project area are: Strawberry Wilderness (west-southwest), Monument Rock (South) and North Fork John Day (northwest). The prevailing wind during fire season is out of the southwest.

Air quality monitoring sites are located in Baker City, LaGrande, Cove and John Day. These sites maintain equipment that is used for estimating both PM10 and PM2.5 levels for health purposes. Visibility is monitored from automated IMPROVE (Integrated Monitoring for Protected Visual Environments) sites located within the Starkey Experimental Forest and near Oxbow, Oregon. This is a joint project with EPA, UC Davis, US Park Service, and US Forest Service. A second visibility site is monitored in Hells Canyon.

In addition to these air quality monitoring sites, during prescribed burning implementation, smoke is monitored utilizing the BlueSky modeling program, and is coordinated with Oregon Smoke Management Forecast offices. Visual monitoring from personnel on the ground during and after ignition of prescribed fire units is also used to evaluate smoke dispersion and direction.

Past Activities

Management practices such as timber harvest and grazing have contributed to natural fuels and fire function alterations within the ecosystem. Timber harvest began in the late 1800's and continued throughout the 20th century, utilizing a variety of different harvest methods. Timber harvest in the Patrick AA in the last 20 years has been primarily improvement cuts and commercial thinning which have broken up some of the stand continuity but, are not to the scale or spatially placed to serve as fuel breaks. Prescribed burning has also been utilized within and adjacent to the AA over the last 25 years. Past prescribed burn units are primarily within dry upland forest types and would need to be retreated with RX fire every 10 - 25 years to replicate historic fire return intervals. Pre-commercial thinning has been performed on areas within the analysis area and has been instrumental in beginning the conversion of overstocked stands back to historical levels but has not been to the scale or spatially placed to assist in serving as fuel breaks.

Desired Condition

The desired condition of the Patrick ecosystems is one where fire is allowed to play its natural role. Historic structure, fuel loadings and ecosystem interactions would be maintained by frequent wildland or prescribed fires. Fire regimes are within the natural (historic) range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition, structure, and pattern) are intact and functioning within the natural (historical) range. The project area would contain stands in various structural stages moving towards historical levels for the landscape. Planned treatments would be arranged both spatially and temporally to limit fire spread up drainage and cross drainages, to best retain wildlife cover, protect values at risk, and maximize fuels treatment funding.

Road access would be maintained to access high occurrence fire start areas and to maintain a high degree of fire suppression effectiveness until fuel treatments would allow natural ignitions to maintain management objectives.

Fuel Accumulation

Debris accumulations and ladder fuels within the project area would be reduced to approximate historical levels, resulting in summer wildfires that burn primarily on the ground with low intensities within the Dry upland forest types and with intensities that would create a mosaic burn pattern within the cold and moist upland forest types. Within the cold and moist forest types, the mortality from wildfires would be limited in size and scope to small dispersed patches of mortality scattered throughout the burn area.

The desired fuels conditions (live and dead) would support primarily surface fire during typical summer conditions. Average fire intensities within dry upland forest types would be low to moderate, resulting in the consumption of surface fuels, mortality of small diameter vegetation of all species and favoring the survival of early seral, fire resistant species of larger diameter (ponderosa pine, western larch, and Douglas-fir). Average fire intensities within cold upland and moist upland forest types would be moderate levels, resulting in the consumption of surface fuels, mortality of small diameter vegetation of all species, creation of small patch openings through mortality in the overstory, and favoring the survival of early seral, fire resistant species of larger diameter. The project area would be in a condition that it could be maintained in the appropriate ecological condition with prescribed fire. The following tables illustrate the desired down woody material and fuel loadings by plant association.

Table 37: Large Woody Debris desired Levels

Forest Type	Species	Pieces/Acre	Piece length and Diameter Small End		Total Lineal Length
			Diameter	Length	
Dry upland	Ponderosa Pine/ Douglas-fir	3 – 6	12”	6 feet	20 – 40 feet
Cold Upland and Moist Upland	Mixed Conifer	15 – 20	12”	6 feet	100 – 140 feet

Table 38: Desired Fuel Loadings by Plant Association

PVG	Tons per Acre	Plant Association
Dry Upland Forest Types	5 – 10	Douglas-fir/spirea, Douglas-fir/elk sedge, Douglas-fir/pinegrass, Douglas-fir/mt snowberry, Douglas-fir/common snowberry, Douglas-fir/ninebark, Grand fir/pine grass, Grand fir/big huckleberry, Ponderosa pine/pine grass, Ponderosa pine/elk sedge, Ponderosa pine/snowberry, Ponderosa pine/common snowberry, Ponderosa pine/Idaho fescue, Ponderosa pine/bluebunch wheatgrass
Cold and Moist Upland Forest Types	7 – 15	Grand fir/twinflower, Grand fir/huckleberry, Grand fir/spirea

A guidance policy for the management of snags has been adopted that is consistent with Forest Plan guidelines and based on Eastside Screens, which calls for 2.25 snags per acre with no differentiation between the various stand types. Existing large snags (>12 inches DBH) should be protected during firing operations through avoidance and/or fuels reduction (FDR) as practical.

Smoke Management

Air Quality Standards

The clean air act (CAA) requires that the EPA establish standards for certain pollutants in order to protect human health and welfare. National Ambient Air Quality Standards (NAAQS) have been established. Management activities that result in emissions are managed to meet established standards.

Particulate matter is the primary pollutant of concern in smoke. Particulate matter is a term used to describe dispersed airborne solid or liquid particles, which will remain in the atmospheric suspension form a few seconds to several months. Particulate matter less than 2.5 microns in diameter (PM2.5) or less than 10 microns in diameter (PM10) describes particles small enough to enter the human respiratory system. National standards for PM10 and PM2.5 are identified in Table 39.

Table 39: Particulate Matter Standards

Pollutant	Averaging Period	Primary NAAQS[1]
PM 10	Annual arithmetic mean	n/a
	24-hour	150 µg/m³
PM 2.5	Annual arithmetic mean	15 µg/m³
	24-hour	35 µg/m³

1. National Ambient Air Quality Standard

Environmental Consequences

Methodology

This analysis addresses the effects of implementing the proposed alternatives for the Patrick project area in relation to the issue “Fuel Loading” and associated fire behavior on National Forest Lands. Modified Fire Behavior was analyzed in terms of Fire Behavior Potential and Ecological Risk associated with the presence or absence of fire.

Key indicators used to compare the alternatives are: a) Fuel Loading and associated fire behavior potential-measured by Flame Length, Fire Type (surface/passive crown/active crown), Surface Rate of Spread, and Mortality in both the overstory and understory, and b) Vegetation departure from historical desired levels.

For the purpose of this analysis, mechanical treatments include commercial harvest, post-harvest non-commercial/pre-commercial thinning, non-commercial/pre-commercial thinning only, mastication and grapple and hand piling. These are all methods of mechanically treating areas that are overstocked, have a ladder fuel component, and/or have heavy concentrations of standing dead and down fuels. Pile burning and/or prescribed fire (under burning) would normally follow mechanical treatments in units

Fuel Loading and Fire Behavior Potential

Fire behavior modeling was used to predict the changes in fuel loading and fire behavior in the project area for the vegetation conditions that would exist for each alternative. Fire behavior model inputs for weather were obtained from weather records at the Blue Canyon RAWS and fuels models were determined based on the existing and future conditions after proposed treatment within stands. The modeling results show how alternative implementation would change fuel loadings, surface and crown fire behavior, and mortality within the project area.

Creating fire resilient forests with fuels treatments implies a three-part approach; reduce surface fuels through prescribed burning, reduce ladder fuels through small diameter thinning and burning, and reduce crown density in both the understory and overstory (Agee 2002 and Skinner 1996).

The following scientific principles can be used in reducing fire behavior potential in large fires:

1. Reduce surface fuel loads
2. Increase crown base heights
3. Reduce canopy density
4. Retain large trees which create shade and moderate wind speed

Crown characteristics that lead to crown fire are described by Finney (1998);

"A surface fire may make the transition to some form of crown fire depending on the surface intensity and crown characteristics (Van Wagner, 1977). The crown characteristics that are used to compute crown fire activity are:

- Crown base height
- Crown height
- Crown bulk density

Lower crown base height (including ladder fuels) facilitates ignition of the crown fuels by the surface fire and then, transition to some form of crown fire. Crown bulk density is used to determine the threshold values for active crown fire, which spreads much faster than a surface fire. Crown height is used as the upper level of the crown space for determining crown fuel loading and the starting height of lofting embers".

Table 40: Reduction of Fire Behavior Potential

Principle[1]	Effect	Advantage	Concerns
Reduce Surface Fuel	Reduces potential flame length	Control easier, less torching	Surface disturbance less with fire that other techniques
Increase canopy base height	Requires longer flame length to begin torching	Less torching	Opens understory, may allow surface winds to increase
Decrease crown density	Makes tree-to-tree crown fire less probable	Reduces crown fire potential	Surface wind may increase, surface fuel may be drier
Retain large trees	Thicker bark and taller crowns	Increases survivability of trees	Removing smaller trees is economically less profitable

1. Agee 2002

Spatial and Temporal Context for Effects Analysis

Direct and indirect effects will be those generally occurring within 1 – 20 years of implementation of an action alternative. Spatially, effects have a wide variety of levels. Mechanical treatment and on the ground prescribed fire effects are usually limited to treatment areas within the unit, stand, and/or fuel model(s). Air quality spatial effects are looked at from the air shed level, that would not only include the project area, but also the larger surrounding area that smoke would affect. Like the spatial context, the temporal effects of activities are quite different. Temporal effects directly tied to treatments on the ground may last for several years or longer (I.E. mechanical treatments), while air quality effects are

generally short duration as smoke generally dissipates in a few days and rarely lasts more than a few weeks. Cumulative effects would be the combined effects of past, present, and future proposed management activities. Cumulative effects would include both the proposed project activities and any additional effects resulting from past, present, and future management activities within the project area.

Vegetation and Fuels Management

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

The following table shows past vegetation and fuels management activities that have occurred within the project area.

Table 41: Past Projects within the Patrick Project Area (some projects are within multiple decades)

1980's	1990's	2000's	2010's
Bull Run	Patrick	California	Greenhorn
Chips	Buck Salvage	Jack	California
Cub	Cub	Three Cent	Jack
Dry	Chips	Geiser	Pinus Aspen
Firetruck	Dip	Gnat P/P	Woodtick
Flat	Cub Salvage	Camp	
Gimlet	Geiser Salvage	Geiser P/P	
Grays Buck	Gimlet	Patrick P/P	
Greenhorn	Grays Buck	Site	
Hale	Greenhorn	Curran	
Larch	Irish Quartz	Pat	
Liston	Mosquito	Geiser Salvage	
Petticoat	Pat		
Sherman	Pogue		
Snow Creek	Sherman		
Whitney	Slip		
	Tub		
	Wataho		
	Camp		
	Clay Liston		
	Midge		
	Patrick P/P		
	Camp Thin		
	Curran		
	Larch		
	LC Salvage		
	Pat Thin		
	Slip II Salvage		
	Three Cent		
	Pat Thin		
	Petticoat		
	Simpson		
	Midge		

Table 42: Past Activities within the Patrick Project Area

Years	Acres	Activity
1995-2012	9,378	Prescribed Fire (Broadcast, Jackpot, and Underburn)
1987-2012	6,177	Piling of fuels (Grapple and Hand Piling)
1982-2015	7,251	Pre-Commercial Thin/Thinning
1982-1998	1,746	Site preparation-burning

Years	Acres	Activity
1992-1999	1,334	Salvage Cut
1985-2011	6,531	Commercial Thin/Harvest
1996	12	Group Selection Cut
1999-2004	1,006	Improvement Cut
1999-2001	34	Single Tree Selection Cut
1987-1995	12,178	Overstory Removal Cut
1983-1999	1,842	Seed tree cut
1989-1999	2,321	Patch Clearcut (w/leave trees)
1982-1995	548	Patch Clearcut

Grazing

Multiple allotments are within the project analysis area. Grazing within the allotments is on-going and is planned to continue into the foreseeable future. This grazing will reduce some fine fuels within the project area each year. The overall effects of grazing within the project area on fuel loadings and the resultant fire behavior are expected to be minimal. For details on grazing within the Patrick Project area, refer to the Range Analysis

Reasonably Foreseeable Activities

Invasive Species Plan Implementation	ongoing
Powerline R.O.W. vegetation management	ongoing
Whitman Range grazing	ongoing
Austin Project (Malheur NF)	Implementation 2021
Little Dean Project	ongoing
Ten Cent Project	ongoing
Road/Highway maintenance-clearing	ongoing
Prescribed burning projects (Whitman/Malheur)	ongoing
Blue Mountains Forest Plan Revision	

Alternative 1 – No Action

Direct and Indirect Effects

Fuel Loading & Fire Behavior Potential

No action will result in no reduction in surface or aerial fuel loadings, and as a result the potential for adverse effects from wildland fire will remain and may increase. Within the analysis area, multi-layered stand structures, tree densities, and live vegetation continue to grow, and dead wood continues to accumulate, creating conditions that allow fire to move vertically from the ground level to the forest crown. Overstocked stand conditions will continue to increase the susceptibility of the stands to insects and disease, resulting in increased surface and crown fuel loadings and associated fire behavior potential. These conditions continue to limit firefighting opportunities, pose undesirable risk to private property, firefighter and public safety, and continue the risk of damaging impacts to natural resources.

The direct effects of alternative one is a continuation of heavy surface and canopy fuel loadings. Flame lengths exceeding four feet can be expected; continuing the risk of crown fire initiation, active fire spread (including onto private property and structures), and decreased opportunities to fight fire direct with hand tools. Crown base heights would remain low and canopy bulk densities would remain high. The potential for crown fire would remain for both single tree torching (Passive) and tree crown to crown spread (active). In some instances, fire suppression efforts would require backing off to areas of lighter fuels and natural breaks or using heavy equipment and aircraft. Not having the

opportunity to direct attack, a fire, combined with the limited access to much of the project area with engines increases the potential for a large, high severity wildfire. This type of fire has potential for resource damage from the need for heavy equipment to suppress the fire and from the direct fire effects, as well as increases the risk to firefighter and public safety.

Fuel models TL05 and TU02 best represent the majority of the project area, with fuel model TL07 also having some representation intermixed with the other fuel models. Multiple other fuel models are also represented in small patches intermixed throughout the project area. The following table shows the current expected fire behavior of the various fuel models that are within the project area.

Table 43: Current Expected Fire Behavior by Fuel Model

PVG	Stand Type	Ground Fuel Model	Description	Surface Flame Length ft.	Fire Type	Resultant Flame Length ft.	Rate of Spread (chains per hour)	Size at 1 Hours (acres)
Dry Upland Forest	Ponderosa Pine	TL05	High load Conifer Litter	2.8	Surface Fire	2.8	6.5	1.69
	Douglas-fir	TU02	Moderate load, humid climate timber-shrub	4.4	Passive Crown Fire	9.7	22.3	20.0
	Grand Fir	TU02	Moderate load, humid climate timber-shrub	4.4	Passive Crown Fire	24.2	33.1	44.1
Cold Upland Forest	Grand Fir	TL05	High load Conifer Litter	2.8	Passive Crown Fire	21.3	28.1	31.7
	Lodgepole Pine	TL07	Large downed logs	2.7	Passive Crown Fire	16.8	22.7	20.4
Moist Upland Forest	Grand Fir	TU02	Moderate load, humid climate timber-shrub	4.4	Passive Crown Fire	23.3	32.1	41.5

The direct effects of not treating acres with crown fire potential also increases the risk of mineral soil exposure during wildfire, increasing the potential damage to soil, vegetation, and water quality. The continued risk of high intensity fire poses an increased risk to deterioration of the view sheds along the highway 7 corridor and the North Fork Burnt River corridor (county road system), and the areas and communities within and around these areas. Additionally, high voltage power transmission lines cross through the project area and at risk of damage or destruction with high intensity fire activity.

Air Quality

The Patrick Project area is located approximately 21 air miles southwest of Baker City, Oregon and 3 air miles west of Sumpter, Oregon. The community of Whitney, Sumpter, Sumpter Valley, Deer Creek, and McEwan are all within close proximity to the project area, as well as State highway 7 (crosses through the project area) and Phillips Lake with the associated high used recreational areas (Campgrounds, trails, boating/fishing). Potential impacts from smoke generated from a wildfire to all these areas will continue to increase as fuel loadings increase over time.

The direct effects of a wildfire burning under the existing conditions has the potential to produce smoke levels that exceed visual and health standards within all of the above mentioned areas as well

as within the remainder of the Powder River and Burnt River Corridors where numerous ranches and private residences exist outside of the community boundaries. Local research found PM10 smoke production was twice as high for wildfires as for prescribed fire. This is due to wildfires generally occurring during the driest periods of the year in which there are low fuel moistures. Research in the Grande Ronde River Basin found the following levels of PM10 smoke emissions (Huff, Ottmar, et al. (1995)):

- Wildfire: 0.318 tons or 635 pounds per acre
- Prescribed Burning: 0.167 tons or 334 pounds per acre

In addition to the lower levels of smoke emissions from prescribed burning when compared to wildfire, wildfires ignite and burn under a multitude of weather conditions, including wind. Prescribed burning generally occurs when weather conditions are favorable to minimize the impacts of smoke to residential areas.

Nearby areas that may be impacted by wildfire smoke includes:

- Baker City (an smoke sensitive receptor area)
- City of Sumpter
- Deer creek/McEwan
- Whitney Valley
- Greenhorn
- Granite
- Black Mountain subdivision
- Numerous residential structures in and around Sumpter Valley, Powder River, and Burnt River
- Highway 7 (a portion of the Elkhorn Scenic Byway) and Phillips Lake recreation sites

Treatments identified for Alternatives 2 and 3 (Action Alternatives)

Alternative 2-proposed action

Treatments in alternative 2 include: Commercial thinning, thinning from below, Group Selection Harvest, Post and Pole Thinning, Defensible Fuel Profile Zones, Non-commercial thinning, Precommercial Thinning, Aspen Restoration and Maintenance, Grapple/Hand Piling, Pile Burning, Landscape Prescribed Fire, and Riparian Restoration. Harvest methods such as Leave Top Attached (LTA) and Whole Tree Yarding (WTY) will be utilized as well. These treatments target canopy, ladder and surface fuels with silvicultural operations and surface fuels with piling, pile burning, and prescribed burning.

Canopy and ladder fuels are reduced utilizing thinning operations that target specific crown characteristics, stand basal area, and canopy density. Treatments would manage towards favoring large trees for the appropriate biophysical environment that are resistant to insects, disease, and fire. Crown and canopy base heights would be increased through the thinning of the understory. Mechanical or hand piling would reduce the slash created from Commercial and Non-commercial thinning as well as the buildup of natural occurring fuels. Prescribed Fire would further reduce surface fuels and increase crown base heights by removing live limb wood in the lower portions of

the crowns. Reducing surface and crown fuels would reduce crown fire potential, potential flame lengths, and reduce the threat of high intensity wildfire.

Danger tree removal would occur along open system roads. No new permanent road construction would occur, but temporary roads would be constructed, and existing permanent roads would be maintained as warranted. No Inventoried Roadless Areas (IRAs) or potential wilderness areas are affected by this project

Alternative 3

Treatments within Alternative 3 differ from Alternative 2 in No Riparian Restoration would occur. Treatments in Alternative 3 would include all the same operations as alternative 2, excluding the Riparian Restoration Treatments, and reduced areas of commercial thinning, pre-commercial thinning, and piling of fuels that is identified within the Riparian areas identified in Alternative 2.

Table 44: Treatments designated by Alternative (Acres)

Upland Treatments	Acres
Commercial thinning from below (HTH)	18,639
Group Selection (HSG)	1,916
DFPZ-HTH	1,241
DFPZ- PP	3
Aspen Restoration-Release from conifers (Aspen-REL)	33[1]
Post & Pole (PP)	1,157
Commercial Thinning Total	22,989
Skyline	1,375
Ground Based	21,614
NCT	10,921
Grapple Pile	8,802
Hand Pile	2,119
PCT	19,502
Grapple Pile	18,173
Hand Pile	1,329
Post-Harvest Burning	17,565
Post NCT Burning	9,949
Stand Alone Burning	8,518
Alternative 2 RVR	
Vegetation Treatments	**Acres**
Commercial thinning from below (HTH)	481
Skyline	216
Ground Based	265
NCT	3,745
Grapple Pile	0
Hand Pile	3,745
PCT (connected to Harvest)	467
Grapple Pile	253
Hand Pile	213

1. This 33 acres is a combination of two delineated treatment units totaling 19 acres and individual, small aspen patches that have been identified within the project area. These smaller aspen patches were estimated at 2 acres each. The actual acreage will vary between individual patches but are expected to average approximately 2 acres based on field observations and past management.

Defensible Fuel Profile Zones (DPFZ)

Defensible fuel profile zones (DPFZ) have been designated as a treatment along several roads that cross through the project area. The areas adjacent to these roads are designated for treatment to

remove fuel loadings (both live and dead) to a level that would allow for firefighters to utilize the road system as a location to safely implement indirect attack strategies when a large wildfire occurs either within or outside the project area. The DPFZ's would vary in width along each side of the roadway up to a 300-foot width dependent upon vegetation conditions/types and topography along the roadway. Fuel and vegetation treatments would be similar to those of adjacent units outside the DPFZ except treatments would focus on creating spacing between overstory tree canopies and reducing ladder fuels and ground fuels to levels that would ensure fire would be on the ground or drop to the ground when it burns into the area. This would allow firefighters a safe and effective location to control wildfires when direct attack is not a viable option. Treatment of the DPFZ areas would occur at the same time as adjoining units.

Direct and Indirect Effects (Action Alternatives)

Fuel Loading and Fire Behavior Potential-action alternatives

The action alternatives propose a combination of vegetation and fuel treatments that research has shown will be effective at reducing fire potential. Several authors and/or papers have supported vegetation treatment in conjunction with fuels reduction as tools to reduce fire behavior. The principle goal of fuels reduction treatments is to reduce fire intensity, reduce the potential for crown fires, and improve the ability of forest stands to survive a wildfire (Agee, 2002). Stand structure and wildfire behavior are clearly linked (Biswell 1960, Cooper 1960, Dodge 1972, Rothermel 1991, Van Wagner 1977), so fuels reduction treatments are a logical approach to reducing extreme fire behavior. The most appropriate fuel treatment strategy is often thinning (removing ladder fuels and decreasing tree crown density) followed by piling and burning of fuels or other mechanical treatments that reduce surface fuel loadings, and then prescribed fire. This approach reduces canopy, ladder and surface fuels, thereby reducing both the intensity and effects of potential wildfires (Graham, McCaffery and Jain. RMRS-GTR-120).

Silviculture treatments that target reduction in canopy closure have the potential to reduce the development of all types of crown fires (Cruz et al. 2002, Rothermel 1991, Scott and Reinhart 2001, Van Wagner 1977) if surface fuels are concurrently treated. Canopy and ladder fuels will be reduced by forest thinning operations that target crown class's, stand basal area and canopy bulk density. Treatments would also maximize managing towards large trees that are resistant to insects, disease, and fire.

In forest stands that have not experienced fire or thinning for several decades, thinning combined with prescribed fire or other surface fuels treatments are necessary to effectively reduce potential fire behavior and crown fire hazard (Peterson et al, PNW-GTR-628). Crown and canopy base heights would be increased through the thinning of the understory (commercial and noncommercial thinning). Prescribed burning will also increase crown base heights by removing live limb wood in the lower portions of the crowns. Surface fuels would be reduced by prescribed fire and/or a combination of mechanical treatments and burning to remove and reduce fuel loadings (e.g. grapple pile and burn). Reducing surface and crown fuels would decrease crown fire potential and flame length. Modification of understory conditions toward a higher proportion of light fuels with low loadings of surface fuels will reduce the difficulty in application of prescribed fire, extending the time available when burning objectives can be met (prescription window), and decreasing the need to burn when the relative risk of ignition is otherwise high. Treatment and maintenance of thinned stands will be required to maintain surface fuel conditions and manage development of ladder fuels over time so as to limit future crown fire risk. Prescribed burning alone, particularly in forested stands where past disturbance cycles have been missed, tends to be difficult to implement and variable in effectiveness. Under the

best of conditions, prescribed burning will be inconsistent in terms of intensities, consumption, and area coverage due to natural variability of vegetation, topography and weather. This is particularly true on the cool/moist sites within the analysis area, which while on the drier end of that environment, are expected to burn in a patchy manner under spring or fall burning conditions, even with other silvicultural treatments.

Thinning and prescribed fire is expected to modify the understory microclimate. Expected results include a slight increase in solar radiation and surface temperatures, and an associated decrease in fine fuel moistures, as well as a small reduction in sheltering from wind. An increase in fine fuels, primarily grass and forbs is also anticipated. Combined, these changes are expected to result in a change in fire behavior. Fire will shift from burning in heavy surface fuels and ladder fuels under a continuous canopy with a high probability of crown fire initiation and spread, to fire burning in light surface fuels with few to no ladder fuels in an open canopy situation, where fire is predominantly a surface fire with low probability of crown fire initiation. Fires in light fuels are expected to be low intensity surface fires with occasional high intensity conditions where fuel, weather, and topographical conditions align. These high intensities are short lived as fire in light fuels spread relatively rapidly and burnout quickly, pose less resistance to control efforts, and are reactive to changes in fine dead fuel moistures. Reduction of ladder fuels, open canopies, and low surface fuel loading would decrease potential for crown fire initiation and spread. Reducing crown fire potential to a surface fire would also lessen the potential for long range spotting to occur. Fires in light fuels are less “severe” than those in heavy fuels as measured by consumption of surface fuels, soil heating, etc. In general, shifting a fire’s behavior from a crown to surface fire produces less severe effects and fewer impacts on resource values (Fitzgerald, PG 130, Fire in Oregon’s Forests).

The action alternatives have a similar impact on the acres undergoing treatment, the difference being in the acreage treated under each alternative. Acres treated by prescribed fire only are expected to experience higher burn intensities and associated mortality under wildfire conditions as compared to those acres treated with a more comprehensive combination of vegetation and fuel reduction treatments. Application of two to three prescribed fire treatments on stand-alone burn units will reduce this difference.

All treatments are expected to result in modifying fuel loadings in all stand types. Treatments that address all three levels of fuels: surface, ladder, and canopy, will be the most effective at moving expected wildfires out of the crowns and reducing flame lengths, and subsequently, producing a low intensity fire. These treatments are most successful where significant surface, ladder, and canopy fuels exist together. Burn only treatments that address primarily surface and to some degree ladder fuels will be effective in reducing surface fire intensity, particularly where ladder and crown fuels are not a concern. Burn only treatments are less effective in reducing crown fire potential under conditions where surface intensity is sufficient to move fire into crown fuels (summer season extreme weather), where ladder fuels exist, and where crown fuels are continuous.

Fire Behavior by Alternative:

The following table compares expected fire behavior of the three alternatives. Fire behavior was modeled for six stand types, dry upland forest-Ponderosa Pine, Douglas-fir, and Grand fir stands (majority of the project area); Cold upland forest-Grand fir and Lodgepole stands, and Moist upland forest-Grand fir stands. Similar fire behavior within the transition areas between forest types is expected to occur as vegetation composition shifts from one type to another. Expected fire behavior in action alternatives 2 and 3, post implementation, is expected to be the same, with less acres being implemented under alternative 3 which would leave more area in the existing condition. Flame length

is the distance between the flame tip and middle of the flame base, Rate of spread is distance per unit of time of the flaming front, and Fire Type is the expected type of fire that would be observed (surface, Passive Crown, Active Crown). The difference between surface and resultant models are surface is the consistent behavior observed as the fire spreads through the surface fuels and the resultant takes into account the passive crown fire activity that would be observed.

Table 45: Fire Behavior by Alternative, Dry upland forest-Ponderosa Pine, Douglas-fir, Grand fir stands

	Ponderosa Pine		Douglas-fir		Grand fir	
	Alternative 1-95 percentile weather	**Alternative 2 & 3- 95 percentile weather**	**Alternative 1-95 percentile weather**	**Alternative 2 & 3- 95 percentile weather**	**Alternative 1-95 percentile weather**	**Alternative 2 & 3- 95 percentile weather**
Flame Length (surface)	2.8 feet	1.4 feet	4.4 feet	1.4 feet	4.4 feet	1.4 feet
Flame Length (resultant)	2.8 feet	1.4 feet	9.7 feet	1.4 feet	24.2 feet	1.4 feet
Rate of Spread (surface)	6.5 CH/HR	2.9 CH/HR	15.4 CH/HR	2.9 CH/HR	15.4 CH/HR	2.5 feet
Rate of Spread (resultant)	6.5 CH/HR	2.9 CH/HR	22.3 CH/HR	2.9 CH/HR	33.1 CH/HR	2.5 feet
Fire Type	Surface	Surface	Passive Crown	Surface	Passive Crown	Surface

Table 46: Fire Behavior by Alternative, cold and moist upland forest-Grand fir and Lodgepole stands

	CUF-Grand Fir		CUF-Lodgepole Pine		MUF-Grand Fir	
	Alternative 1-95 percentile weather	**Alternative 2 & 3- 95 percentile weather**	**Alternative 1-95 percentile weather**	**Alternative 2 & 3- 95 percentile weather**	**Alternative 1-95 percentile weather**	**Alternative 2 & 3- 95 percentile weather**
Flame Length (surface)	2.8 feet	1.4 feet	2.7 feet	1.8 feet	4.4 feet	0.8 feet
Flame Length (resultant)	21.33 feet	1.4 feet	16.8 feet	1.8 feet	23.3 feet	0.8 feet
Rate of Spread (surface)	6.5 CH/HR	2.5 CH/HR	4.2 CH/HR	3.6 CH/HR	15.4 CH/HR	1.3 CH/HR
Rate of Spread (resultant)	28.1 CH/HR	2.5 CH/HR	22.7 CH/HR	3.6 CH/HR	32.1 CH/HR	13.CH/HR
Fire Type	Passive Crown	Surface	Passive Crown	Surface	Passive Crown	Surface

Probability of Mortality within the Alternatives:

With no action, expected probability of mortality in all stand types would be very high. Very few of the overstory trees would survive a wildfire start in any of the various forest types. After treatment, all forested stand types would have lower probability of mortality for the various species within the stands. In a post treatment wildfire, larger trees would have a good chance of survival, with the highest mortality being in the smaller diameter classes. It is important to note that modeling has built in default low end and high-end mortality rates that do not change once a certain preset level is met. For example, with ponderosa pine, the lowest mortality rate that is achievable is .04 (4%), no matter how low the flame lengths get.

Table 47: Mortality of Species by DBH in post treatment stands

Probability of Mortality (%)-existing condition							
		DUF			CUF		MUF
Species	**size classes**	**PIPO**	**PSME**	**ABGR**	**ABGR**	**PICO**	**ABGR**
Fir, Grand	0-8" DBH	78	100	100	100	100	100
Fir, Grand	9-16" DBH	35	98	99	99	99	98
Fir, Grand	17-21" DBH	17	n/a	97	97	97	97
Fir, Grand	22+" DBH	n/a	n/a	94	94	94	93
Larch, Western	0-8" DBH	87	100	100	99	100	100
Larch, Western	9-16" DBH	27	98	98	98	98	98
Larch, Western	17-21" DBH	n/a	57	94	95	94	95
Larch, Western	22+" DBH	n/a	n/a	n/a	93	91	n/a
Pine, Lodgepole	0-8" DBH	86	100	100	100	100	100
Pine, Lodgepole	9-16" DBH	53	100	100	100	100	100
Pine, Lodgepole	17-21" DBH	n/a	n/a	99	99	99	99
Pine, Lodgepole	22+" DBH	n/a	n/a	n/a	n/a	99	n/a
Pine, Ponderosa	0-8" DBH	79	100	100	100	100	100
Pine, Ponderosa	9-16" DBH	19	97	98	98	98	98
Pine, Ponderosa	17-21" DBH	8	60	94	95	95	96
Pine, Ponderosa	22+" DBH	4	11	90	90	90	90
Douglas-fir	0-8" DBH	77	100	100	100	100	100
Douglas-fir	9-16" DBH	22	95	98	98	98	98
Douglas-fir	17-21" DBH	9	59	93	95	95	94
Douglas-fir	22+" DBH	4	31	90	90	92	90
Crown Scorch Height (feet)		12.2	60.2	163.8	143	111.6	157.6
Resultant Flame Length (feet)		2.8	9.7	24.2	21.3	16.8	23.3
Fire Type		surface	Passive Crown	Passive Crown	Passive Crown	Passive Crown	Passive Crown
Probability of Mortality (%)-post treatment							
		DUF			CUF		MUF
Species	**size classes**	**PIPO**	**PSME**	**ABGR**	**ABGR**	**PICO**	**ABGR**
Fir, Grand	0-8" DBH	n/a	n/a	n/a	53	n/a	n/a
Fir, Grand	9-16" DBH	n/a	n/a	30	30	25	24
Fir, Grand	17-21" DBH	17	n/a	15	15	15	15
Fir, Grand	22+" DBH	n/a	n/a	7	7	7	8
Larch, Western	0-8" DBH	70	56	56	56	31	56
Larch, Western	9-16" DBH	27	23	20	20	20	20
Larch, Western	17-21" DBH	n/a	9	7	9	9	8
Larch, Western	22+" DBH	n/a	n/a	n/a	6	7	n/a
Pine, Lodgepole	0-8" DBH	n/a	n/a	n/a	n/a	n/a	n/a
Pine, Lodgepole	9-16" DBH	n/a	n/a	n/a	53	50	n/a

Probability of Mortality (%)-existing condition							
Pine, Lodgepole	17-21" DBH	n/a	n/a	n/a	39	34	n/a
Pine, Lodgepole	22+" DBH	n/a	n/a	n/a	n/a	26	n/a
Pine, Ponderosa	0-8" DBH	56	56	56	49	45	56
Pine, Ponderosa	9-16" DBH	17	17	17	17	17	17
Pine, Ponderosa	17-21" DBH	8	9	8	9	8	8
Pine, Ponderosa	22+" DBH	4	4	4	4	5	5
Douglas-fir	0-8" DBH	56	n/a	56	40	42	56
Douglas-fir	9-16" DBH	17	17	17	17	20	17
Douglas-fir	17-21" DBH	9	8	10	9	8	10
Douglas-fir	22+" DBH	4	4	5	5	5	4
Crown Scorch Height (feet)		2.7	2.7	2.7	2.5	4.5	0.6
Resultant Flame Length (feet)		1.4	1.4	1.9	1.4	1.8	0.8
Fire Type		surface	surface	surface	surface	surface	surface

1. n/a indicates that species and size class did not exist in modeling/stand data

Air quality

Several management techniques will be implemented to limit air quality impacts. The use of prescribed fire in this area would create a short-term smoke impact. This would be transient and may last for more than 72 hours per occurrence. Prescribed burns would be planned so that factors such as wind direction and air mass stability would help limit the effects of smoke (e.g. smell, eye irritation) on local residents, campers, or the general public. In the evenings, the residual smoke would tend to follow the local wind patterns, and flow down slope into the Burnt River Drainage towards Unity and within Whitney Valley. Experience from several prescribed fires in the same vicinity as the project area has shown that the effects of this smoke can be minimized by controlling length and time of ignition and burning under favorable mixing conditions for smoke dispersion and direction. Local residents would be contacted in the vicinity of the prescribed fire and appropriate safety signs and other methods would be used to warn motorists.

Whole Tree Yard (WTY) fuels treatments will be used for most ground based harvest units, and Leave Top Attached (LTA) fuels treatments will be used for most skyline harvest units, reducing the amount of residual surface fuel that would otherwise be burned during prescribed fire implementation. The fuels removed during these operations would be piled and burned during the fall/winter timeframes when smoke concerns would have the lowest potential to have negative impacts on local residence or motorist passing through the area.

Activity and Natural Fuel burns will be implemented during the spring and fall resulting in the consumption of surface fuels while limiting damage to overstory vegetation. Burns vary in size and will be designed where possible to allow for modification in burn acreage based upon emission limitations. Where burns are a first entry event, smoldering of larger material, particularly stumps and down logs, can be expected to last for several days. Where previous burning has occurred, maintenance or re-entry burns will produce much less smoldering and overall have reduced emissions, both in terms of amount and duration.

Landing, Grapple, and Hand pile burning will most likely occur late fall through mid-winter. Burn areas can be tailored to meet favorable emission conditions by limiting and varying the number and location of piles burned at any particular time. Piles will consume with a minimum of smoldering as

they burn with a much higher intensity than seen with underburning, due to typical fuel moistures found with piled material and vertical nature of the piled fuels.

All burning will be conducted in compliance with Oregon DEQ requirements and applicable agreements. Burns will be registered, planned, accomplishment reported, and monitoring conducted as specified in the Oregon Smoke Management Plan (OAR 629-048, 2008). Burn plans will address smoke management concerns and requirements. During implementation, certified burn bosses will follow smoke management direction (currently provided by Oregon Department of Forestry smoke forecasters) in their planning and application of fire.

Treatment Effects:

Stocking level treatment effectiveness would last for 20 to 30 years (ladder and crown fuels) while surface fuel treatments are expected to remain effective for about 10 years. Maintenance burning would be used to maintain both future stocking levels, control regeneration, and surface fuel accumulation by maintaining fuel loading in the range of 7 tons per acre or less.

Flame lengths would be reduced to 1 – 4 feet on treated acres. Most fire behavior models show less than 10% mortality in ponderosa pine, western larch, and Douglas-fir overstory with flame lengths less than 4 feet and fire being contained to the surface (No passive or Active crown fire). Hand crews can use direct fire suppression tactics when flame lengths do not exceed four feet. Engines and dozers (where roads and terrain allow) can directly fight fire with 4 – 8 foot flame lengths. Having the opportunity to utilize direct suppression tactics decreases the potential fire size, the risk to public and firefighter safety, and private property and structures.

Thinning treatments would be designed to leave the largest and healthiest trees on site to provide shading of surface fuels and reduced surface wind speeds. Smaller diameter tree densities would be reduced to minimize the potential for crown fire initiation. This partially shaded gap between the surface and crown fuels would be increased through pruning with prescribed fire, minimizing the potential for crown fire. This kind of treatment is known as “thinning from below” or “low thinning” and mimics mortality caused by surface fire (Graham et al., 1999 PNW-GTR-43).

Long range spotting potential decreases as crown fire potential and flame lengths decrease, potential flame lengths are reduced, and firefighting opportunities to direct attack a fire within the corridor are increased.

Cumulative Effects

Air Quality

Air resources are somewhat unique in that, the past impacts to air quality are not usually evident. Smoke emissions during the spring and fall months primarily result from Federal prescribed fire activities (BLM and FS) in northeast Oregon and western Idaho. Federal land managers currently coordinate to manage the cumulative effects of prescribed burning across northeast Oregon. Private landowners treating forest fuels where under the protection of Oregon Department of Forestry are required to follow the advice of the Departments smoke management forecaster when burning.

Other emission concerns include summer wildfires, agricultural burning, and home heating in local communities. Both wildfires and agricultural burning typically occur mid to late summer. Home heating is generally limited to the winter months. In all three instances, the additional emissions

produced are low and are not expected to impact air quality at the time of prescribed fire implementation.

Under any alternative that calls for burning, there is a potential for future restrictions to meet air quality standards.

Known Current, and Future Adjacent Projects

Past and ongoing Forest Service projects as well as adjacent ownerships of private property can influence management options for fuel treatments and prescribed fire. Numerous recent fuel treatment activities have been planned and implemented or are pending implementation near the Patrick Project Area. These planned activities will not overlap in space as the project areas are distinct separate areas. For implementation, coordination between projects occurs at the forest level with cooperators as well as with smoke management personnel to coordinate activities so that any simultaneous implementations will not cause adverse impacts to the air sheds or other resources that may be impacted.

Prescribed Fire Underburn

Ten Cent	planned
Austin	planned
Little Dean	ongoing
Deer, Union Miners, Baboon	ongoing
BEMA	ongoing
Broman	ongoing
Mile 9/Sheep	ongoing
Greenhorn	ongoing
Crawford	ongoing

Prescribed Fire Pile Burning

Ten Cent	ongoing
Austin	planned
Little Dean	ongoing

Community Assistance/Cooperators Activities

Community assistance plans that identify additional wildland/urban interface and opportunities for fuels treatments in urban interface areas adjacent to national forests would enhance the Forest Service's ability to treat areas adjacent to urban interface and in protecting high risk, high value areas. The ability to treat acres across agency boundaries and on private ownership contributes to long-term forest health, mitigation of large fires, reduction of suppression costs and greater firefighter and public safety. The amount treated annually is difficult to predict due to a number of factors, but is predicted to increase. Coordination with others that are implanting fuels treatments occurs as mentioned above with cooperators and smoke management personnel to prevent negative effects on resources.

Wildfire Management

Other ownerships adjacent to or surrounded by lands administered by the forest service affect opportunities to use fire, and therefore to emulate historical wildland fire effects, on large landscapes. In general, private landowners use timber harvest rather than wildland fire to manage their vegetation.

Wildland fire may be used to treat fuels, but treatments are often limited in extent and effect. The proximity or inclusion of private lands can be a limiting factor in the use of wildland fire. These fires can burn large areas for long time periods depending on the vegetation, fuels, weather, and other factors.

Wildland Urban Interface

Wildland Urban Interface will continue to change over the life of the project. As community wildland urban interface plans are updated, additional WUI areas may be added beyond what is currently identified and priorities/recommendations for each WUI can change. The Patrick Project Area contains portions or the entirety of four WUI areas; Whitney, Greenhorn, Woodtick Village/Rattlesnake Estates and Sumpter Valley. The trend indicates that people will continue to move to western states and build houses adjacent to NFS lands. This will have an effect on wildland fire and fuels projects with input by the public in support or not of those projects. It will also affect the use of wildland fire by limiting wildland fire in some areas because of social and political concerns.

Climate Change and Fire

The combined effects of droughts and insects may lead to a pulse of tree mortality that increases the potential for intense fires. There is a short-term and a long-term facet to the increase in potential fire intensity. In the short-term, warmer, drier conditions will limit the capacity of the ecosystem to maintain the quantity of vegetation currently growing on site. As this stress continues, vegetative capacity to resist insect, disease, and other disturbance mechanisms is reduced and the potential for mortality increases. Increased mortality provides additional available fuel for wildfire, thus increasing fire potential. Once the dead foliage drops, this danger may be considerably reduced for a few years. However, as the trees decay over the next decade or so following the pulse of mortality, they fall and can help create and an accumulation of large, heavy fuels. These large and heavy fuels contribute to a longer-term potential for intense fires since they may take many years to decompose, especially in the dry environments of the west.

Even in the absence of increased mortality from either drought or insects, a warming climate would likely alter fire regimes in ways that would make it more difficult to manage forests influenced by many decades of fire suppression and other activities. Climate change influence fire regimes in complex ways due to differentials in responses to variation in temperature and precipitation regimes. Both tree-ring records and modeling indicate that the probability of having fires is primarily driven by temperature, whereas the extent and intensities of fires is driven more strongly by precipitation patterns. Warmer temperatures lead to an earlier onset and later end for the drying period, thus increasing the probability of a fire during the longer fire season. Precipitation influences the growth of vegetation (fuels). The amount of precipitation during the wet season will influence the amount of fuel produced.

Both action alternatives manage the forest ecosystem so that it is better able to accommodate climate change and to respond adaptively as environmental changes accrue. The action alternatives encourage gradual adaptation to change to a warmer and drier environment by favoring disease and fire resistant trees, reducing stand density, and lowering fuel loadings.

Other Activities

Livestock grazing would continue to reduce fuel loading in fine herbaceous fuels and can limit fire spread rates. Fuel wood cutting would continue to remove large diameter fuels, but this would have

an insignificant effect on fuel loadings in the 0 – 3 inch diameter class which is the fuels in which a fire spreads.

Summary of Effects

Vegetation and fuels treatments outlined in the two action alternatives all address, to differing degrees, the objective of moving the landscape toward a condition of reduced risk of high severity and extent of disturbance, taking into account changes in climate.

The two action alternatives will result in a reduction in the intensity and severity of future summer wildfires. Through reduction of accumulated fuels and modification of stand structure toward a more open, fire resilient spacing and species composition, treatments will increase management options for fire managers when determining how to deal with future wildfires.

Wildlife

This report describes the existing wildlife habitat conditions in the Patrick analysis area and the effects of the project alternatives, including direct, indirect, and cumulative effects to wildlife and their habitats. A Biological Evaluation was completed in a separate document to address effects to Endangered, Threatened, and Sensitive species.

Management Indicator Species (MIS)

The National Forest Management Act (NFMA) regulations require that Forests provide habitat capable of maintaining viable populations of selected species, including management indicator species (MIS)(36 CFR 219.19). The Forest Plan identifies five wildlife species, or groups of species, as management indicator species. These species serve as indicators of the effects of management activities by representing a larger suite of species using the same type of habitat (Table 48). MIS life history, risk factors, conservation status and population trend, as well as habitat condition and species viability are described in detail in the Wallowa-Whitman National Forest MIS assessments (Penninger and Keown 2011a, b, and c). Portions of those assessments are summarized in the discussions below.

Table 48. MIS and their primary habitats

Species	Habitat
American marten	Old-growth and mature forest
Northern goshawk	Old-growth and mature forest
Pileated woodpecker	Old-growth and mature forest
Primary cavity excavators*	Snags and logs
Rocky mountain elk	Cover and forage

* Northern flicker; black-backed, downy, hairy, Lewis', three-toed, and white-headed woodpeckers; red-naped and Williamson's sapsuckers; black-capped, chestnut-backed, and mountain chickadees; and pygmy, red-breasted, and white-breasted nuthatches.

Scale of Analysis

Correct determination of the scale of analysis is the cornerstone of habitat analysis (Morrison et al. 2006). The choice of spatial scale must be based on the species' relationship with the landscape and should consider the scale at which to apply our results for management purposes (Morrison et al. 2006). Wildlife habitat is commonly analyzed at the watershed scale because it provides a systematic way to understand and organize ecosystem information and thus enhances the ability to estimate direct, indirect, and cumulative effects of management activities (Regional Interagency Executive Committee 1995). However, the watershed scale may be too fine to analyze viability for wide-ranging

species' unless it can be placed within the broader context of how the watershed contributes to overall species viability (Regional Interagency Executive Committee 1995).

Impacts to MIS species within the Patrick Project area were determined by analyzing effects to their habitat at several spatial scales starting with the watershed, then framing that within the context of the Wallowa-Whitman National Forest and the Blue Mountains Ecological Province. These scales take into account the species' relationship with the landscape as well as being practical for management purposes. MIS population viability assessments have been conducted for American marten, pileated woodpecker, and northern goshawk at the Blue Mountains and WWNF scales (Wales 2011a, Wales 2011b, Wales 2011c). These assessments are incorporated by reference within the existing condition and effects analysis for each species. For more in-depth information on the methodology behind these assessments, please refer to the full-length assessments in the project record and the associated peer-reviwed literature (Wales 2011a, Wales 2011b, Wales 2011c).

Topics and Issues Addressed in This Analysis

Purpose and Need

Managing forest structure, composition and density toward the historic range of variability will increase the likelihood that viable populations of wildlife species will persist on the forest as mandated in the National Forest Management Act. Increasing the structural complexity and species diversity of vegetation would provide habitat for a greater number of wildlife species within the project area. Maintaining and restoring wet meadows, quaking aspen, mountain mahogany, and deciduous riparian shrubs would provide valuable wildlife habitat. Increasing the amount of single-story old forest would provide habitat for sensitive species such as the white-headed woodpecker that are nearly absent from the project area.

Issues

Disturbance associated with open roads, combined with a decrease in forest cover from the proposed harvest treatments, may contribute to poor elk distribution.

Resource Indicators and Measures

Table 49. Resource indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address: P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)?
Elk	Elk security	Acres within project area > 0.5 miles from open roads	Yes	Research – Johnson et al. (2005a), Ager et al. (2003), Rowland et al. (2000), Hillis et al. (1991), Ranglank et al. (2017), Ranglank et al. (2017)
Elk	Elk security	Acres within project area > 1.0 miles from open roads	Yes	Research – Johnson et al. (2005a), Ager et al. (2003), Rowland et al. (2000), Hillis et al. (1991), Ranglank et al. (2017), Ranglank et al. (2017)
Elk	Elk security	HEI value	Yes	LRMP Standard (4-57)

Old-growth Habitat

Old-growth habitat is categorized and analyzed in 2 categories according to the LRMP: 1) late/old structure (LOS) habitat; and 2) MA15 – Old-growth Preservation. Habitat covered by either category is intended to provide for old-growth associated wildlife species; however, the two terms have different administrative implications. LOS is a general term referring to old forest multi-story (OFMS) and/or old forest single-story (OFSS). Maintaining connectivity and reducing fragmentation of LOS stands is important for the movements of old growth associated species. MA15 land is specifically designated for Old-Growth Preservation. These old-growth areas are intended to maintain habitat diversity, preserve aesthetic values, and to provide old-growth habitat for wildlife.

Range of Variation

Regional Forester Amendment #2 of June 12, 1995 established interim riparian, ecosystem, and wildlife standards for timber sales (these standards are referred to as the "Eastside Screens"). The Eastside Screens require that a range of variation approach be used when comparing historical reference and current conditions, incorporating the best available science. The range of variation approach assumes that native species have evolved with the historical disturbance regimes of an area and so a forest will continue to sustain populations of those species if current conditions fall within the historic range of variation (Powell 2010).

Single-story old forest is extremely deficient within the project area and species such as the flammulated owl, common flicker, and white-headed woodpecker, that are adapted to an open forest structure, are currently experiencing population declines. Both action alternatives would maintain existing old forest and bring the project area closer to HRV. This would increase the likelihood that species associated with single-story old forest would continue to persist.

Management of old forest structure and old forest preservation stands (MA-15) is identified as a vegetation issue for this project area and is addressed in detail in the silviculture report.

Marten

The marten (*Martes americana*) is one of the most habitat-specialized mammals in North America (Bull and Heater 2001), making it a good indicator species for the mature, mesic coniferous forests it inhabits. Martens require complex physical structure in the forest understory contributed by coarse woody debris and lower branches of trees and shrubs (Buskirk and Ruggiero 1994, Witmer et al. 1998, Bull and Heater 2000). A complex physical structure near ground level provides protection from predators, protective thermal microenvironments, and access to the subnivean space where most prey are captured during winter (Buskirk and Ruggiero 1994, Witmer et al. 1998, Bull and Heater 2000). Martens in northeastern Oregon have been documented using large-diameter hollow trees and logs, accumulations of coarse woody debris, and trees with brooms for denning and resting sites (Bull and Heater 2000). Based on research data compiled in the DecAID Wood Advisor (Mellen-Mclean et al. 2009) for eastside mixed conifer forests, 70% of martens in the populations studied used snags > 23.9 inches DBH for denning and resting, and down wood > 20.7 inches DBH for denning, resting, and foraging.

Home range estimates for marten are variable and may be influenced by habitat quality, prey availability, predation risk, and intraspecific interactions (Bull and Heater 2001, Buskirk and Ruggiero 1994). A review of 19 studies reported home range estimates between 2.0 and 27.0 km^2 for males and 0.6 to 17.0 km^2 for female marten (Powell 1994). Martens in northeastern Oregon exhibited larger home ranges than those found in many studies with an average home range size of 2717 ha (27 km^2) for males and 1416 ha (14 km^2) for females (Bull and Heater 2001). Bull and

Heater (2001) recommended managing larger areas (27 km^2 per breeding pair) for marten in northeastern Oregon. Managing for adjoining home ranges and allocating appropriate patches of habitat within 33 km (mean dispersal distance) will increase the probability of retaining viable populations (Bull and Heater 2001). Martens will not travel far from substantial overhead forest cover, so preserving direct corridors between suitable habitat is essential (Witmer et al. 1998). Habitat used for dispersing or traveling may lack some of the components of habitat used for reproduction and foraging, but generally has a canopy closure ≥ 50%, a large down wood component, and a high density of trees (Bull et al. 2005).

Habitat fragmentation at the landscape and stand scale can pose a threat to marten population viability. Potential obstacles to movement of marten across the landscape include highways, railroads, and utility corridors. An ongoing factor contributing to habitat fragmentation on the Wallowa-Whitman is the high density of roads and associated reductions in snags and logs from firewood removal and danger tree management.

There is a trapping season for marten in the Blue Mountains but Oregon Department of Fish and Wildlife trapping records indicate this is a minor source of mortality. Marten habitat that is easily accessed during winter may function as a population sink, however, the majority of marten habitat is inaccessible during the winter trapping season. Other factors that influence marten populations include mortality from intra-specific strife, predation, and prey abundance and availability (Penninger and Keown 2011). It is not clear to what extent these factors influence the marten populations in the Blue Mountains but some of these risks may be mitigated by increasing habitat quality and quantity. Recommendations for managing marten habitat in Oregon include maintaining currently occupied habitat, minimizing forest fragmentation around core sites, increasing and reconnecting suitable habitat patches in the vicinity of known populations, and restoring functional landscape connectivity to enable recolonization (ODFW Conservation Strategy 2019).

Existing Condition

Blue Mountain/WWNF Population Viability- While furbearer trapping reports are too sparse to derive a trend in the population, they do confirm the persistence of a population in the Blue Mountains (Penninger and Keown 2011). Results of occupancy surveys in 2010 detected marten in six of seven sample units on the Wallowa-Whitman (Penninger and Keown 2011). In Addition, The Wolverine Foundation and the Oregon Department of Fish and Wildlife have detected marten at multiple locations throughout the Eagle Cap Wilderness during carnivore surveys.

Wales (2011a) conducted a viability assessment for marten at the Blue Mountains and Wallowa-Whitman National Forest scales. Wales' analysis used vegetation data to determine the existing amount of source habitat, the departure from historic conditions, and the quality of the source habitat (habitat that contributes to stationary or positive population growth and to long-term population persistence). A watershed index (WI) score was derived for each watershed by evaluating the departure from historic condition and several parameters of habitat quality. A watershed with a high watershed index score provides habitat of the quality, quantity, and distribution necessary to support a self-sustaining and well-distributed marten population. The WI scores were then weighted by the amount of source habitat currently existing in each watershed to derive a weighted watershed index (WWI). Watersheds with the highest WWI scores are considered to provide the greatest contribution to species viability on the forest. The WI and WWI were then combined with a habitat distribution index (an index of how watersheds with a high amount of source habitat are distributed across the Blue Mountains) to derive a viability outcome score. A viability outcome score is an index of the capability of an area to provide for a viable marten population. A viability outcome score was

calculated for both the Blue Mountains and the Wallowa-Whitman and the score was nearly the same at either scale. The viability outcomes for the current condition were lower than the historical outcome scores. However, habitat is estimated to currently exist in the quality, quantity, and distribution capable of supporting a viable marten population on the Wallowa-Whitman (Penninger and Keown 2011).

North Fork Burnt River Watershed- The Patrick project area lies primarily within the North Fork Burnt River watershed. This watershed currently contains 2,198 acres of marten source habitat, which is 18% of the 11,900 acres of potential source habitat within the watershed. The weighted watershed index indicates this watershed provides a relatively small contribution to marten population viability on the forest. This watershed currently provides ≥ 40% of the median amount of source habitat that occurred historically, which is above the threshold necessary to support marten population viability (Penninger and Keown 2011).

According to a GIS query, the Patrick project area contains 1304 acres of marten source habitat that could contribute to a stable or increasing population (defined here as cold moist and cold dry vegetation groups with > 50% canopy cover in the Old Forest structural stages as well as cold moist and cold dry vegetation groups not in an Old Forest structural stage, but having trees 24-35" DBH). In addition, the project area contains 2755 acres of secondary habitat that could be used for foraging, resting, or traveling (cold moist and cold dry vegetation groups with > 50% canopy cover and trees 19-24" DBH) and 7,569 acres of potential habitat that currently does not provide habitat but could potentially provide marten habitat at some time in the future (cold moist and cold dry vegetation groups currently not meeting the criteria for source or secondary habitat). However, the majority of source habitat within the project area occurs in isolated patches that are less than 100 acres in size. In contrast, the average home range size of a male marten in northeastern Oregon is 6,671 acres.

Environmental Consequences

Alternative 1 – No Action

There will be no direct or indirect adverse effects to marten from alternative 1 because no timber harvest, fuels treatments, or transportation activities will occur. Existing marten source and secondary habitat would remain unchanged.

Alternatives 2 and 3

Due to the decrease in canopy cover, treatments under alternatives 2 and 3 are expected to remove marten source habitat under both action alternatives. Silviculture treatments proposed under alternative 2 would remove 866 acres (66%) of existing source habitat and alternative 3 would remove 803 acres (62%) of existing source habitat Table 50). Impacts to marten source habitat are expected to last several decades as canopy closure recovers and tree diameters increase during that period.

Table 50. Proposed Treatment in Marten Source Habitat

	Alternative 1	Alternative 2	Alternative 3
Total acres of source habitat removed	0	866	803
Percent of source habitat within watershed removed	0	66%	62%

Percent of forest-wide source habitat removed	0	<1%	<1%

Prescribed fire and non-commercial harvest have the potential to reduce understory and down wood densities but is unlikely to reduce canopy closure below suitable levels. Therefore, prescribed fire and non-commercial treatments are expected to degrade, but not remove, marten habitat on 338 acres under alternative 2, and 119 acres under alternative 3.

Dwarf mistletoe, more specifically the brooms produced by dwarf mistletoe infection, has been identified as a structural component of marten habitat. In northeastern Oregon, Bull and Heater (2000) reported that 19% of tree platforms used by marten for resting were formed by mistletoe. In addition, mistletoe brooms provide resting structure for potential prey species including red squirrels and flying squirrels. Bull et al. (2004) reported reductions of northern flying squirrel densities in stands treated for mistletoe reduction. Both action alternatives propose to reduce available mistletoe on the landscape through mechanical treatments. Because stands currently show uncharacteristically high levels of dwarf mistletoe, commercial timber harvest prescriptions for stands with existing mistletoe would include removal of infected trees to some degree, depending on stand condition.

Removal of mistletoe-infected trees within currently suitable marten habitat would degrade habitat quality. Proposed treatments would reduce available resting structures for marten and potential prey species that use these structures. In some areas, removal may also limit recruitment of future down logs. Retention of mistletoe-infected trees, 21 inches DBH or greater, would allow some treatment units to retain a level of resting structures likely to be more beneficial to marten and prey.

Hazard tree removal along haul routes through source habitat would potentially remove snags in proximity to roads where snag densities are already low due to past and ongoing firewood gathering. Activities that increase overall human presence and project-related noise levels, including temporary road reconstruction as well as timber harvest, may temporarily displace marten locally in the short-term (i.e. during implementation), but are not expected to impact marten distribution or productivity within the project area in the long-term.

Cumulative Effects – Alternative 1

Because there would be no direct or indirect effects to marten from alternative 1, there would be no cumulative effects.

Cumulative Effects – Alternatives 2 and 3

Appendix A of the EA was reviewed for actions that might affect marten habitat within the North Fork Burnt River watershed. Additionally, silviculture activities proposed in the adjacent Austin Vegetation Management Project have the potential to degrade or remove additional source habitat for marten but are not expected to change the viability outcome because source habitat will remain well distributed. On Forest Service lands within and outside the project area, firewood cutting, and hazard tree removal will continue to reduce available snags and logs, but the effect is limited to areas adjacent to open roads. Recreation activities including the use of OHV and snowmobile trails could cause additional disturbance and marten may avoid these areas during periods of human use. However, the effect would be temporary so it would not influence population viability under current levels of use. The future Travel Management Plan in combination with the post-sale road management plan in this project could further reduce road densities and cross-country motor vehicle use thereby increasing habitat permeability and reducing threats for marten. However, it is unlikely

that the road management plan proposed in this project would have a significant effect at the population scale.

Summary

Because this project impacts less than 0.006% of suitable habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative effect to marten habitat. The decrease in habitat quality due to the Patrick Vegetation Management Project would be insignificant at the Forest scale. The Patrick project may reduce habitat permeability at a localized scale but impacts at the Forest scale would be immeasurable. Post-treatment availability of source habitats would continue to exceed the threshold of 40% of the historical amount in the North Fork Burnt River watershed under both action alternatives, thereby continuing to contribute to species viability on the Forest.

Northern Goshawk

Source habitats for goshawk are old forest and unmanaged young forests in montane, lower montane, and riparian woodland communities. Important habitat attributes of goshawk prey species include snags, down logs, woody debris, large trees, openings, herbaceous and shrubby understories, and an intermixture of various forest structural stages (Wisdom et al. 2000). During winter some goshawks may travel short distances to lower elevations and more open habitats in all upland woodland types (Wisdom et al. 2000).

Goshawks use broad landscapes that incorporate multiple spatial scales to meet their life requisites (Squires and Kennedy 2006). At least three-levels of habitat scale are recognized during the breeding season: (1) a nest area, composed of one or more forest stands or alternate nests; (2) a post fledging area (PFA), which is an area around the nest used by adults and young from the time of fledging, when the young are still dependent on the adults for food, to independence; (3) and a foraging area that comprises the breeding pair's entire home range.

Nest Areas

The nest area (also commonly referred to as the nest site) is the area immediately surrounding the nest tree and includes the forest stand containing the nest tree(s). Reynolds et al. (1992) defined a nest area as approximately 30 acres (12 ha) in size that is the center of movements and behaviors associated with breeding from courtship through fledging. The nest area is characterized by high use by the breeding pair, and typically contains 2 to 4 alternate nests (Reynolds et al. 1992). One study conducted on the Fremont National Forest reported an inter-alternative nest distance of 804 feet (245 m), and that distance was comparable to other reports in the literature (Desimone and DeStefano 2005).

In general, goshawk nest areas are unique in structure, with large trees, dense canopies, and high canopy closure. Goshawk nesting habitat in eastern Washington and Oregon is generally composed of mature and older forests (McGrath et al. 2003). Nest stands are typically composed of a relatively high number of large trees, high canopy closure (>50%), multiple canopy layers, and a relatively high number of snags and down wood (Finn 1994, McGrath et al. 2003)(Table 51).

Table 51. Habitat Characteristics within 24.7 acres (10 ha) of Northern Goshawk Nest Trees in Northeast Oregon and Washington

Study Area	Basal Area	Canopy Cover %	Trees per Acre (tpa)	Distance to Water	Slope%	Aspect
E. Oregon (Reynolds et al. 1982)	-	59.8%	195 tpa (482 trees/ha)	-	-	North
E. Oregon (Moore and Henny 1983)	226 ft^2/acre (51.9 m^2/ha)	-	408 tpa (1007 trees/ha)	653 feet (199 m)	14%	No preference
E. OR./WA (McGrath et al. 2003)	178 ft^2/acre (40.6 m^2/ha)	53.1%	349 tpa (862.4 trees/ha)	1,123 feet (342.4 m)	22.7%	North

Post Fledging Family Area (PFA)

The PFA surrounds the nest area and is defined as the area used by the family group from the time the young fledge until they are no longer dependent on the adults for food (up to two months) (Reynolds et al. 1992, Kennedy et al. 1994). PFAs typically include a variety of forest types and conditions. PFAs have patches of dense trees, developed herbaceous and/or shrubby understories, and habitat attributes (snags, down logs, small openings) that are critical for goshawk prey (Reynolds et al. 1992). Although PFAs generally include a variety of forest conditions, the vegetation structure resembles that found within nest stands (Reynolds et al. 1992). In northeast Oregon, dense canopy and late forest structure (i.e., trees >20.8 inches [53 cm] DBH and canopy closure >50%) was clearly important at landscape scales close to the nest but decreased in relative abundance with distance from the nest. This decrease in relative abundance does not necessarily indicate that such forest structure is less important as distance from the nest increases. Rather, it may be a function of the heterogeneous landscape and sparsity of remaining large (170 ha) patches of older forest in eastern Oregon (Daw and DeStefano 2001).

The size of the PFAs has been described by numerous authors. Daw and DeStefano (2001) identify the post fledgling area (PFA) as ranging from 120-240 ha (296-593 acres). The PFA is important to the persistence of goshawk populations because it provides fledgling hiding cover and foraging opportunities as fledglings learn to hunt (Daw and DeStefano 2001).

Foraging Area

Foraging areas are typically 4,900-5,900 acres comprised of a forest mosaic that supports a wide range of suitable prey (Marshall et al. 2003). Daw and DeStefano (2001) estimate based on averages from previous studies done in eastern Oregon, that goshawk foraging areas are 3,707-5,189 acres. Foraging areas are usually more open than nesting areas, but should contain large trees, snags, down logs, vegetative layering, and other structural elements important to prey species (Reynolds et al. 1992, McGrath at al. 2003).

Threats to the Species

Several factors are cited by researchers and managers as potentially detrimental to current and future goshawk viability. These include human disturbance, pesticides and other contaminants, and harvest for falconry. However, the primary concern throughout the goshawk's range, is habitat alteration due to timber and fire management practices (Squires and Kennedy 2006).

Potential threats to habitat caused by various silvicultural treatments include forest fragmentation, creation of even-aged and monotypic stands, potential increases in area of younger age classes, and

loss of tree species diversity (Desimone and DeStefano 2005, Squires and Kennedy 2006). Harvest of mature forests decreases goshawk nesting habitat (Reynolds et al. 1992). Desimone and DeStefano (2005) also report that reduced proportion of mature closed-canopy forest, which is subsequently replaced by early successional forest, reduces the probability of an area as a potential nesting habitat. More severe alterations such as clearcuts, and moderately high alterations such as partial removal of stands resulting in <50% canopy closure, reduce the likelihood of goshawks reoccupying the area due to deterioration in the quality of potential nest areas (Desimone and DeStefano 2005). Greenwald et al. (2005) point to studies conducted after 1992 that show goshawk avoidance of open areas and early-seral forests, and that logging reduces goshawk occupancy and productivity. In addition to the relatively long-term impacts of removing nest trees and degrading habitat by reducing stand density and canopy cover, logging activities conducted near nests during the incubation and nestling periods can have an immediate impact: nest failure due to abandonment (Boal and Mannan 1994, Squires and Reynolds 1997, NatureServe 2010).

Fire suppression may lead to increased susceptibility of stand replacing fire, insect and disease outbreaks, and can result in the deterioration or loss of nesting and foraging habitat (Graham et al. 1999, cited in NatureServe 2010, Wisdom et al. 2000). Fire suppression can create dense understories, which may obstruct flight corridors used by goshawks to hunt prey (Wisdom et al. 2000). Other habitat altering activities that may pose a threat to the goshawk include grazing, which reduces the growth of herbaceous understory that supports potential prey species (Graham et al. 1999, cited in NatureServe 2010, Wisdom et al. 2000) and high road densities, which may result in the loss of snags and down wood habitat important to goshawk prey (Wisdom et al. 2000).

Predation is another threat to the goshawk. Following canopy reduction by logging, goshawks are often replaced by other raptors including Red-tailed hawks (*Buteo jamaicensis*), great horned owls (*Bubo virginianus*), and long-eared owls (*Asio otus*) (Crocker-Bedford 1990, Erdman et al. 1998). Great horned owls are reported as an especially significant predator, because they prey on both adult and nestling goshawks (Boal and Mannan 1994, Erdman et al. 1998, Rohner and Doyle 1992).

Existing Condition

Blue Mountain/WWNF Population Viability-

Population trend data from the North American Breeding Bird Surveys indicate that there has been a slight but statistically insignificant negative population trend of the goshawk in Oregon and the Northern Rockies during the period of 1966-2015, and a slight positive but also statistically insignificant trend during the period of 2005-2015. The interpretation of this data should be done with caution, as the goshawk is not readily detected by breeding bird surveys, so the population trend is based on relatively few sightings and survey routes with sightings. The Partners in Flight species assessment database also indicates a possible or moderate population decrease in the Northern Rockies and the goshawk is a species of regional concern.

Wales (2011c) conducted a fine-scale analysis of source habitat on National Forest lands in the Blue Mountains, including the Wallowa-Whitman National Forest. This analysis indicated that there has been a relatively small (-6%) decline in the amount of source habitat on the Wallowa-Whitman from historical conditions. The current amount of source habitat (Table 52) in each watershed was identified by using four variables: potential vegetation group, canopy closure, number of canopy layers, and tree size. Potential vegetation groups (PVG) are an aggregation of plant association groups (PAGs) with similar environmental regimes and dominant plant species. Each aggregation (PVG) typically includes PAGs representing a predominant temperature or moisture influence (Powell et al. 2007).

Table 52. Northern Goshawk Source Habitat Definition (Wales 2011c)

Potential Vegetation Group	% Canopy Closure	# Canopy Layers	Tree Size (DBH)
Dry Ponderosa Pine	≥40%	Single and multi-story	≥15” DBH
Dry Douglas Fir	≥40%	Single and multi-story	≥15” DBH
Dry Grand Fir	≥40%	Single and multi-story	≥15” DBH
Cool Moist	≥60%	Single and multi-story	≥15” DBH
Cold Dry	≥60%	Single and multi-story	≥15” DBH

Based on the PVG, not considering the other variables identified in Table 51, it’s estimated that there are approximately 1,655,868 acres of potential goshawk habitat on the Wallowa-Whitman. Potential habitat is the area within the dry ponderosa pine, dry Douglas-fir, dry grand fir, cool moist, and cold dry PVGs that has the capability to provide source habitat, but currently does not provide the necessary tree size, canopy cover, or structural conditions. Given time, these areas may provide the canopy closure and tree sizes of source habitat. Currently, there are approximately 440,696 acres (94% of historical condition) of source habitat on the Wallowa-Whitman. Thirty-two of the thirty-five watersheds (91%) on the Wallowa-Whitman, that historically provided source habitat, currently provide source habitat for northern goshawk. Source habitat is distributed in all clusters of watersheds on the Wallowa-Whitman with a high number of watersheds that provide ≥40% of the estimated historical median amount of habitat. While the presence of roads and trails has decreased the habitat effectiveness of source habitat in most watersheds (67% in the low habitat effectiveness class) most watersheds (86%) on the Wallowa-Whitman have high watershed index scores. High watershed index scores indicate good habitat abundance with low departure from historical conditions, and high habitat quality, with greater than 50% of the source habitat being late-successional habitat.

The current viability outcome index for the Blue Mountains is very near historical conditions, indicating that suitable environments (habitat) are broadly distributed and of high abundance, and the goshawk is likely well-distributed throughout the Blue Mountains. The results for the Wallowa-Whitman are similar, though slightly lower than for the entire Blue Mountains. In either case, the outcome scores indicate that suitable environments for goshawk are broadly distributed and of high abundance and that the goshawk is likely well distributed throughout the Wallowa-Whitman. In conclusion, the viability assessment indicates that source habitat of the goshawk is still available in adequate amounts, distribution, and quality, to maintain goshawk viability in the Blue Mountains and on the Wallowa-Whitman.

North Fork Burnt River Watershed- The Patrick project area lies primarily within the North Fork Burnt River watershed. This watershed has a high watershed index (WI) score as reported by Wales (2011c). High WI values are indicative of good habitat abundance with low departure from historical conditions, and high habitat quality, with greater than 50% of the source habitat being late-successional habitat. The WI score was then weighted by the amount of source habitat currently existing in the watershed to derive a weighted watershed index (WWI). Watersheds with the highest WWI scores are considered to provide the greatest contribution to population viability on the forest. The North Fork Burnt River watershed has a high WWI score, meaning that it likely provides a significant contribution to goshawk viability on the forest. It also provides more than 40% of the estimated historical median amount of source habitat, which is considered the threshold for population viability. Despite the fact that this watershed currently provides a significant amount of high-quality source habitat (21,886 acres), the habitat effectiveness is considered low due to the amount of source habitat that falls within the zone of influence from roads.

*Patrick Project Area***-** According to a GIS query, the Patrick project area contains 13,239 acres of goshawk source habitat that could contribute to a stable or increasing population. In addition, the project area contains 25,303 acres of potential habitat that currently does not provide habitat but could potentially provide goshawk habitat at some time in the future (cold moist and cold dry vegetation groups currently not meeting the criteria for source habitat).

Environmental Consequences

Alternative 1 – No Action

There would be no direct or indirect adverse effects to northern goshawk from the no action alternative because no timber harvest, fuels treatments, or transportation activities would occur. Existing source habitat would remain unchanged.

Alternatives 2 and 3

Both timber harvest and prescribed fire treatments would occur in northern goshawk source habitat under both action alternatives. There are approximately 13,239 acres of source goshawk habitat in the analysis area, with approximately 12,417 acres occurring in proposed treatment units under alternative 2, and approximately 10,902 acres occurring in treatment units under alternative 3 (Table 53). Alternative 2 has an additional 149 acres of prescribed fire treatments and an additional 1206 acres of non-commercial treatments in source habitat than alternative 3. Prescribed fire and non-commercial treatments may simplify stand structure but does not typically remove source habitat. The primary difference between the two action alternatives would be the additional 160 acres of commercial harvest that would occur within riparian units under alternative 2.

Table 53. Acres of goshawk source habitat to be treated by alternative

Proposed Treatment	Alternative 2	Alternative 3
Commercial harvest	6011	5851
Non-commercial harvest	4680	3474
Prescribed fire	1726	1577
Total Acres	**12,417**	**10,902**

Commercial harvest treatments would likely reduce average stand diameter and/or canopy closure below suitable levels, thereby removing source habitat for the next several decades. Non-commercial harvest and prescribed fire treatments are expected to increase average stand diameter due to removal of trees primarily in smaller size classes. Non-commercial treatments may simplify stand structure over the next 20 years but would retain the characteristics of source habitat, including a residual canopy closure greater than 40 percent.

Hazard tree removal along haul routes through source habitat would potentially remove snags in proximity to roads where densities are already low due to past and ongoing firewood gathering. Activities that increase overall human presence and project-related noise levels, including temporary road reconstruction as well as timber harvest, may temporarily displace goshawks locally in the short-term (i.e. during implementation), but are not expected to impact distribution within the project area after implementation.

In addition to impacts to available habitats, each action alternative poses potential for direct impact to nesting individuals. Both timber harvest and prescribed fire could cause individual harm or mortality if operations destroy a nest tree occupied by young of the year. If goshawk nesting is discovered prior

to, or during implementation, a no-activity core area of 30 acres would be designated around active nests.

Goshawk Habitat at the Watershed Scale

Treatments proposed under alternatives 2 and 3 would reduce the amount of source habitat available in the watershed by approximately 27 percent (Table 54).

Table 54. Proposed Treatment Acres in Goshawk Source Habitat

	Alternative 2	Alternative 3
Total Acres of Source Habitat Removed	6,011	5,851
Percent of source habitat within watershed removed	27.5%	26.7%
Percent of forest-wide source habitat removed	1.4%	1.3%

Post-treatment availability of source habitats would continue to exceed the threshold of 40% of the historical amount under both action alternatives, thereby continuing to contribute to species viability.

Goshawk Habitat at the Wallowa-Whitman National Forest Scale

Existing goshawk source habitat on the Wallowa-Whitman, as modeled by Wales (2011c), totals 440,696 acres. As a result of projected habitat loss under the Patrick project, source habitats would decline under alternatives 2 and 3 by approximately 6,011 and 5,851 acres respectively, equating to a Forest-level reduction of 1.4 or 1.3 percent (Table 54).

Cluster analysis used to describe existing distribution of source habitats across the Wallowa-Whitman indicates that these habitats are well distributed across the Forest (Penninger and Keown 2011b). Post-treatment levels of source habitat under both action alternatives would result in no change in the number of watersheds in Cluster W1 containing >40% source habitat that contribute to goshawk habitat distribution. Goshawk source habitat would continue to be well distributed across the forest.

Cumulative Effects – Alternative 1

Because there would be no direct or indirect effects to goshawk from alternative 1, there would be no cumulative effects.

Cumulative Effects – Alternatives 2 and 3

Appendix A of the EA was reviewed for actions that might affect goshawk habitat within the North Fork Burnt River watershed. Additionally, silviculture activities proposed in the adjacent Austin Vegetation Management Project have the potential to degrade or remove additional source habitat but are not expected to change the viability outcome because source habitat will remain well distributed. Recreation activities including the use of OHV and snowmobile trails could cause additional disturbance and goshawk may avoid these areas during periods of human use. However, the effect would be temporary so it would not influence population viability under current levels of use. The future Travel Management Plan in combination with the post-sale road management plan in this project could further reduce road densities and cross-country motor vehicle use thereby increasing

habitat quality and reducing threats for goshawk. However, it is unlikely that the road management plan proposed in this project would have a significant effect at the population scale.

Summary

The proposed treatments may impact individuals and their habitat but will not impact goshawk population viability on the Forest because the scale of treatments combined with project design criteria around nest sites will maintain habitat of sufficient quality and quantity to support successful reproduction.

The Forest Plan, as amended, requires a 30-acre nest area and 400-acre post-fledging area (PFA) that emphasizes the retention and development of late/old forest structure (LOS) be established around every known active nest site (U.S. Forest Service 1995). Logging is prohibited in the nest area, and there are seasonal restrictions on logging and burning in the PFA during the nesting season, March 15 - August 31. An active nest is defined as a nest that has been used within the past five years.

Because this project impacts up to 1.4% of source habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small-scale, long-term (80-100 years) adverse effect to goshawk habitat. The loss of habitat would be insignificant at the scale of the Wallowa-Whitman National Forest. Under both action alternatives, post-treatment availability of source habitat would continue to exceed the threshold of 40% of the historical amount in the North Fork Burnt River watershed, thereby continuing to contribute to species viability on the Wallowa-Whitman National Forest.

Pileated Woodpecker

The pileated woodpecker occurs primarily in dense mixed-conifer forest in late seral stages, or in deciduous tree stands in valley bottoms. It is occasionally seen in younger stands lacking large-diameter trees, particularly in winter. It is rarely found in stands of pure ponderosa pine. The association with late seral stages stems from the need for large diameter snags or living trees with decay for nest and roost sites, large diameter trees and logs for foraging on ants and other arthropods, and a dense canopy to provide cover from predators (Marshall et al. 2003). This woodpecker species is a bird that averages over sixteen inches in length, it cannot construct a nest or roost cavity in a small diameter tree. The requirement for larger snags and trees is a function of the physical size of this woodpecker species.

In northeastern Oregon, the pileated woodpecker has shown a preference for mature, unlogged grand fir stands with at least 60% canopy closure, multiple canopy layers ($\geq$ 2), and high snag density (Bull and Meslow 1977, Bull 1987, Bull and Holthausen 1993). Bull et al. (2007) found that densities of nesting pairs of pileated woodpeckers were beneficially associated with the amount of late structural stage forest, adversely associated with the amount of area dominated by ponderosa pine and the amount of area with regeneration harvest. Although there is a preference for dense canopy stands, Bull et al. (2007) found that high tree mortality and loss of canopy closure in stands of grand fir and Douglas-fir did not appear to be detrimental to pileated woodpeckers, provided that large dead or live trees and logs were abundant and that stands were not subject to extensive harvest. Pileated woodpecker densities remained steady over 30 years in areas where canopy cover dropped below 60% due to tree mortality. Older stands of grand fir and Douglas-fir consisting primarily of snags continued to function as nesting, roosting and foraging habitat for pileated woodpeckers (Bull et al. 2007). While closed canopy forests were not essential for use by pileated woodpeckers, nest success was higher in home-ranges that had greater amounts of forested habitat with $\geq$60% canopy closure (Bull et al. 2007).

Nesting

The pileated woodpecker nests in large, dead trees. Typical nest trees have little bark remaining, few limbs, are more than 30 feet tall, and have broken tops (Bull 1987). In northeastern Oregon, Bull and Meslow (1977) reported all nests from their study area were greater than 23 inches in diameter at breast height (DBH). Bull (1987) reported a strong selection of trees larger than 21 inches DBH for nesting. Based on research data compiled in the DecAID Wood Advisor (Mellen-Mclean et al. 2009) for eastside mixed conifer forests 70% of pileated woodpeckers in the populations studied, used snags > 25.2 inches DBH for nesting. Large diameter trees are required to accommodate the large nest cavity (8 inches diameter and 22 inches deep). In a study conducted on the Starkey Experimental Forest, all but one of 123 different nests were in dead trees. Ponderosa pine (73%) and western larch (25%) are the nest tree species most used on the east side of the Cascade Range (Bull 1987). Pileated woodpeckers select nest snags from clusters of snags in dense types or stands (Bull and Meslow 1977). Nest trees are larger and have fewer entrance holes than roost trees. Nest cavities are excavated just prior to nesting (Bull 1987), occurring in late March and early April and take 3-6 weeks to complete (Bull and Meslow (1988). Some pairs begin excavation of several cavities but complete only one. The partially completed cavities were sometimes completed in later years and used as nests (Bull and Meslow 1988, Hoyt 1957).

Roosting

Pileated woodpeckers roost inside tree cavities at night. Roost trees are presumed to be used to reduce predation and to conserve energy by minimizing heat loss in the winter. Based on research data compiled in the DecAID Wood Advisor (Mellen-Mclean et al. 2009) for eastside mixed conifer forests, 70% of pileated woodpeckers in the populations studied used snags > 25.8 inches DBH for roosting. Tree species used for nesting and roosting differ. In northeastern Oregon (Union, Baker, and Umatilla Counties) most roost trees were in grand fir (62%), both live and dead, that were extensively decayed by Indian paint fungus (*Echinodontium tinctorium*) and had a hollow interior. Conks of Indian paint fungus were seen on 92% of the roost trees in grand fir (Bull et al. 1992). Roost trees are used all year with pileated woodpeckers using multiple roost trees. Bull et al. (1992) reported an average of 7 roost trees being used by an individual bird over a 3-10-month period (range 4-11 roost trees). Some birds used the same roost every night while others changed every few weeks. The pileated woodpecker gains entry ~~to the hollow interior~~ by excavating an entrance hole to the hollow interior of the tree or entering through broken treetops. Most roost trees have >1 entrance/exit hole. Old growth stands of grand fir, with ≥60% canopy closure and little or no logging activity are preferred sites for roosting (Bull et al. 1992).

Foraging

Pileated woodpeckers feed primarily on insects in dead wood in snags, logs, and naturally created stumps (Bull and Meslow 1977, Bull et al. 1986). Numerous authors have reported carpenter ants (*Camponotus* spp.) as the primary food of pileated woodpeckers (Beal 1911, S.Y. Hoyt 1950, S.F. Hoyt 1957, Bull and Jackson 1995). Carpenter ants comprised 95% of the diet of pileated woodpeckers on the Starkey Experimental Forest (Beckwith and Bull 1985). In addition, they are known to consume fruits, nuts, woodboring beetle larvae, and other insects. In northeastern Oregon, snags and logs >15 inches diameter were preferred, as were Douglas-fir and western larch (Beckwith and Bull 1985, Bull and Holthausen 1993, Bull et al. 1992), but foraging was documented on dead woody material as small as 2 inches in diameter. Based on research data compiled in the DecAID Wood Advisor (Mellen-Mclean et al. 2009) for eastside mixed conifer forests, 70% of pileated woodpeckers in the populations studied used snags > 12.9 inches DBH for foraging. Stands with higher density of snags and logs were preferred for foraging (Bull and Meslow 1977).

Home Range Size

Bull (1975) estimated nest territory size based on observations, vocalizations, and feeding locations. Estimates of area utilized by various pairs during reproduction ranged from 250 ha to 500 ha (618 - 1236 acres)(Table 55). Bull and Meslow (1977) reported that the minimum density for one pair was 1,620 acres of forest. During nesting, territories ranged from 320 to 600 acres (Bull and Meslow 1977). Bull (1987) reported an average nesting territory size of approximately 544 acres (220 hectares). Bull and Holthausen (1993) found that pileated woodpeckers in northeastern Oregon have an average home range size of 900 acres (range 800 – 1,575 acres). Bull et al. (2007) utilized data from many of these previous studies, comparing density of nesting pairs and traditional home ranges on 30 years of data on two study areas and 15 years of data on five study areas on the WWNF and Umatilla National Forests. The average territory size (including habitat and non-habitat), considering all seven study areas was 1,561 ha (3,857 acres) and average amount of suitable habitat within the territory was (765 acres).

Table 55. Pileated woodpecker home range sizes in northeast Oregon

Bull (1975)	Range = 250-500 ha (618-1236 acres) during reproduction
Bull and Meslow (1977)	Minimum Density = 1,620 acres of forest Nesting Territory = 320-600 acres
Bull (1987)	Nesting Territory = 220 ha (544 acres)
Bull and Holthausen (1993)	Paired birds mean = 407 ha (1005 acres) range = 321-630 ha (793-1556 acres) Single birds mean = 597 ha (1475 acres) range = 200-1464 ha (494-3616 acres)
Bull et al. 2007	Average area (includes non-habitat) = 1,561 ha (3,857 acres) Average amount of habitat = 310 ha (765 acres)/pair*

*The average amount of habitat per pair was used to estimate the current number of pileated woodpeckers on the WWNF as this literature is the most recent, was conducted on the WWNF and Umatilla National Forests, includes many of the previous studies, and is an estimate of suitable habitat (not area, suitable or non-habitat, within the territory), and correlates the best with the estimated acres of suitable habitat on the WWNF.

Threats to the Species

Threats to the pileated woodpecker are avian predators, including northern goshawks (*Accipiter gentilis*), sharp-shinned hawk (*Accipiter striatus*; Smith 1983) and Cooper's hawks (*A. cooperi)*; Michael 1921), red-tailed hawks (*Buteo jamaicensis*) and great-horned owls (*Bubo virginianus*). Bull (1987) and Bull et al. (2007) report that timber harvest has had a negative effect on habitat of this species. Removal of large diameter live and dead trees, of down woody material, and of canopy, reduces nest and roost sites, foraging habitat, and protective cover. In addition, prescribed fire may eliminate or reduce the number of snags, logs, and cover (Bull 2003). Firewood collection and snag felling along roadsides also reduces the availability of snags for nesting and roosting. Bate et al. (2007) found that snag numbers were lower adjacent to roads due to removal for safety considerations, removal as firewood, and other management activities. Other literature has also indicated the potential for reduced snag abundance along roads (Wisdom et al. 2000). Another possible threat is unsustainable conditions in late-seral montane forests. Due to fire exclusion and past management, forests are susceptible to catastrophic fire, insect, and disease problems in parts of the Columbia Basin (Wisdom et al. 2000).

Existing Condition

Population Trend

The breeding bird survey (BBS) data provides an index of population abundance that can be used to estimate population trends and relative abundances at various geographic scales. Various agencies and organizations, including the U.S. Fish and Wildlife Service and Partners in Flight, utilize BBS trends along with other indicators to assess bird conservation priorities. The BBS indicate that the population trend of the pileated woodpecker is increasing in both Oregon and the Northern Rockies. There was an estimated 1.5 percent population increase per year in Oregon, and a 1.9 percent population increase per year in the Northern Rockies, during the period between 1966 and 2015.

Blue Mountain/WWNF Population Viability-

Habitat trends of the pileated woodpecker were assessed at the Blue Mountains and Wallowa-Whitman National Forest scales using the species viability assessment conducted by Wales (2011b). Wales (2011b) conducted a fine-scale analysis of source habitat on National Forest lands in the Blue Mountains, including the Wallowa-Whitman, following the methodology in Suring et al. (2011). Source habitat is defined here as; habitat with single-story and multi-story dry Douglas fir and dry grand fir with greater than 40% canopy cover, trees greater than 20" DBH, as well as cool moist and cold dry single-story and multi-story forest with canopy cover greater than 60% , and trees greater than 20" DBH. This analysis indicated that there has been a decline in the amount of source habitat on the Wallowa-Whitman from historical conditions, with forty of the forty-nine watersheds (82%) analyzed for the pileated woodpecker on the Wallowa-Whitman having less source habitat than the estimated historical condition. However, source habitat of the pileated woodpecker is still available in adequate amounts and distribution, to maintain pileated viability on the Wallowa-Whitman. Currently, there are approximately 206,374 acres (57% of historical condition) of source habitat on the Wallowa-Whitman. Twenty-nine of the thirty-five watersheds (83%) on the Wallowa-Whitman, that historically provided source habitat, currently provide source habitat for pileated woodpeckers. Reductions of snags and the presence of roads has decreased the quality of source habitat in many watersheds, but 33% of the watersheds on the Wallowa-Whitman have high watershed index scores, indicating good habitat abundance, moderate to high snag densities and low to moderate road densities. Additionally, 29% of the watersheds are in the moderate category. Watersheds having $\geq$40% of the historical amount of source habitat, which is considered the threshold necessary to support population viability, are distributed across the Wallowa-Whitman and found in all clusters.

The viability assessment indicates the Wallowa-Whitman still provides for viability of the pileated woodpecker. The pileated woodpecker is distributed across the Wallowa-Whitman and there are adequate amounts, quality, and distribution of habitat to provide for pileated woodpecker population viability.

North Fork Burnt River Watershed**:** The Patrick project area lies primarily within the North Fork Burnt River watershed. This watershed contains 9,516 acres of pileated source habitat, which is approximately 15% of the 62,000 acres of potential source habitat in this watershed. This watershed has a moderate watershed index score. The WI provides a measure of change in the amount of source habitat from historical conditions (departure) and the influences of habitat quality (snag abundance) and risk factors (road density). The variables were weighted based on peer review of what was believed to have the strongest relationship and influence on the pileated woodpecker. Habitat departure was most heavily weighted, followed by snag density, and then road density. The WI score was then weighted by the amount of source habitat currently existing in each watershed to derive a

weighted watershed index (WWI). The WWI is an index of the potential capability of each watershed to contribute to population viability. The North Fork Burnt River watershed has a high WWI score, indicating that it provides a considerable contribution to pileated woodpecker viability on the forest.

Environmental Consequences

Alternative 1 – No Action

There would be no direct adverse effects to pileated woodpecker from the no action alternative because no timber harvest, fuels treatments, or transportation activities would occur. Existing source habitat would remain unchanged.

Alternatives 2 and 3

There are approximately 5,612 acres of pileated woodpecker source habitat in the analysis area, with approximately 5,227 acres occurring in proposed treatment units under alternative 2, and approximately 4,478 acres occurring in treatment units under alternative 3. Alternative 2 has an additional 58 acres of prescribed fire treatments and an additional 586 acres of non-commercial treatments in source habitat, then alternative 3. Prescribed fire and non-commercial treatments may simplify stand structure but does not typically remove source habitat. The primary difference between the two action alternatives would be the additional 105 acres of commercial harvest that would occur within riparian units under alternative 2. That difference is insignificant considering that the average nesting territory of one pair of pileated woodpeckers in northeastern Oregon is just over 1,000 acres.

Under both action alternatives, commercial harvest treatments would likely reduce average stand diameter and/or canopy closure below suitable levels, thereby removing source habitat for the next 30-40 years. Non-commercial harvest and prescribed fire treatments are expected to increase average stand diameter due to removal of trees primarily in smaller size classes. Non-commercial treatments may simplify stand structure over the next 20 years but would retain the characteristics of source habitat, including a residual canopy closure greater than 40 percent. Prescribed fire and mechanical fuel reduction treatments were found to reduce the amount of foraging habitat (snags, stumps, and down logs) and abundance of ants (prey) of the pileated woodpecker in the short term (1 to 3 years) (Bull et al. 2005). Although some habitat elements may be reduced under non-commercial treatments, sustainability of habitats is expected to increase as stand density reductions lower the risk of disturbance such as stand-replacement fire.

Hazard tree removal along haul routes through source habitat would potentially remove snags in proximity to roads where densities are already low due to past and ongoing firewood gathering. Activities that increase overall human presence and project-related noise levels, including temporary road construction as well as timber harvest, may temporarily displace pileated woodpeckers locally in the short-term (i.e. during implementation), but are not expected to impact distribution after project implementation.

In addition to impacts to available habitats, each action alternative poses potential for direct impact to nesting individuals. Both timber harvest and prescribed fire could cause individual harm or mortality if operations destroy a nest tree occupied by young of the year. However, that would be unlikely to occur because all existing snags >12 in DBH would be retained.

<u>Pileated Woodpecker Habitat at the Watershed Level</u>

Treatments proposed under alternatives 2 and 3 would reduce the amount of source habitat available in the watershed by approximately 26% and 25% respectively. Post-treatment availability of source

habitats would continue to exceed threshold of 40% of the historical amount in the North Fork Burnt River watershed under both action alternatives, thereby continuing to contribute to species viability.

Pileated Woodpecker Habitat at the WWNF Scale

Existing pileated woodpecker source habitat on the WWNF totals 206,374 acres. As a result of projected habitat loss under the Patrick project, source habitats would decline by 2,464 acres under alternative 2 or 2,359 acres under alternative 3, equating to a Forest-level reduction of 1.2 or 1.1 percent respectively (Table 56). Post-treatment levels of source habitat under both action alternatives would result in no change in the number of watersheds containing >40% source habitat that contribute to pileated woodpecker habitat distribution.

Table 56. Proposed Treatment in Pileated Source Habitats

	Alternative 1	Alternative 2	Alternative 3
Total acres of source habitat removed	0	2,464	2,359
Percent of source habitat within watershed removed	0	26%	25%
Percent of forest-wide source habitat removed	0	1.2%	1.1%

Cumulative Effects – Alternative 1
The no action alternative would not have incremental, cumulative effects to other past, present and reasonably foreseeable future actions in this area.

Cumulative Effects – Alternatives 2 and 3
Appendix A of the EA was reviewed for actions that might affect pileated woodpecker habitat within the North Fork Burnt River watershed. Silviculture activities proposed in the adjacent Austin Vegetation Management Project have the potential to degrade or remove additional source habitat but are not expected to change the viability outcome because source habitat will remain well distributed. On Forest Service lands within and outside the project area, firewood cutting, and hazard tree removal will continue to reduce available snags and logs, but the effect is limited to areas adjacent to open roads. Recreation activities including the use of OHV and snowmobile trails could cause additional disturbance and pileated may avoid these areas during periods of human use. However, the effect would be temporary so it would not influence population viability under current levels of use. The future Travel Management Plan in combination with the post-sale road management plan in this project could further reduce road densities and cross-country motor vehicle use, thereby increasing habitat quality and reducing threats for woodpeckers. However, it is unlikely that the road management plan proposed in this project would have a significant effect at the population scale.

Summary

The proposed treatments may impact individuals and their habitat but will not impact pileated woodpecker population viability on the Forest because the scale of treatments combined with project design criteria that retains all snags greater than 12” diameter will maintain habitat of sufficient quality and quantity to support successful reproduction.

Because this project impacts up to 1.2% of source habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small-scale, long-term (30-40 years) adverse effect to pileated woodpecker habitat. The loss of habitat would equate to the loss of nesting habitat for approximately 2 breeding pairs of pileated woodpeckers based on their average breeding range but it

would be insignificant at the scale of the Wallowa-Whitman National Forest. Under both action alternatives, post-treatment availability of source habitat would continue to exceed the threshold of 40% of the historical amount in the North Fork Burnt River watershed and thus continue to provide a considerable contribution to species viability on the Forest.

Rocky Mountain Elk

Elk are the most popular big game species in northeastern Oregon and are an indicator of the quality and diversity of general forested habitat, the interspersion of cover and forage areas, and the security habitat provided by cover and low levels of human activity. It is commonly accepted that other big game species (i.e., mule deer, white-tailed deer, black bear, and cougar) are at least partially accommodated when high quality elk habitat is present. Elk use a variety of habitat types in all successional stages and use patterns change both daily and seasonally. Calving habitat is usually gentle terrain with plenty of succulent vegetation less than 1,000 ft from water. Optimal calving habitat has an abundance of low shrubs or small trees under an overstory with a canopy closure ≥50% (Thomas 1979). Elk are primarily grazing animals, preferring a diet of grasses and forbs, but in winter they turn to browsing the tips off twigs from willow, alder, aspen, oak or other woody vegetation (Csuti et al. 2001). Quaking aspen can provide cover and is an important browse plant, particularly in winter, along with curl-leaf mountain mahogany.

Disturbance due to roads is a major factor influencing elk distribution across the landscape as evidenced by the results from a variety of studies conducted in northeastern Oregon and elsewhere (Rowland et al. 2005).

Existing Condition

Population viability

The National Forest Management Act (1976) requires that habitat exist to provide for viable populations of all native and desired non-native vertebrates. Elk are a game species that are managed by the Oregon Department of Fish and Wildlife on a management objective basis. Management objectives were developed to consider not only the carrying capacity of the land, but also the elk population size that would provide for a huntable surplus, and tolerance levels of ranchers, farmers, and other interests that may sometimes compete with elk for forage and space. Biologically, a population that is managed around a management objective is much larger than a minimum viable population. A minimum viable population represents the smallest population size that can persist over the long term. Currently, elk populations on the Forest are regulated by hunting and predation. Elk numbers are substantially higher than what would constitute a concern over species viability. All alternatives, including the existing condition, would provide for elk populations well above a population viability threshold.

Population Trend

The Patrick Project Area is within the Sumpter Wildlife Management Unit. Based on annual elk census numbers from 1997 – 2017 in the Sumpter unit, the overall trend in total elk observed during that period is stable and just below the objective of 2,000 elk (Figure 10). While the population is stable, the distribution of elk within the Sumpter unit is less than ideal. Increased availability of forage coupled with reduced disturbance on private land results in elk using private land more than is desirable by landowners, hunters, and, wildlife management agencies.

YEAR

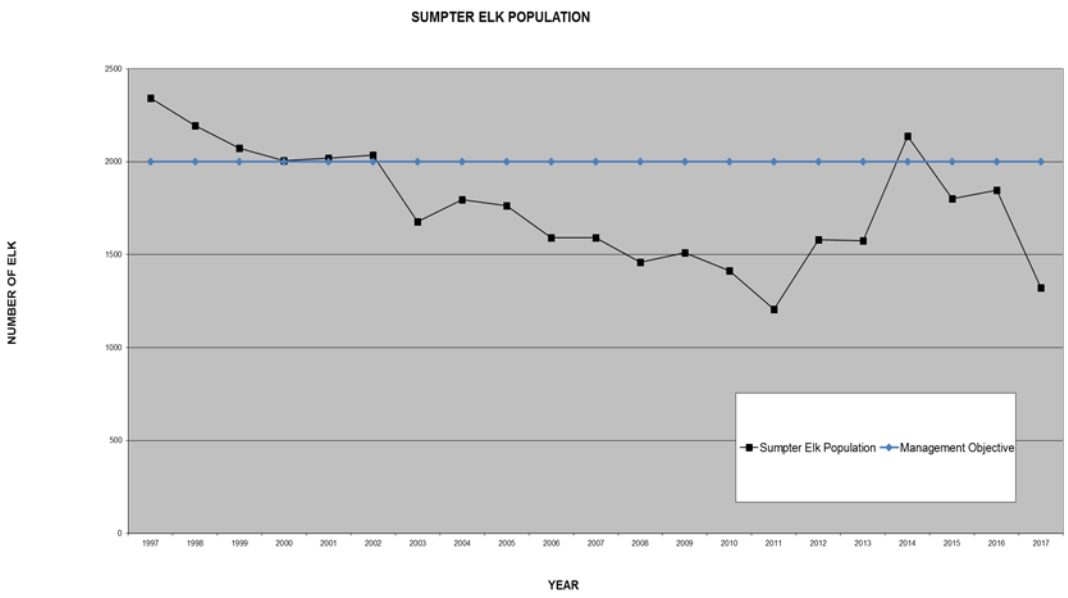


Figure 10. Elk Population in the Sumpter Wildlife Management Unit 1997-2017

Cover

The Patrick project area is predominantly elk summer range. While the project area biologically functions as summer range for elk, the Forest Plan addresses elk habitat through allocation of management areas (MAs), each with its own standards and guidelines. There are approximately 10,386 acres of MA3 within the project area. Forest Plan direction pertaining to cover within MA3 includes the following standard: "At least 80 percent of the treated area is within 900 feet of a satisfactory cover patch at least 40 acres in size." However, this standard is impossible to meet in this project area because currently there are no patches of satisfactory cover greater than 40 acres in size within MA3. The lack of satisfactory cover within the project area is due to the preponderance of dry forest types, which lack the biophysical capability to develop and sustain satisfactory cover. Powell (2012) documented that in dry-forest stands comprised mostly of ponderosa pine, a 70% canopy cover objective is not biologically feasible, even at the maximum density stocking level.

The Forest Plan also establishes a minimum standard to maintain at least 30 percent of the forest land within a project area as cover, including both marginal (40-70% canopy closure) and satisfactory cover (>70% canopy closure). There are currently approximately 5,054 acres of satisfactory cover, approximately 21,699 acres of marginal cover, and approximately 22,040 acres of forage habitat (<40% canopy closure) in the Patrick analysis area. The existing percentage of cover within the project area is 55 percent, which far exceeds the minimum Forest Plan standard.

Road Density

Current open road densities exceed the Forest Plan standards (maximum) for all management areas within the Camp Creek subwatershed (Table 57). Road densities exceed the Forest Plan standards for all management areas except MA-1 within the Headwaters of the North Fork Burnt River subwatershed. Open road densities within the Patrick Creek-North Fork Burnt River subwatershed are below Forest Plan standards for all management areas. Road densities within the Petticoat Creek-North Fork Burnt River subwatershed are below standards for all management areas except MA-3A. Open road density within MA-3A in the Petticoat Creek-North Fork Burnt River subwatershed appears high in relation to Forest Plan standards, but that is because only a small amount of MA-3A

(1.1 square miles) exists within the Petticoat Creek-North Fork Burnt River portion of the project area and small slivers of land tend to skew densities. Similarly, the Antelope Creek-North Fork Burnt River and Trout Creek subwatersheds exceed Forest Plan standards but very minor portions of those subwatersheds fall within the project area. The Forest Plan does not have a quantitative standard for old-growth (MA-15) but states the following: *"Avoid new road construction through old-growth stands. When it is necessary to build a road through an old-growth area, or where a road already exists, the road will be managed to retain the old-growth characteristics of the area including solitude. This will normally require seasonal or year-round road-use restrictions."*

Table 57. Patrick Summary of Existing Road Densities (mi/mi2)

Subwatershed	MA	Area (mi^2)	Open Rd (mi)	Forest Plan Standard (maximum)	Current Open Road Density (mi/mi^2)
Antelope Creek-North Fork Burnt River	3	1.38	2.66	1.5	1.65
Camp Creek	1	19.69	63.95	2.5	3.25
Camp Creek	3	2.44	5.14	1.5	2.11
Camp Creek	15	2.58	3.22	None	1.25
Camp Creek	1W	1.90	3.54	1.5	1.86
Headwaters North Fork Burnt River	1	9.33	18.56	2.5	1.99
Headwaters North Fork Burnt River	3	1.39	3.59	1.5	2.59
Headwaters North Fork Burnt River	15	1.22	2.68	None	2.20
Headwaters North Fork Burnt River	3A	8.44	16.83	1.5	1.99
Patrick Creek-North Fork Burnt River	3	4.28	1.95	1.5	.46
Patrick Creek- North Fork Burnt River	15	0.78	0.00	None	0.00
Patrick Creek- North Fork Burnt River	3A	7.55	11.18	1.5	1.48
Petticoat Creek-North Fork Burnt River	1	5.67	9.68	2.5	1.71
Petticoat Creek-North Fork Burnt River	3	6.31	7.83	1.5	1.24
Petticoat Creek-North Fork Burnt River	15	1.10	3.15	None	2.85
Petticoat Creek-North Fork Burnt River	3A	1.10	3.03	1.5	2.75
Trout Creek	1	0.43	2.34	2.5	5.44
Trout Creek	3	0.42	2.10	1.5	4.95

Habitat Effectiveness

Habitat effectiveness generally refers to the ability of the habitat to support wildlife and how this ability is affected by human disturbance (e.g., Suring et al. 1998; Gaines et al. 2001). Habitat Effectiveness Index (HEI) values were calculated for the Patrick project area using an elk habitat model developed by Thomas et al. (1988). This model is based on the interaction of four variables that influence elk habitat selection: the size and spacing of cover and forage areas, density of roads open to vehicular traffic, forage quantity and quality, and the quality of cover. The HEI model developed by Thomas et al. (1988) relies on open road density as an indicator of relative effects from roads on elk habitat. However, more recent research found no relationship between the number of elk locations and HEI values based on road densities (Rowland et al. 2000). In contrast, Rowland et al. (2000) did find a strong, linear increase in selection ratios of elk as distance to roads increased. Therefore, a method using a distance-banding approach, as described by Rowland et al. (2005), was used for this analysis. The Forest Plan standard for HEI within summer range is a minimum of 0.5 with an average of 0.62. The existing HEI value for the Patrick project area is 0.36.

Elk Security

Security for elk on publicly accessible lands has traditionally been regarded as areas away from motorized routes with high canopy cover that can maintain elk even during periods of hunting stress (Lyon 1979, 1983; Hillis et al. 1991, Ranglack et al. 2017). Estimates vary among studies but elk show preference for areas that are at least 0.4 miles from an open road (Table 58). In areas where terrain is gentle, hunter effort is high, or cover is low, the distance from motorized routes needs to be even greater to provide elk security.

Table 58. Elk avoidance of motorized routes based on studies of radio-collared elk

Study	Season	Minimum distance from motorized route
Johnson et al. 2005a	Hunting seasons	0.5 miles
Ager et al. 2003	Non-hunting seasons	0.4 – 0.6 miles
Rowland et al. 2000	Summer	1.25 miles
Hillis et al. 1991	Hunting seasons	0.5 miles (>30% of an analysis area)
Ranglank et al. 2017	Archery season	≥ 1.7 miles (≥ 13% canopy cover)
Ranglank et al. 2017	Rifle season	≥ 0.95 miles (≥ 9% canopy cover)

Currently, much of the project area (92%) is less than 0.5 mile from an open road and is unlikely to be providing adequate elk security (Table 59). During rifle hunting seasons and elk calving season, the number of acres greater than 0.5 miles from an open road increases by 783 and 3,408 acres respectively, due to the closure of gates in the Patrick Creek Cooperative Travel Management Area. Even so, the percentage of the project area that is greater than 0.5 miles from an open road is 9% during rifle seasons and 14% during calving seasons, well below the minimum of 30% recommended by Hillis et al. (1991).

Table 59. Distance band acres within Patrick Project Area

Distance from open road (miles)	Acres (% project area)	Calving Season Acres (5/1 – 7/1)	Rifle Season Acres (Approximately 10/1 – 11/15)
< 0.5	48,649 (92%)	45,241 (86%)	47,866 (91%)
0.5 - 1	4,074 (8%)	5,899 (11%)	4,746 (9%)
>1.0	59 (<0%)	1,643 (3%)	170 (<0%)

Environmental Consequences

Alternative 1 – No Action

There would be no direct or indirect adverse effects to elk cover and forage from alternative 1 because no timber harvest, fuels treatments, or transportation activities would occur. The no action alternative would maintain current conditions for elk habitat in the short-term (0-20 years). Changes in elk habitat in the mid to long-term (beyond 20 years) would depend largely on the occurrence and scale of disturbances such as wildfire, insect or disease activity, and changes in travel management and hunting. These events cannot be predicted with a reasonable level of certainty, but the potential risks associated with forgoing management actions can be described.

In the absence of restoring ponderosa pine and Douglas-fir on drier sites, trees that are stressed from competition with adjacent trees would be more susceptible to insects and disease. This could lead to decreases in cover as trees die and canopy closure decreases. Heavily stocked conifer stands would also decrease in canopy closure as self-pruning occurs, and tree crowns become shallower and narrower from competition for space. In the absence of fire, forest fuels would build to a point that puts fire-resistant trees at risk. Large-scale fire of high severity could degrade elk habitat through a loss of cover, and through a reduction in edge habitat between cover and forage areas.

Alternative 1 would also forego the opportunity to increase elk security or improve elk distribution within the project area.

Alternatives 2 and 3

There is very little difference between the two action alternatives in terms of their impacts to elk so they are grouped for the purposes of this discussion.

Both action alternatives would decrease the amount of cover and increase the amount of forage, thus bringing the cover:forage ratio to approximately 52:48. The project area would still meet the Forest Plan standard of 30% minimum cover and the resulting cover:forage ratio would be closer to the optimal cover:forage ratio of 40:60 suggested by Thomas (1979). The reduction in cover would persist over the next 40-50 years, but many of these acres would recover to marginal cover within the next 20 years. The increase in forage resulting from prescribed fire and silviculture treatments under these alternatives would be beneficial to elk, particularly where forage is enhanced within or adjacent to security habitat.

Road densities would be slighty reduced under both action alternatives, but would continue to exceed Forest Plan standards in subwatersheds that are currently exceeding standards (Table 60).

Table 60. Patrick Project Area Summary of Existing and Proposed Road Densities (mi/mi2)

Subwatershed	MA	Area (mi^2)	Forest Plan Standard (maximum)	Current Open Road Density (mi/mi^2)	Proposed Open Road Density (mi/mi^2)
Antelope Creek-North Fork Burnt River	3	1.38	1.5	1.65	1.65
Camp Creek	1	19.69	2.5	3.25	2.89
Camp Creek	3	2.44	1.5	2.11	1.66
Camp Creek	15	2.58	None	1.25	1.25
Camp Creek	1W	1.90	1.5	1.86	1.86
Headwaters North Fork Burnt River	1	9.33	2.5	1.99	1.92
Headwaters North Fork Burnt River	3	1.39	1.5	2.59	2.59
Headwaters North Fork Burnt River	15	1.22	None	2.20	1.74

Headwaters North Fork Burnt River	3A	8.44	1.5	1.99	1.65
Patrick Creek-North Fork Burnt River	3	4.28	1.5	0.46	.20
Patrick Creek- North Fork Burnt River	15	0.78	None	0.00	0.00
Patrick Creek- North Fork Burnt River	3A	7.55	1.5	1.48	1.43
Petticoat Creek-North Fork Burnt River	1	5.67	2.5	1.71	1.50
Petticoat Creek-North Fork Burnt River	3	6.31	1.5	1.24	1.24
Petticoat Creek-North Fork Burnt River	15	1.10	None	2.85	2.85
Petticoat Creek-North Fork Burnt River	3A	1.10	1.5	2.75	2.14
Trout Creek	1	0.43	2.5	5.44	5.44
Trout Creek	3	0.42	1.5	4.95	4.95

Currently, less than 8% of the project area is greater than 0.5 miles from an open motorized route (Table 61). This means that 92% of the area is in poor to marginal quality condition with regard to human disturbance. Alternatives 2 and 3 would increase the number of acres greater than 0.5 miles from an open motorized route by 363 acres during calving and rifle seasons and by 1,012 acres during the remainder of the year. That would increase the percentage of the project area that is greater than 0.5 miles from an open road to 10% during rifle seasons, 15% during calving season, and 9% during the remainder of the year. This is still well below the minimum of 30% recommended by Hillis et al. (1991). This increase may not be enough to significantly influence elk distribution because 85% to 91% of the project area would still be in poor to marginal quality condition with regard to human disturbance. However, the creation of additional security habitat within or adjacent to forage patches would increase the likelihood that elk will utilize the forage created by this project, and it would reduce the negative impacts resulting from the loss of cover.

Table 61. Existing and Proposed Distance Band Acres within the Patrick Project Area

Distance from open road (miles)	Existing Acres (% project area)	Proposed Acres (% project area)	Calving Season Acres (5/1 – 7/1)	Proposed Calving Season Acres (5/1 – 7/1)	Rifle Season Acres (Approximately 10/1 – 11/15)	Proposed Rifle Season Acres (Approximately 10/1 – 11/15)
< 0.5	48,649 (92%)	47,637 (90%)	45,241 (86%)	44,878 (85%)	47,866 (91%)	47,504 (90%)
0.5 - 1	4,074 (8%)	4,975 (9%)	5,899 (11%)	6,262 (12%)	4,746 (9%)	5,108 (10%)
>1.0	59 (<0%)	170 (<0%)	1,643 (3%)	1,643 (3%)	170 (<0%)	170 (<0%)

Under both action alternatives, some of the project area would lack sufficient hiding cover after harvest and prescribed fire. Both alternatives would exacerbate the adverse effects from open roads by causing elk to leave the area, or become more vulnerable to legal and illegal harvest. The body of peer reviewed literature clearly establishes a relationship between vegetative cover and disturbance from roads. This relationship is considered in the HEI model used to analyze effects of the alternatives.

These alternatives would result in an increase in HEI values resulting from the increase in acres greater than 0.5 miles from an open road. Under both action alternatives, HEI values would exceed the Forest Plan standard of 0.5, and would bring the HEI closer to the desired average of 0.62 in summer range (Table 62).

Table 62. HEI values by alternative

Alternative	HEI
Existing condition	0.36
Alt 2	0.60
Alt 3	0.60

Cumulative Effects – Alternative 1

The no action alternative would not have incremental, cumulative effects to other past, present and reasonably foreseeable future actions in this area. Any effects from alternative 1 would be indirect, which are described above.

Cumulative Effects – Alternatives 2 and 3

Appendix A of the EA was reviewed for actions that might affect elk within the North Fork Burnt River watershed. Activities that have the potential to affect elk are discussed below. Effects are combined for alternatives 2 and 3.

On National Forest System lands within and outside the project area, human disturbance associated with recreation including firewood cutting, camping, and OHV use could temporarily displace elk. It has been documented that human-associated disturbance has the potential to displace elk and/or deplete energy reserves that are critical for successful reproduction. The Patrick project would remove forested cover, which could influence the way elk respond to the ongoing human disturbance associated with recreation. However, the cumulative effects would be difficult to measure at the landscape scale because these activities are typically small in scale and short in duration.

Grazing by cattle would continue in this analysis area. Grazing by cattle throughout the season could reduce available forage for elk. The effect of adequate forage not being available to elk would be localized and not widespread enough to affect herd productivity. Monitoring by the range specialist does not indicate a broad-scale problem of cattle over-utilizing forbs and graminoids in this area. These effects, although relatively small in scale, would not change as a result of either action alternative.

Prescribed burning occurring outside of the project area including the adjacent Austin Vegetation Management Project would provide additional forage enhancement. Periodically burned grasslands typically provide higher quality forage later into the year than stagnant grasslands that have missed several years of fire. Prescribed fire would also regenerate some shrub communities that are decadent and currently functioning only as low cover. Fire would create and maintain a mosaic of cover and forage that more closely represents historical conditions. Prescribed fire treatments would be staggered over multiple years to avoid depleting forage over such a large area that it would adversely impact elk habitat.

Silviculture activities proposed in the Austin Vegetation Management Project would result in additional alteration of cover, forage, and security habitat that could potentially influence elk distribution. It is unknown whether treatments would significantly influence elk distribution at the landscape scale, but they are not expected to influence population viability.

Noxious weed treatments would not affect elk habitat. In general, treating and preventing weed infestations increases the quality of elk habitat. Any adverse impacts to elk would be limited to the temporary disturbance that would occur while people are actively treating weed infestations. This disturbance is so localized and short-term, it would have no effect on elk populations. In addition, there are many project design features associated with invasive species treatments that are designed to protect MIS and sensitive species.

The future Travel Management Plan in combination with the post-sale road management plan in this project could further reduce road densities and manage cross-country motor vehicle use, thereby reducing disturbance from motorized vehicles and increasing security habitat for elk. While a specific number of miles of designated routes (roads and trails) would not be known until a decision is made, any potential effects from implementation of the Travel Management Plan would benefit elk because disturbance associated with roads reduces habitat effectiveness for elk. Without knowing which alternative will be selected, it is impossible to predict what impact it may have on elk distribution and herd productivity. The cumulative effects to elk would be addressed within the analysis for the Travel Management Plan. It is also unclear whether the road management plan proposed in this project would have a measurable effect to elk at the landscape scale, so cumulative effects cannot be predicted with any reasonable degree of certainty.

Summary

Prescribed burning and silviculture prescriptions under both action alternatives would improve forage quality and quantity for elk. Both action alternatives would result in a mosaic of burned and unburned habitat which would benefit elk. Low cover provided by shrubs and small trees would be set back in the short-term, but would return in three to ten years. The benefits to big game habitat from burning, often outweigh the adverse in relatively open timber and grasslands like those found in much of this analysis area. However, areas with improved forage quantity and quality from logging and burning may not be utilized where high road densities exist. The creation of additional security habitat within

or adjacent to forage patches would increase the likelihood that elk will utilize the forage created by this project, and would reduce the negative impacts resulting from the loss of cover.

Degree to Which the Purpose and Need for Action is Met

Standards for elk from the 1990 Wallowa-Whitman Forest Plan focus on road densities and cover. However, in the 30 years since that plan was written, biologists have gained a greater understanding of elk biology and behavior. The effect of roads on elk habitat selection has been widely documented. However, it is the spatial arrangement of roads rather than the density that has the greatest influence. In addition, it has been documented that forest cover is less important than previously thought, particularly when roadless areas are well-distributed across the landscape. Alternative 1 would forego the opportunity to create forage and additional security habitat for elk. Alternatives 2 and 3 would create additional security habitat for elk that would reduce the negative effects incurred from the loss of cover and allow elk to better utilize the forage that would be created by this project (Table 63).

Table 63. Summary comparison of how the alternatives address the key issues

Issue	Indicator/Measure	Alt 1	Alt 2	Alt 3
Elk Security	Acres within project area > 0.5 miles from a road	4,074	4,975	4,975
Elk Security	Acres within project area > 1.0 miles from open roads	59	170	170
Elk Security	HEI value	0.36	0.60	0.60

Connectivity of Old Forest (LOS) Habitat

Existing Condition

Connectivity between MA-15 “old growth” and Old Forest (LOS) stands was assessed using field reconnaissance, aerial photographs and GIS mapping. The connectivity network connects, to the extent possible, all Old Forest and MA-15 stands within and outside the project area according to direction in the Eastside Screens. This approach of addressing connectivity habitat is consistent with direction in the Eastside Screens to retain canopy closure in the upper 1/3 of site potential, and other criteria that define connective corridors.

Old forest stands within the project area are isolated due to past harvest (see silviculture report). For this reason, the structure of connective corridors is comprised primarily of the understory reinitiation stage. Silviculture prescriptions were specifically designed within connective corridor stands to reduce tree stocking while retaining additional canopy closure and structural complexity. These treatments would accelerate the development of mature and old growth forest characteristics while improving stand resilience and resistance to insects and diseases. Silviculture prescriptions designed to retain the function of connective corridors are discussed in more detail in the direct and indirect effects section below.

Although the Patrick project involves several types of activities that could alter the quality and function of connective corridors, this effects analysis focuses on the commercial silviculture treatments. Timber harvest is the primary activity that would reduce canopy closure and decrease structural complexity within treated stands. Other activities such as prescribed fire, non-commercial thinning, and mechanical fuels reduction can affect the quality and function of connective corridors, but to a much lesser degree than timber harvest. Also, the structural components affected by these less

impactful activities can be replaced (grow back, recover) quickly relative to timber harvest. For example, non-commercial thinning, mechanical fuels reduction, and prescribed fire generally target the reduction of smaller diameter materials from forest duff to woody materials under 10” in diameter. An exception is prescribed fire which can consume all sizes of woody material, live and dead. Fire is an inexact tool, so there is the possibility that some larger woody structures would be consumed, and new ones created as trees are killed. However, prescriptions for fire are designed to retain the larger diameter woody materials and consume smaller diameter materials.

Environmental Consequences

Alternative 1 – No Action

In the absence of silviculture treatments to reduce tree stocking, canopy closure would continue to increase, and trees would be subject to increased stress and competition for resources. As a result, these drier stands would be subjected to increased risks from wildfire (see fuels report), insects, and diseases (see silviculture report) that would kill trees in numbers and distribution that could adversely affect connectivity between patches of Old Forest habitat.

To forego prescribed burning, non-commercial thinning, and mechanical fuels reduction would perpetuate higher tree densities, higher fuels loading, ladder fuels, and tree species compositions that are not sustainable for the biophysical setting. These indirect effects would contribute to uncharacteristic insect, disease, and wildfire events. The effects of wide scale tree mortality from these disturbances would have a much greater adverse effect to connectivity, than the prescribed treatments under alternatives 2 and 3. These adverse effects could render the Old Forest and connective corridors unsuitable for the wildlife species that depend on them as habitat.

Alternatives 2 and 3

Commercial and non-commercial harvest would reduce the density of trees within connectivity corridors on 10,339 acres under alternative 2 and 7,846 acres under alternative 3. These effects would persist over the next 10 to 20 years. Harvest prescriptions within connective corridors would retain basal areas between the middle to upper management zone. The upper management zone represents the tree stocking level prior to when self-thinning occurs. Tree stocking that exceeds the upper management zone is where competition between trees leads to density induced mortality of some trees. The silviculture prescriptions in connective corridor units would reduce competition between residual trees, increase tree growth rates, and increase trees’ ability to defend against insects and diseases, while retaining still retaining higher levels of canopy closure and structural complexity to facilitate movement of wildlife between Old Forest habitat patches. The burning, non-commercial thinning, and mechanical fuels reduction in connective corridors would not have a measurable adverse effect on the function of the corridors.

Cumulative Effects – Alternatives 1, 2 and 3

None of the ongoing or reasonably foreseeable projects described in Appendix A, would impact connectivity corridors within the project area so there would be no cumulative effects from the proposed activities.

Primary Cavity Excavators (PCE)

The Forest Plan identifies 15 primary cavity excavators as management indicator species (MIS) for the availability and quality of dead and defective wood habitat: northern flicker; black-backed, downy, hairy, Lewis’, three-toed, and white-headed woodpeckers; red-naped and Williamson’s

sapsuckers; black-capped, chestnut-backed, and mountain chickadees; and pygmy, red-breasted, and white-breasted nuthatches.

The abundance of cavity-using species is directly related to the presence or absence of suitable cavity trees. Habitat suitability for cavity-users is influenced by the size (diameter and height), abundance, density, distribution, species, and decay characteristics of the snags. In addition, the structural condition of surrounding vegetation determines foraging opportunities (Rose et al. 2001). Not every stage of the snag's demise is utilized by the same species, but rather a whole array of species will use the snag at various stages or conditions. Uses of snags include nesting, roosting, foraging, perching, courtship, drumming, and hibernating.

Existing Condition

Population Trend

Population trend data is obtained for PCE species mainly from two sources. Breeding bird survey data collected long-term along with established survey routes, provide indices for species trends at the state level. Stable trends are shown for 10 of the 15 PCE species in Oregon, with long-term decreases shown for two species (northern flicker and mountain chickadee) (Table 64). Trend information is inconclusive for three-toed and white-headed woodpecker, likely due to low overall detection rates. Regional indices of species security are also assessed under the Partners in Flight program. Scores for Bird Conservation Region 10 (BCR 10), which includes the Wallowa-Whitman, are shown in Table 64. Scores above 13 indicate a species may be of regional concern, and these include the black-backed woodpecker, Lewis' woodpecker, pygmy nuthatch, red-naped sapsucker, white-headed woodpecker and Williamson's sapsucker.

The combination of the state and regional indices shows stability, and regional scores below the threshold of concern for 6 of the 15 species. Increased concern, but stable state trend is shown for 4 species, while decreasing trend and lower regional concern is shown for 2 species. White-headed woodpecker and Lewis' woodpecker show the highest regional concern but lack trend information at the state level. Three-toed woodpecker also lacks state trend information, but the regional score is below the threshold of concern.

Table 64. Population Trend Data for Cavity-nesting MIS in Oregon and BCR 10

Species	Breeding Bird Surveys	Partners in Flight Database
Black-backed woodpecker	stable	14
Downy woodpecker	stable	10
Hairy woodpecker	stable	10
Lewis's woodpecker	no trend	18
Northern flicker	decrease	13
Northern three-toed woodpecker	No data	13
Pygmy nuthatch	stable	14
Red-breasted nuthatch	stable	11
Red-naped sapsucker	stable	17

White-breasted nuthatch	stable	8
White-headed woodpecker	no trend	18
Williamson's sapsucker	stable	17
Black-backed chickadee	stable	13
Chestnut-backed chickadee	stable	11
Mountain chickadee	decrease	12

Habitat Trend at the Regional Level

Wisdom et al. (2000) analyzed the current amount of available habitat in relation to historical availability for a range of species, producing a trend index by Ecological Reporting Unit (ERU). In the Blue Mountains, trend indices were reported for 8 of the 15 PCEs (Table 65). Decreasing or Strongly Decreasing trend is indicated for 6 of the 8 species. Strongest decreases are shown for species associated with mature ponderosa pine habitats with large snags (white-headed woodpecker, pygmy nuthatch), as well as single-story old forest, multi-storied Douglas-fir and western larch, and riparian cottonwood woodlands (Lewis' woodpecker). Factors contributing to these declines include transition to shade-tolerant tree species, past timber harvest, and increased road densities that allow snag removal for firewood (Wisdom et al. 2000). Black-backed woodpecker habitat, consisting of a range of green and burned forest condition, has also decreased at the regional level due to past timber harvest, firewood removal, and fire suppression. The highest regional increase is shown for three-toed woodpecker, which is associated with late seral subalpine and montane conifer.

Table 65. Long-term Regional Trend of PCE Habitats in the Blue Mountains

Species	Group	ERU Relative Change & Trend Category
Black-backed woodpecker	9	-30.96 Decreasing
Lewis's woodpecker	2	-72.17 Strongly decreasing
Northern three-toed woodpecker	11	100+ Strongly increasing
Pygmy nuthatch	1	-79.78 Strongly decreasing
White-breasted nuthatch	1	-27.57 Decreasing
White-headed woodpecker	1	-79.26 Strongly decreasing
Chestnut-backed chickadee	6	-3.08 No change
Williamson's sapsucker	6	-37.96 Decreasing

Forest-wide Snag Densities

Snag densities at the Forest level were summarized using Gradient Nearest-Neighbor (GNN) satellite interpretation data made available from the LEMMA (Landscape Ecology, Modeling, Mapping, and Analysis) team (LEMMA 2011). According to the data clipped to the Forest-wide extent, snags 10-20" DBH average about 7.5 per acre, while snags ≥20" DBH averaged less than 2 per acre.

North Fork Burnt River Snag Densities

Snag densities within the watershed were estimated using the methods described in DecAID, the USDA Forest Service Region 6 Decayed Wood Advisor (https://apps.fs.usda.gov/r6_DecAID). The North Fork Burnt River watershed was determined to be the appropriate scale of analysis based on the number of acres of each wildlife habitat type available within the watershed. The predominant wildlife habitat types within the watershed that have proposed silviculture treatments include the ponderosa pine-Douglas fir habitat type and the eastside mixed conifer habitat type. Eighty-one percent of the ponderosa pine/Douglas-fir habitat type within the watershed has less than 4 snags/acre that are 10-20" DBH (Figure 11). Seventy-seven percent of the eastside mixed conifer wildlife habitat type within the watershed has less than 6 snags/acre that are 10-20" DBH (Figure 12). For large snags (>20" DBH), 92% of ponderosa pine/Douglas-fir and 84% of the eastside mixed conifer in the watershed has less than 2 snags/acre (Figure 13 and Figure 14). At current snag densities, it is unlikely that much of the watershed is providing high quality habitat for primary cavity excavators.

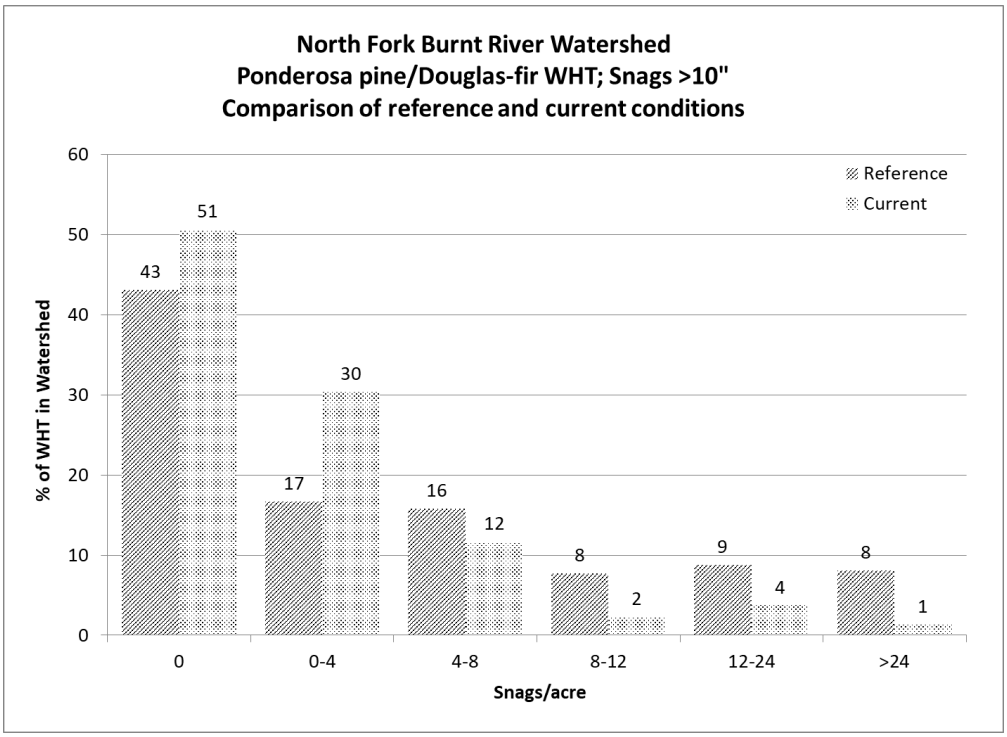


Figure 11. Existing snag densities relative to HRV (reference) for snags 10-20" DBH within the ponderosa pine/Douglas-fir wildlife habitat type in the North Fork Burnt River Watershed

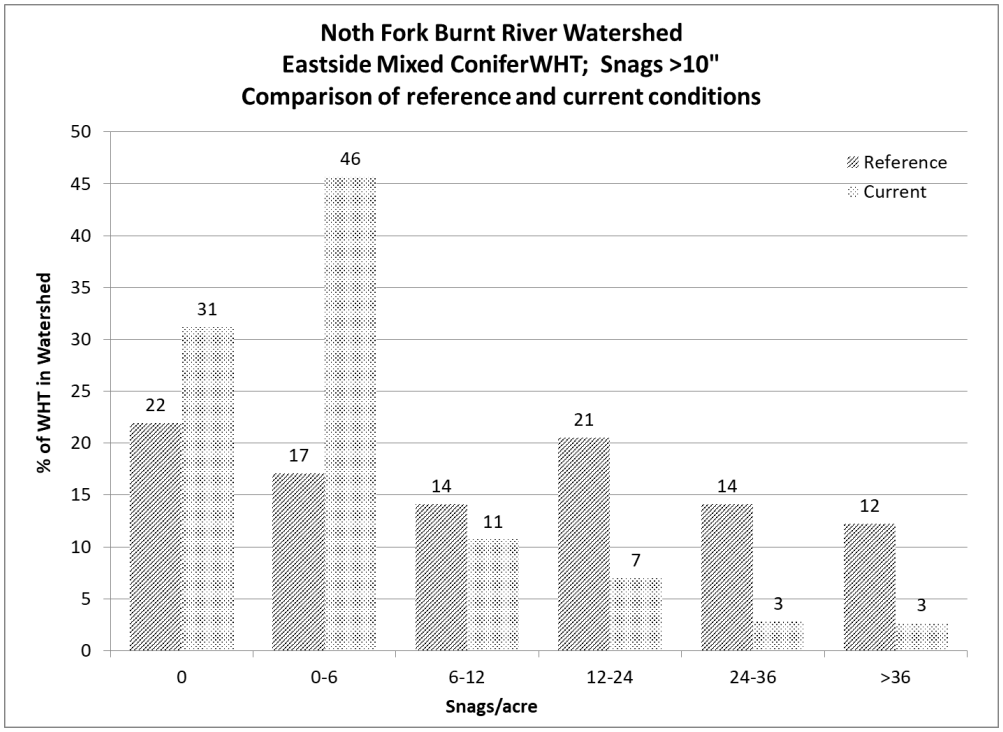


Figure 12. Existing snag densities relative to HRV (reference) for snags 10-20" DBH within the eastside mixed conifer wildlife habitat type in the North Fork Burnt River Watershed

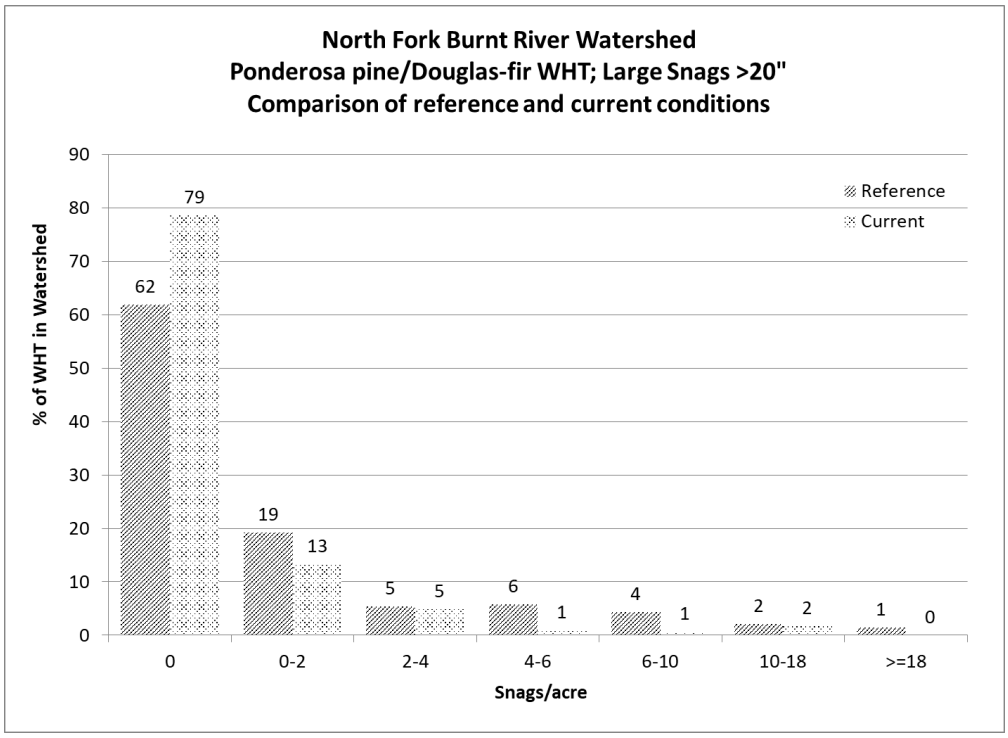


Figure 13. Existing snag densities relative to HRV (reference) for snags >20" DBH within the ponderosa pine/Douglas-fir wildlife habitat type in the North Fork Burnt River Watershed

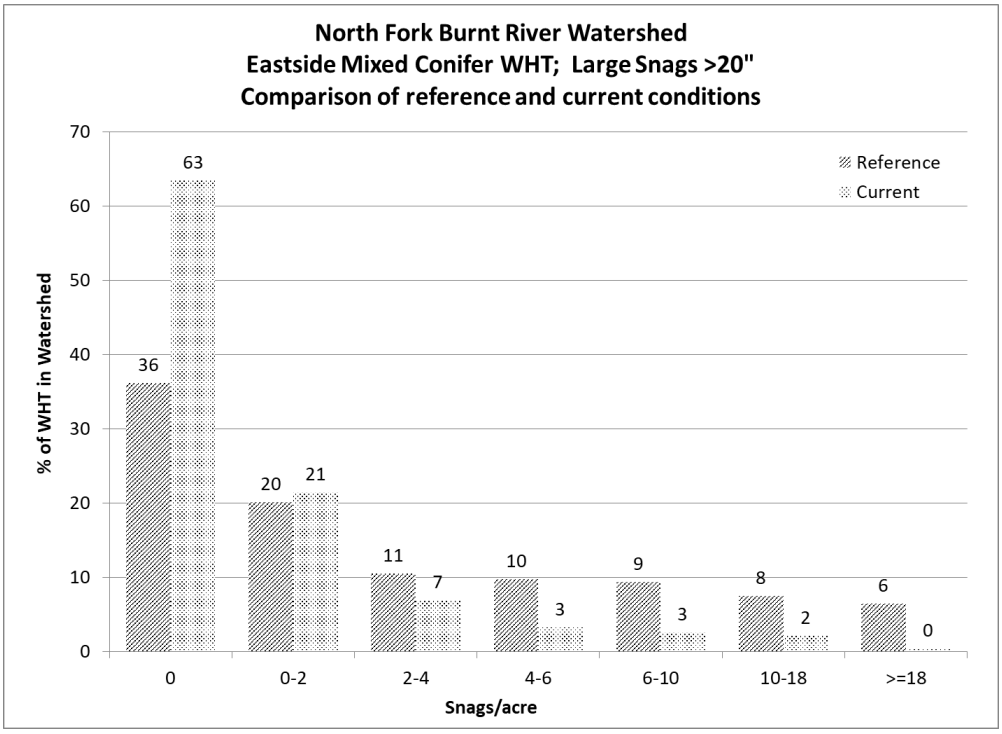


Figure 14. Existing snag densities relative to HRV (reference) for snags >20" DBH within the eastside mixed conifer wildlife habitat type in the North Fork Burnt River Watershed

Existing Condition in Relation to the R6 Decayed Wood Advisor (DecAID)

Tolerance intervals are, estimates of the percent of all individuals in the population that are within some specified range of values. In the USFS Region 6 decayed wood advisor (DecAID) (https://apps.fs.usda.gov/r6_DecAID), tolerance intervals tell us what percent of primary cavity excavators in a population use snags below or above certain diameters. For example, an 80% tolerance level indicates 80% of the individuals in the population have a value for the parameter of interest (e.g. snag density) between 0 and the value for the 80% tolerance level. Or conversely, 20% of the individuals in the population have a value for the parameter of interest greater than the 80% level. The tolerance interval is the range between 2 tolerance levels. For example, the value for 80% is the level and the range of 0 to 80% is the interval.

DecAID displays three tolerance levels (30%, 50% and 80%) for density and DBH class of snags in various vegetation condition groups used by wildlife species. Ranges of snag densities by DBH class are provided as a result of data from various studies. In the Patrick project area, vegetation condition groups include Ponderosa Pine/Douglas-fir and Eastside Mixed Conifer habitats and include both Large Tree and Small/Medium tree habitat types. The ranges of snag densities by DBH class for each vegetation group and habitat type are shown in Table 66. Wildlife snag use levels shown in Table 66 exclude those estimated for white-headed woodpecker because the data are from a declining population.

Table 66. Tolerance levels and snag densities for wildlife species

Habitat Type/ Structure	Tolerance Levels	Snag Densities (per acre) Used by Wildlife by Diameter Class (DBH)
Ponderosa Pine/ Douglas-fir (Large)	80%	10-50 > 10” 2.8-18 > 20”
Ponderosa Pine/ Douglas-fir (Large)	50%	4.7-30 > 10” 1-8 > 20”
Ponderosa Pine/ Douglas-fir (Large)	30%	1.1-15 > 10” 0-3.5 > 20”
Ponderosa Pine/ Douglas-fir (Small/Medium)	80%	10-49 > 10” 2.8-18 > 20”
Ponderosa Pine/ Douglas-fir (Small/Medium)	50%	4.7-30 > 10” 1.6-8.4 > 20”
Ponderosa Pine/ Douglas-fir (Small/Medium)	30%	1.2-15 > 10” 0-3.5 > 20”
Mixed Conifer (Large)	80%	12.1-50 > 10” 4-18 > 20”
Mixed Conifer (Large)	50%	5.6-56 >10” 1.4-17 >20”
Mixed Conifer (Large)	30%	1.1-15 >10” 0-3.7 > 20”
Mixed Conifer (Small/Medium)	80%	12.1-50 > 10” 4.0-18 > 20”
Mixed Conifer (Small/Medium)	50%	5.6-56 > 10” 1.4-17 > 20”
Mixed Conifer (Small/Medium)	30%	1.1-15 > 10” 0-3.7 > 20”

While DecAID provides data on wildlife use of snags, it does not measure the biological potential of wildlife populations. There is no direct relationship between tolerances, snag densities and snag sizes used in DecAID and snag densities and sizes that measure potential population levels (Mellen-McLean et al 2009). Therefore, DecAID wildlife tolerance levels are only one component used to evaluate the effects of this project on dead wood habitats and associated species.

The Wallowa-Whitman LRMP direction originally provided to maintain snags and green tree replacements was based on numbers provided in Thomas (1979). These included maintaining at least 40% maximum population potential (MPP) for snags within upland conifer stands, and at least 60% MPP for snags within riparian settings. More recent studies have shown these snag densities are too low to meet the needs of many primary and secondary cavity users. These inadequate standards contributed to the reduced number of large snags today. Since then, the Eastside Screens has changed this to provide for 100% potential population levels. Bull et al. (1997) found 2.25 snags/acre were insufficient, and that 4 snags/acre (2.8 snags between 10-20 in DBH and 1.2 snags >20 in DBH) is

more appropriate as a minimum density required by primary and secondary cavity users for roosting, nesting, and foraging needs. Harrod et al. (1998) determined a range of historic snag densities for dry eastside forests between 5.9-14.1 snags/acre (5-12 are 10-20 inches DBH and 0.9 to 2.1 are >20 inches DBH). Korol et al. (2002) determined that HRV for large snags (20" DBH) for dry eastside mixed conifer forest with a low intensity fire regime was 2.9-5.4 snags/acre.

Live green trees of adequate size must also be retained to provide replacements for snags and logs through time. Generally, green tree replacements (GTRs) need to be retained at a rate of 16-74 trees per acre, depending on biophysical group, estimated rotation, pre-commercial and commercial thinning, and average stand diameter (Schommer et al. 1993). Pre-activity levels of logs would also be left unless levels exceed amounts specified in the Forest Plan, as amended (Table 67). Larger blowdowns with intact tops and rootwads are preferred to shorter sections of tree boles.

Table 67. Forest Plan standards for down wood

Stand Type	Pieces/acre	Piece Length	Diameter Small End
Ponderosa pine	3 – 6	>6'	12"
Mixed conifer	15-20	>6'	12"
Lodgepole pine	15-20	>8'	8"

1. The table converts to about 0.4, 1.7, and 3.3 tons/acre for ponderosa pine, mixed conifer, and lodgepole pine, respectively.

Environmental Consequences

Alternative 1 – No Action

There would be no direct adverse effects to pileated woodpecker from the no action alternative because no timber harvest, fuels treatments, or transportation activities would occur. Existing source habitat would remain unchanged.

Alternatives 2 and 3

Snag Availability

Both action alternatives have the potential to reduce snags within proposed treatment areas. However, the amount of removal of snags as hazards within timber harvest units in Patrick is expected to be low. The rate of snag removal due to timber harvest safety concerns is estimated at less than 1% (of existing at the stand scale) for timber sales on the district (J. Chandler pers. comm. 2014).

Treatments in the form of prescribed fire would likely consume a portion of existing snags, while also creating new snags via fire damage to a small portion of existing green trees. The level and extent of impact to the existing snag resource from prescribed fire is unknown. Harrod et al. (2009) described that burning treatments increased the probability of snag fall, but that these losses were offset by tree mortality caused by fire. Stephens and Moghaddas (2005) reported no significant difference in overall soft snag numbers when compared between controls, mechanically thinned, and mechanically thinned and burned stands in the Sierra Nevada.

Post-harvest availability of snags within the project area is expected to be similar to existing conditions, including low to moderate snag availability. Hazard tree removal would be emphasized along haul routes, but existing snags are likely already sparse near roads due to past and ongoing firewood cutting. In addition, areas near haul routes represent a small portion of the overall project area acreage and therefore would not contribute to a sizeable reduction in snag numbers.

For Lewis' woodpecker, both action alternatives are likely to reduce the potential for burned area habitats in the long-term but would be offset by a relatively steady availability of suitable green stands. Stand density reductions and enhancement of ponderosa pine habitats would increase available habitat for hairy woodpecker, northern flicker, pygmy nuthatch, white-breasted nuthatch, and Williamson's sapsucker.

Aspen restoration treatments on 33 acres under both action alternatives is expected to increase habitat available to aspen-associated species that include downy woodpecker, red-naped sapsucker, Williamson's sapsucker, black-capped chickadee, chestnut-backed chickadee, and mountain chickadee.

Stand density reductions can adversely impact red-breasted nuthatch by reducing structural diversity. Because the species is known to use both unmanaged and managed forest stands, the level of impact within the project area is expected to be minor.

Currently, a large portion of acres within Patrick are at increased susceptibility to insect mortality, disease, and stand-replacement fire relative to historic levels of disturbance. Such overstocked stand conditions also increase the potential for future pulses of conifer mortality that provide suitable habitat for black-backed woodpeckers. By reducing stand densities, the action alternatives would decrease the potential for habitat availability in the form of stand-replacement fires or large areas of insect-induced conifer mortality. Remaining potential black-backed woodpecker habitat would occur in untreated areas within and outside of RHCAs and MA-15 (Old-Growth) areas as well as additional areas where higher stand densities are maintained within connectivity corridors.

Cumulative Effects – Alternative 1

Because there are no direct or indirect effects from alternative 1, there would be no cumulative effects.

Cumulative Effects – Alternatives 2 and 3

Appendix A of the EA was reviewed for actions that might affect primary cavity excavator habitat within the North Fork Burnt River watershed. Activities that have the potential to affect primary cavity excavators are discussed below. Effects are combined for alternatives 2 and 3 because they would be similar.

Vegetation management activities proposed in the Austin Vegetation management project would alter habitat for primary cavity excavators as described in the direct effects for this project. The result would be additional habitat alteration in the adjacent watershed. Considering snags would not be removed unless they pose a safety hazard and project design features would be utilized to protect snag habitat, the combined treatments are not expected to decrease population viability because primary cavity excavator habitat would remain well distributed across the forest.

On National Forest System lands within and outside the project area, firewood cutting, and danger tree removal would continue to reduce available snags and logs. Firewood cutting within the project area could be increased after implementation due to the clearing and re-opening of roads that have grown closed. This would result in increased disturbance from noise, vehicles, and people during firewood season. However, firewood cutting, and danger tree removal would be limited to areas adjacent to open roads so there would be no cumulative effect to population viability because these activities impact only a small fraction of habitat on the forest.

Recreation activities including the use of OHV and snowmobile trails could cause additional disturbance and cavity excavators may avoid these areas during periods of human use. However, the effect would be temporary so it would not influence population viability under current levels of use. The future Travel Management Plan in combination with the post-sale road management plan in this project could further reduce road densities and cross-country motor vehicle use, thereby increasing habitat quality and reducing threats for primary cavity excavators. However, it is unlikely that the road management plan proposed in this project would have a significant effect at the population scale.

Summary

No alternative considered for the Patrick Project would affect population viability for primary cavity excavator species because reduction of potential habitat is small in relation to overall availability of habitat forest-wide.

All proposed actions are consistent with Forest Plan standards and guidelines pertaining to primary cavity excavators. Current availability of snags in the project area is below the historical range of variability, but the spatial arrangement of available snags is variable due to past activities. Timber harvest and prescribed fire proposed under both action alternatives has the potential to impact snag availability, but that impact is expected to be minor within the project area and on the landscape as a whole due to project design features that protect snag habitat. Stand density treatments in conifer stands are expected to enhance habitat for Lewis' woodpecker, white-headed woodpecker, northern flicker, pygmy nuthatch, white-breasted nuthatch, and Williamson's sapsucker. Aspen restoration treatments would enhance habitat for downy woodpecker, red-naped sapsucker, Williamson's sapsucker, black-capped chickadee, chestnut-backed chickadee, and mountain chickadee. Although treatments would improve habitat for these species within the project area, the effect to habitat forest-wide would be small considering that the project area encompasses only 2% of the Wallowa-Whitman. Proposed tree density reduction treatments would reduce risk of insect and wildfire disturbance within the project area, thereby reducing the potential for future pulses of habitat suitable for Lewis', hairy, and black-backed woodpeckers within a large portion of the project area.

Landbirds and Neotropical Migratory Bird Species (NTMBS)

Neotropical migratory landbirds are those that breed in the United States and winter primarily south of the United States-Mexico border. They are a large group of species, including many hawks, shorebirds, flycatchers, vireos, swallows, thrushes, warblers, and hummingbirds, with diverse habitat needs spanning nearly all successional stages of most plant community types. Nationwide declines in population trends for neotropical migrants have developed into an international concern. Recent analyses of local and regional bird population counts, radar migration data, and capture data from banding stations show that forest-dwelling bird species, many of which are neotropical migrants, have experienced population declines in many areas of North America (Finch 1991). Habitat loss is considered the primary reason for the declines. Other contributing factors include fragmentation of breeding grounds, deforestation of wintering habitats, and pesticides.

Scale of Analysis-

For highly mobile animals such as birds, effective conservation requires that local planning and implementation be designed in the broader context of larger areas such as ecoregions (Noss 1983, Franklin 1993). The desireable ecological unit for the planning, delivery, and tracking of bird conservation is the Bird Conservation Region (www.nabci-us.org/bcrs.html). The Wallowa-Whitman National Forest lies within the Northern Rocky Mountain Bird Conservation Region. There are

approximately 125 regularly breeding landbird species within the Northern Rocky Mountain Landbird Conservation Planning Region also known as Bird Conservation Region 10 (BCR 10). Approximately 25% of BCR 10 occurs in Oregon and Washington, and over 60% of the land is in public ownership, primarily managed by the U.S. Forest Service. Because much of the region consists of public forest lands, a significant part of landbird conservation includes addressing issues within the context of public lands management (Altman and Bresson 2017). Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds,* directs that environmental analyses evaluate the effects of proposed actions on migratory birds.

Existing Condition

In 2017, Altman and Bresson updated the Conservation of Landbirds and Associated Habitats and Ecosystems in the Northern Rocky Mountains of Oregon and Washington (hereafter referred to as the Conservation Strategy). The Conservation Strategy was developed by multiple agencies and organizations including the U.S. Forest Service, Bureau of Land Management, Partners in Flight, and the American Bird Conservancy. The Conservation Strategy is focused on native landbird species that breed in the Northern Rocky Mountains of Oregon and Washington. Because breeding bird species occur in all the habitats and conditions that support non-breeding bird species, there is an underlying assumption that habitat management for breeding birds will likely support most, if not all, of the habitat needs of non-breeding birds in these habitat types (Altman and Bresson 2017). The Conservation Strategy uses a focal species approach based on the assumption that managing for a suite of species representative of important habitat components will conserve many other species and elements of biodiversity. Focal species representing the habitat types found in the Patrick project area are in Table 68.

Table 68. Focal bird species for landbird conservation in coniferous forests of the northern Rockies

Focal species	Forest condition	Habitat attribute
Chipping sparrow	Dry Forest	Short-statured herbaceous understory with scattered sapling pines
Flammulated owl	Dry Forest	Interspersion of herbaceous openings and patches of dense sapling/pole trees
White-headed woodpecker	Dry Forest	Large patches of late-successional forest with heterogeneous canopy cover
Lewis's Woodpecker	Dry Forest	Large snags
Olive-sided flycatcher	Mesic Mixed Conifer	Forest edges and openings with scattered trees
Townsend's warbler	Mesic Mixed Conifer	High canopy cover and foliage volume
Orange-crowned Warbler	Mesic Mixed conifer	Patches of a dense understory shrub layer
Williamson's sapsucker	Mesic Mixed Conifer	Large snags

Unique Habitats

In addition to focal species, the Conservation Strategy identifies 12 unique habitats that are important for landbird conservation either because a priority species is highly dependent on it and/or it is limited in extent, distribution or elevation. Unique habitats that occur within the Patrick project area **and** are likely to be impacted by the proposed activities include aspen and riparian shrub. These two unique habitats are represented by the Warbling Vireo and Willow Flycatcher, respectively. Neither of these

species have been documented in the Patrick project area although suitable habitat likely exists. Population data for these species is summarized in the following pages under Population Estimates.

Recommended habitat strategies that are applicable to unique habitats within this project area include 1) implement the use of prescribed fire in restoration to stimulate aspen regeneration, 2) manage encroaching conifers to ensure dominance of aspen and retention of ecological function, and 3) target conservation and restoration efforts where riparian shrub is ecologically appropriate and hydrologically sustainable.

Habitat Types

Habitat types described in the Conservation Strategy that occur in the Patrick project area include Dry Forest and Mesic Mixed Conifer Forest (late succession). The Conservation Strategy identified eight focal species that represent a range of desired habitat attributes within these habitat types. Two focal species have been documented within the project area (White-headed Woodpecker and Chipping Sparrow), and suitable habitat exists for the other six species. The assumption is that providing habitat for focal species should also address the habitat needs of most if not all of the other bird species occurring in those habitat types. Habitat strategies were identified for each species, several of which are within the scope of this project (Table 69).

Table 69. Focal species habitat strategies that are within the scope of this project

Focal Species	Habitat Strategies
Chipping sparrow	• Conduct thinning or partial overstory removal to provide suitable canopy and ground cover habitat
Flammulated owl	• Target conservation efforts near grassland or dry meadow openings • Conduct uneven-aged forest management that provides for a mosaic of broken and closed canopies • Manage for proximitity of patches of dense trees for roosting and snags and snag-patches for nesting • In restoration efforts, leave patches of dense sapling thickets to function as roost and cover sites • Where grassy openings in potential or suitable habitat are being encroached by shrubs and trees, initiate actions such as manual removal and prescribed fire to maintain these openings • Provide adequate snags that ensure cavity availabilty in May • If snags are limiting and habitat is suitable, create snags through appropriate methods • Eliminate or restrict fuelwood cutting in suitable habitat by closing roads and/or limiting permits • Use nest boxes as short-term habitat augmentation where restoration activities are occurring and snags are limiting

White-headed woodpecker	• Target conservation efforts in areas of broken canopies and large snags • Eliminate or restrict fuelwood cutting in suitable habitat by closing roads and/or limiting permits • Manage for large diameter trees through wider tree spacing and reduction of competition • Maintain all large, dominant pine-cone producing trees to provide seeds for foraging during non-breeding season • If snags are limiting and habitat is suitable, create snags through appropriate methods • Retain broken-topped snags, soft snags, leaning logs, and high stumps (> 10 ft tall) for potential nesting • Retain or provide downed logs for foraging sites • Manage for low shrub and down wood cover through prescribed fire and manual treatments to reduce populations of small mammals as nest predators • Conduct uneven-aged forest management that provides for a mosaic of broken and closed canopies
Lewis's Woodpecker	• Conduct selective logging to increase suitability of habitat as long as sufficient large living and dead trees are retained • If snags are limiting and habitat is suitable, create snags through appropriate methods • Use nest boxes as short-term habitat augmentation where restoration activities are occurring and snags are limiting • Retain all soft snags of a sufficient size • Conduct prescribed burns and understory thinning to maintain existing late-successional trees and accelerate development of mid-successional stages to late-successional forest • Eliminate or restrict fuelwood cutting in suitable habitat by closing roads and/or limiting permits • Conduct controlled underburning or other techniques to promote a shrubby understory for insect production
Olive-sided flycatcher	• Eliminate or restrict fuelwood cutting in suitable habitat by closing roads and/or limiting permits • Retain standing dead or diseased trees where they occur • Retain snags and large trees within selective harvests • If snags are limiting and habitat is suitable, create snags through appropriate methods • Conduct underburning or other techniques to promote a shrubby understory for insect production • Conduct selective logging to increase suitability of habitat as long as sufficient large living and dead trees are retained
Townsend's warbler	• Target conservation efforts where closed canopy forests are ecologically appropriate (north-facing slopes, wet sites) • Designate large, unmanaged or lightly managed areas where overstory canopy cover is emphasized • Conduct management in young forests (e.g. thinning from below) that enhances development of late-successional forest with high canopy cover and foliage volume • Avoid management that results in <70% canopy cover

Orange-crowned Warbler	• Retain or promote understory growth through natural disturbance or management that breaks up the forest canopy, yet still maintains the dominance of a mid- or late-successional forest.
Williamson's sapsucker	• Target conservation efforts within areas of late-successional western larch trees • Retain blown out large living trees >40" regardless of landscape context • Retain known or suitable nesting and roosting snags from all harvest and salvage activities and restrict access for fuelwood cutters • Conduct selctive logging to increase suitability of habitat as long as sufficient large living and dead trees are retained • If snags are limiting and habitat is suitable, create snags through appropriate methods • Eliminate or restrict fuelwood cutting in suitable habitat by closing roads and/or limiting permits

Responsibility Species

There are 12 species with a relatively large percent of their population (>25%) in the region, and thus considered to be a high responsibility for landbird conservation partners. All of these species have been documented within or adjacent to the Patrick project area and use habitat that could be impacted by vegetation management activities. Responsibility species include Calliope Hummingbird, Cassin's Finch, Cassin's Vireo, Clark's Nutcracker, Dusky Flycatcher, Lazuli Bunting, Mountain Chickadee, Red-breasted Nuthatch, Red-naped sapsucker, Townsend's Warbler, Western Tanager, and Williamson's Sapsucker. The Williamson's Sapsucker is particularly significant because it has a relatively small population and 25% of the population occurs in eastern Oregon.

Population Estimates

Population size is an important metric in assessments of a species conservation status and its response to natural or anthropogenic changes in its habitat (Altman and Bresson 2017). The Partners in Flight Species Assessment Database includes population size as one of several factors considered in the prioritization of species (Table 70). A population estimate was not available for the Flammulated Owl.

Table 70. Focal and Responsibility species (known or suspected to occur in the Patrick project area) population estimates and percent of continental population for the Northern Rockies (BCR 10) and Oregon

Species	BCR 10 Population	% of total	BCR 10 Oregon Population	% of total
Chipping Sparrow	20,000,000	8.6	1,900,000	0.8
Flammulated Owl	No data available	12.5	No data available	3.6
White-headed Woodpecker	15,000	9.5	12,000	8.0
Red-naped Sapsucker	1,200,000	61.9	70,000	3.3
Calliope Hummingbird	1,500,000	61.8	130,000	5.5
Cassin's Finch	1,200,000	41.0	400,000	14.5
Cassin's Vireo	2,200,000	55.7	100,000	2.5
Dusky Flycatcher	4,400,000	55.9	500,000	6.8
Lazuli Bunting	1,500,000	27.3	300,000	4.8

Williamson's Sapsucker	110,000	36.0	80,000	25.6
Lewis' Woodpecker	8,000	11.6	2,000	3.3
Olive-sided Flycatcher	200,000	15.3	15,000	0.9
Willow Flycatcher	3,000,000	32.0	50,000	0.6
Townsend's Warbler	7,000,000	39.0	600,000	3.6
Orange-crowned Warbler	5,100,000	6.3	90,000	0.1
Warbling Vireo	14,000,000	28.1	200,000	0.4
Clark's Nutcracker	90,000	40.1	14,000	6.0
Mountain Chickadee	2,400,000	31.5	600,000	7.8
Red-breasted Nuthatch	5,000,000	25.4	700,000	3.6
Western Tanager	3,300,000	30.2	700,000	6.0

Population Trends

The Breeding Bird Survey (BBS) (Robbins et al. 1986) is the primary source of population trend information for North American landbirds since 1968 (www.mbr-pwrc.usgs.gov/bbs/). There are 38 BBS routes within the Northern Rocky Mountains, one of which is located near the town of Granite, north of the Patrick project area. BBS data indicates more than three times as many species are experiencing significant recent (1980-2012) and/or long-term (1966-2012) declining population trends than increasing population trends (i.e., 38 species vs. 12 species). This marks a reversal of the positive trend for many species compared to 15 years ago, when previous estimates reported more than twice as many species with increasing populations (36 species vs. 16).

Population trend data is given below (Table 71) for Focal and Responsibility species potentially impacted by vegetation management within the Patrick project area. Trend estimates were not considered for this analysis if the precision was low or statistically insignificant. Of the eight species that have experienced a statistically significant trend, the Willow Flycatcher and Mountain Chickadee are experiencing a long-term downward trend and the Olive-sided Flycatcher and Cassin's Finch are exhibiting both a short-term and long-term downward trend. The Warbling Vireo and Western Tanager have experienced an increasing population trend in the long-term and short-term, and Cassin's Vireo has experienced an increasing population trend in the long-term and short-term, data is either not available or lacking in precision.

Table 71. Breeding bird survey significant population trends for Focal and responsibility species with habitat potentially impacted by vegetation management within the Patrick project area

Species	Long-term 1968-2012	Short-term 1980-2012
Olive-sided Flycatcher	Declining	Declining
Willow Flycatcher	Declining	Not available
Cassin's Finch	Declining	Declining
Red-naped Sapsucker	Increasing	Not available
Cassin's Vireo	Increasing	Not available

Warbling Vireo	Increasing	Increasing
Mountain Chickadee	Declining	Not available
Western Tanager	Increasing	Increasing

Other species may be experiencing population declines, but lack sufficient data for statistical confidence (e.g. Lewis's Woodpecker and Williamson's sapsucker) or are not adequately detected using Breeding Bird Survey methods, such as owls.

Environmental Consequences

Alternative 1 – No Action

The No Action alternative retains existing habitat for migratory birds by virtue of no timber harvest treatments, fuels treatments, or transportation activities.

Alternatives 2 and 3

Effects from this project to migratory birds should be minimal. The effects of fire vary depending on intensity and extent, but it is generally accepted that the effects of prescribed fire are less severe than those from wildfires. Prescribed burning is done under specific prescriptive parameters that often result in favorable outcomes, whereas wildfires (and associated suppression activities) generally occur when fuels are dry, temperatures are high, and relative humidity is low. Large, stand-replacement wildfires have long-term adverse effects for most upper forest canopy birds, but small, low intensity prescribed burns tend to have a beneficial effect on the majority of avian species. Prescribed burning may temporarily setback mature shrubs currently functioning as nesting habitat, but would likely then rejuvenate these same plants by stimulating resprouting and new growth. Shrub levels would increase in the years after a burn, and this favors species (e.g., olive-sided flycatcher) that prefer early-seral forest conditions. A preliminary study suggested neither spring or fall prescribed burns adversely affected breeding songbirds, either in terms of adundance or demographics (Sallabanks et al. 2006). Although spring burns may have detrimental effects on some ground-nesting forest birds by causing direct mortality, any impacts are likely to be limited to a small subset of the avian community. As a result, Sallabanks et al. (2006) recommended that spring burns be employed as a management tool, in conjunction with fall burns, to restore dry forest habitat types to historical structure and composition in the Intermountain West. They also stated that spring prescribed burns should only be administered prior to vegetation leaf-out because relatively few ground-nesting birds begin nesting earlier, and such administered burns have little risk of destroying active nests (with the possible exception of those of the dark-eyed junco). Prescribed springtime burning associated with this project would occur prior to vegetation leaf-out and fall burning would occur after the breeding season in mid-September through November. Logging poses risks of direct mortality or displacement during spring and early summer.

In the short-term, some nesting habitat may be lost because of logging and burning, but the scale at which it would occur is not expected to significantly reduce avian richness or abundance. Some birds may experience shifts in home ranges as habitat is altered, but treatments would not result in their complete displacement from the project area. The short-term losses of relatively abundant, early-nesting species, such as the dark-eyed junco, may be a necessary tradeoff for the effective restoration of dry forests. Such losses may be further justified if populations of other species, such as the flammulated owl, white-headed woodpecker, and pygmy nuthatch, ultimately benefit from such restoration. While the long-term overall shift in forest structure would favor species dependent on single-story old forest, this is the type of forest historically characteristic of much of the project area and is important to chipping sparrows and flammulated owls. Open forest stands would continue to

support a diversity of shrubs and grasses that avian species depend on. A mosaic of forest and rangeland conditions capable of supporting breeding bird populations would still exist if the project is implemented. There is no indication that habitat changes from the project would result in reduced numbers of these birds that would be significant at local or landscape scales.

Proposed aspen treatments under both alternatives and riparian treatments under alternative 2 would restore unique habitats that have been identified as important to the conservation of landbird populations (Table 72).

Table 72. Acres of proposed treatments in unique habitats

	Alternative 1	Alternative 2	Alternative 3
Total acres of aspen restored	0	41	39
Total acres of riparian habitat restored	0	481	0

Cumulative Effects – Alternative 1

The no action alternative would not have incremental, cumulative effects to other past, present and reasonably foreseeable future actions in this area. Any effects from alternative 1 would be indirect, which are described above.

Cumulative Effects – Alternatives 2 and 3

Appendix A of the EA was reviewed for actions that might affect migratory bird habitat within the North Fork Burnt River watershed. Activities that have the potential to affect avian species are discussed below. Effects are combined for alternatives 2 and 3 because they would be similar.

Vegetation management activities proposed in the Austin vegetation management project would alter habitat for migratory birds similarly to what is described in the direct effects for this project. The result would be additional habitat alteration in the adjacent watershed. Given that the changes to habitat from this project are not expected to significantly impact populations of migratory birds, the combined treatments from both projects are not expected to decrease population viability.

On National Forest System lands within and outside the project area, firewood cutting, and danger tree removal would continue to reduce available snags and logs. Firewood cutting within the project area could be increased after implementation due to the clearing and re-opening of roads that have grown closed. This would result in increased disturbance from noise, vehicles, and people during firewood season. However, firewood cutting, and danger tree removal would be limited to areas adjacent to open roads so there would be no cumulative effect to population viability because these activities impact only a small fraction of habitat on the forest.

Recreation activities including the use of OHV and snowmobile trails could cause additional disturbance and migratory birds may avoid these areas during periods of human use. However, the effect would be temporary so it would not influence population viability under current levels of use. The future Travel Management Plan in combination with the post-sale road management plan in this project could further reduce road densities and cross-country motor vehicle use thereby increasing habitat quality and reducing threats for avian species. However, it is unlikely that the road management plan proposed in this project would have a significant effect at the population scale.

Summary

Of the approximately 125 regularly breeding landbird species within the Northern Rocky Mountains, 20 species were specifically addressed in this analysis because they have been documented within or near the project area and use habitats that are potentially impacted by vegetation management. Additionally, they also met one or several of the following criteria: 1) are likely to become candidates for listing, 2) are focal species representing a particular habitat type, or 3) a large percentage of their continental population occurs within this region.

Four of the species that were addressed (Mountain Chickadee, Olive-sided Flycatcher, Willow Flycatcher, and Cassin's Finch) are experiencing significant downward population trends. One of these species (Cassin's Finch) is considered a responsibility species because 41% of the continental population occurs within the Northern Rocky Mountain region, 14.5% of which resides in northeastern Oregon. Cassin's Finch has been observed just outside the project area and suitable habitat does exist. However, it is unknown whether habitat quality is sufficient for successful reproduction.

The proposed treatments are consistent with strategies to maintain or improve avian habitat. This project would not adversely affect populations of migratory birds because project treatments would begin to shift the project area towards the overall long-term goal of increasing late and old structure (LOS) habitat. Treatments would retain the old-growth component of the area and promote the desired growth of large trees. Burn plans are designed to maximize retention and protection of large diameter live trees, snags, and logs. A mosaic of forest and rangeland conditions capable of supporting breeding migratory bird populations would still exist if the project is implemented. There is no indication that habitat changes from the project would result in reduced numbers of migratory birds that would be meaningful at local or landscape scales.

Unique and sensitive habitats

The LRMP states that the alteration of unique habitats (i.e., cliffs, talus slopes) should be avoided (U.S. Forest Service 1990). Some species, such as amphibians, bats, and reptiles, may only be found in these types of habitats.

Existing Condition

The analysis area contains some unique and sensitive habitats in the form of large rock/boulder features, riparian areas, ponds, seeps, and springs.

Environmental Consequences

Alternative 1 – No Action

The No Action alternative retains existing unique and sensitive habitats by virtue of no timber harvest treatments, fuels treatments, or transportation activities.

Alternatives 2 and 3

LRMP standards for protecting fisheries and watershed resources generally maintain and protect unique and sensitive habitats. Riparian habitat and aquatic species (fish, amphibians, insects) should be largely unaffected by treatment activities (see the Hydrology, Soils, and Fisheries Reports). There would be no direct lighting of vegetation at large rock/boulder piles. There is no indication that changes to unique and sensitive habitats from the proposed project would result in reduced populations of any wildlife species that would be meaningful at local or landscape scales.

Cumulative Effects – Alternatives 1, 2 and 3

Because there are no anticipated direct or indirect effects to unique and sensitive habitats from the proposed treatments, there would be no cumulative effects when combined with other activities.

Summary

A mosaic of unique and sensitive habitat conditions capable of supporting breeding wildlife populations would still exist if the project is implemented. There would be no effect to unique and sensitive habitats from the proposed project.

Degree to Which the Alternatives Address the Issues

Table 73. Summary comparison of how the alternatives address the key issues

Issue	Indicator/Measure	Alt 1	Alt 2	Alt 3
Elk Security	Acres within project area > 0.5 miles from a road	4,074	4,975	4,975
Elk Security	Acres within project area > 1.0 miles from open roads	59	170	170
Elk Security	HEI value	0.36	0.60	0.60

Summary of Environmental Effects

Table 74. Summary comparison of environmental effects to wildlife resources

Resource Element	Indicator/Measure	Alt 1	Alt 2	Alt 3
American Marten	Acres of source habitat removed	0	866	803
Northern Goshawk	Acres of source habitat removed	0	6011	5851
Pileated Woodpecker	Acres of source habitat removed	0	2,464	2,359
Migratory Birds	Acres of aspen restoration	0	41	39
Migratory Birds	Acres of riparian restoration	0	481	0

Socio-Economics

Summary of Direct and Indirect Effects

Baker County has an average poverty rate of 17.7% (U.S. Census Bureau 2018). Alternative 1 (No Action) would not change this current condition. There are no minority groups or Indian tribes living within the area, therefore No Action would not directly or indirectly affect these groups. No other environmental impacts to low income residents have been identified that would result from the No Action alternative.

The socio-economic effects of commercial timber harvest and non-commercial treatments proposed under Alternatives 2 and 3 would be beneficial to the local economy. The present net value of timber sale and related projects under Alternative 2 is $40,603 with a cost benefit ratio of 1.01. Commercial timber harvest under Alternative 2 would generate approximately $4,948,672 with a predicted high

bid of $40.33/CCF. The present net value of the timber sale and related projects for Alternative 3 is $168,550 with a cost benefit ratio of 1.04. Commercial timber harvest would generate approximately $4,928,285 with a predicted high bid of 39.39/CCF. Estimated revenues for these sales are based on the current market conditions. The harvest of timber, burning, road reconstruction, and other proposed projects would provide local employment (see Table 75). See Socio-Economic Specialist Report for Table 1 that displays the costs of the alternatives and Table 2 that displays the values.

Although Alternative 2 would have a lower PNV (present net value) and B/C (cost/benefit ratio) than Alternative 3 it would be more beneficial to the local economy from the perspective of jobs created (see Table 75 below) total wood products generated and delivered to local industry (more acres of commercial harvest) and a higher total revenue.

Table 75. Total Timber Harvest and Non-commercial Thinning Jobs by Alternative

Work Activity	No Action	Alternative 2	Alternative 3
Timber Harvest	0	54	53
Non-commercial Thinning	0	44	39
TOTAL	0	98	92

1. *Each job represents one year of full time employment. Estimate of timber harvest jobs derived from regional averages. Estimate of Non-commercial treatment jobs based on past contract production on Whitman Ranger District. Jobs would occur over a 5-12 year period starting in 2022.*

There are no minority groups or Indian tribes living within the area, therefore none of the action alternatives would directly or indirectly affect these groups. The health of low-income residents and others in the surrounding area should not be affected by smoke from prescribed fire from any of the action alternatives because prescribed burning is managed to comply with state air quality standards (Patrick project design criteria and mitigation measures).

Cumulative Effects on Socio-Economics

Alternative 1 – No Action

The no action alternative would not contribute to the economies of the counties surrounding this project area; therefore, it has the potential to further impact the current struggles of the timber industry in northeast Oregon.

Action Alternatives 2 and 3

The cumulative effect of Alternatives 2 and 3 are similar, they would all provide the counties surrounding the project area with receipts which otherwise would be dollars out of the taxpayer's pocket. They would provide jobs as described under the direct and indirect effects above. The income generated by this project contributes to family wage earners and local industries which in turn support other local businesses, hospitals, and services contributing to the overall economic vitality of the Counties. More of this happens under Alternative 2 than under Alternative 3. In addition, the alternatives and the effects will be similar when considering utilization of material at manufacturing facilities. The products produced from this project under all of the action alternatives would not support the local businesses and mills alone; however, when added to the wood products being removed from other private, adjacent State, and corporate lands, as well as other national forest timber sales, it contributes to the overall viability and sustainability of local mills and businesses. The acres treated would provide seasonal work/benefits over a period of 10-15 years.

There would be no cumulative effects on the health of low-income residents of the area as a result of smoke from the proposed prescribed fires in combination with other burning since air quality is managed across a large area. The other environmental impacts of the action alternatives are identified in the Patrick Vegetation Management Project EA and are localized to the Patrick analysis area; therefore low income residents living in the Whitney valley and surrounding areas would not be directly, indirectly, or cumulatively affected.

Water Resources

Introduction

The following information was used to analyze existing conditions and the effects of the proposed actions and includes consideration of best available science:

1. District GIS data base (e.g. RHCA locations, topography, roads, location of treatment units, recent past harvest activities and past fire);
2. Field observations of stream flow, disturbance, channel morphology, vegetation, groundcover, species, canopy cover;
3. Review of historic and current land uses;
4. Vegetation data provided by the silviculturalist and LIDAR;
5. Scientific literature;
6. Stream order based on GIS maps;
7. Soils data from Natural Resources Conservation Service 2014 database;
8. Reports and discussions with other specialists;
9. Stream survey data; and
10. Prism climate data via FS WEPP.

For detailed information regarding the existing condition of water resources in the Patrick project area, refer to the Water Resources specialist report in the project file. The Fisheries and Aquatics Resources section of this EA provides analysis of 3rd through 6th order streams as they pertain to the RMOs.

The potential impact to water resources of these alternatives varies as a function of: 1) the geographical extent of the activity; 2) the magnitude of change in the overstory and understory vegetation; 3) the topography; and 4) road locations and their orientations with respect to the streams. The parameters with the greatest potential for change under the proposed activities are: 1) soil water available to plants; 2) channel morphology; 3) channel complexity; 4) channel substrate; 5) stream flows; and 6) stream temperature. This effects analysis examined the alternatives with respect to their impacts on these parameters. The tables referenced in the effects analysis are found in the specialist report (Project File).

Resource Indicators and Measures

Indicators and Measures

Indicators used to analyze effects of proposed actions are listed in tables below.

Table 76. Resource indicators and measures for assessing effects to water quantity, water quality and RHCA condition

Resource Element	Sub-Element	Measure	Issue (Analysis or Key)	Source
Water Quantity	Soil Water to Plants	Canopy Cover	Analysis Issue	LRMP
	Streamflow		Analysis Issue	LRMP
Water Quality	Stream Temperatures	Acres of RHCA Treated, Acres of Primary Shade Zone Treated	Key Issue	INFISH, LRMP, ODEQ 303(d)
RHCA Condition	Channel Morphology	Bank Stability, Streamflows	Analysis Issue	INFISH, LRMP
	Channel Complexity	Debris Jams, Inchannel Wood, and Pools	Analysis Issue	INFISH, LRMP
	Channel Substrate	Ground Cover, Temporary Roads in RHCAs	Analysis Issue	LRMP

Existing Conditions

Past Management

The analysis area has a history of logging, small wildfires, road and railroad building, grazing and mining. Ongoing activities in the project area include noxious weed treatment, grazing, firewood cutting, mining, road maintenance, snowmobile and OHV use, dispersed camping and hunting. These past and current activities have all contributed to the existing condition of water resources in the project area. Please see specialist report for more in-depth analysis of these impacts.

Vegetation Characteristics and Water Demand

Canopy Cover

Existing canopy cover was estimated for each unit using NRM FSVeg Data Analyzer program. Canopy cover across the project area ranges from 0 to 100 percent. Existing canopy cover in the proposed harvest units ranges from 2 to 100 percent and are summarized below by subwatershed and treatment proposed to allow for comparison with post-treatment results discussed in the effects analysis (see Specialist Report). However, it is not just the percent cover but the characteristics of the canopy cover that influence how much precipitation reaches the ground. Characteristics of importance include type of species (i.e. grand fir vs. Ponderosa pine), trees per acre and their mix of sizes (i.e. seedlings, saplings, trees), number of layers and type of species creating the layers. Grand fir, and to a less extent Douglas-fir, are more effective at intercepting precipitation given their needle type and low dense branching structure than Ponderosa pine which has a more open structure (USDA Forest 2014c). Therefore, in multi-story stands where grand fir or Douglas-fir are abundant, less water reaches the ground and soil moisture conditions would be drier than in multi-layered stands composed of mainly Ponderosa pine. As grand fir or Douglas-fir becomes a greater part of the understory or the number of grand fir or Douglas-fir layers increases, the amount of water reaching the ground decreases.

Stream and Riparian Conditions

There are 194 miles of stream channels in the Project Area. 27% (52 miles) of the channels have perennial flow and are fish bearing (Category 1). 16% (31 miles) of the channels have perennial flow and are not fish bearing (Category 2). The 57% (111 miles) are intermittent (Category 4). Very few streams in the project area are named. Therefore, for analysis and reference purposes, those streams that did not have a name were given identifiers in the GIS attribute tables (USDA Forest Service, GIS 2018 Database).

Over the last number of years (2008 to 2015), stream surveys were conducted on many of the fish bearing Category 1 streams in the Project area using the Region 6 Stream Survey methodology. Additional data was gathered from Proper Functioning Assessments and cross section analyses. Data collected were bankfull widths, wetted widths and depths, stream gradients, and channel sinuosity (see Specialist Report).

Stream-side vegetation varies, but for Category 1 streams it is shrub- and tree-cover dominated with forbs and grasses in the understory. Present are aspen/common snowberry, mountain alder-red osier dogwood/mesic forbs, mountain alder/snowberry as well as channels with only conifers. Where riparian vegetation is present, the majority of the widths were less than 25 feet wide (stream survey field sheets for Patrick Vegetation streams, project file). Category 4 stream riparian areas exhibit limited hardwood cover and dominated by conifers due to fire suppression.

Channel morphology

Most of the forested streams in the project area are Rosgen A and B type streams (Rosgen 1996). They are relatively confined, have low sinuosity, and flow through narrow drainages bordered by steep, forested hillslopes. These drainages are typically a step-pool system and therefore, potential changes in channel morphology are limited to changes in channel widths and depths and step-pool characteristics and frequencies. The channel widths and depths are in part the result of historic land use and current flows and therefore are oversized for the drainage areas and flows. Most meadows within the project boundaries are few as they are typically privately held and managed. (See Aquatics report for rosgen stream types in fish bearing portions of the stream network).

Stream Sedimentation

The RMO for fine sediment is <20% in spawning habitat, with fine sediment defined as <2mm. The Oregon DEQ (ODEQ) has established water quality standards under Section 303(d), for water quality impaired streams, necessary to meet Clean Water Act (CWA) requirements in order to assure protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife. Three streams within the Project Area are 303(d) listed for sedimentation. These streams include Geiser Creek, Trout Creek, and Patrick Creek. Percent fine sediment data is available for Patrick Creek in the Table 77 and illustrates a high percentage of streambed materials composed of sand, silt or clay and are less than 2 mm in size class.

Only 639 feet of Trout Creek are located within the project area and the remainder of stream is outside the project area. There are no proposed actions within the Trout Creek Riparian Habitat Conservation Area (RHCA). Since it is a small portion of the stream in the project area and no proposed actions are occurring along this portion of the stream, Trout Creek is not carried forward further in the analysis on sediment.

Two Wolman Pebble Counts were done from 2007-2018 for each surveyed reach, except for North Fork Burnt River Reach 4. Values for both counts are provided (Table 77). The first number in each

column belongs to the first count. The percentages of channel substrate less than 2 mm ranged from 0 to 82% with an average value of 28. The variability of fines across the streams is quite large. Three sites had both of the fine sediment values >20% that were over the forest plan standard. Five sites had both measurements <20% and six sites were mixed with values above and below the threshold. Sources of the fines are likely roads, eroding or trampled stream banks, and trampled seeps/springs adjacent to the streams.

Table 77. Channel substrate for stream survey reaches

Stream	Reach	Year	Sand, silt, clay (< 2mm)[1]	Gravel (2 to 64 mm)[1]	Cobbles (64 to 256 mm)[1]	Boulders (256 to 512 mm)[1]
Camp Creek	R1	2012	35/49	49/51	16/0	0/0
	R2	2012	13/16	33/77	4/7	0/0
Gimlet Creek	R1	2018	18/28	83/71	0/1	0/0
	R3	2018	8/25	83/62	10/12	0/1
Mosquito Creek	R1	2013	3/59	95/41	2/0	0/0
	R2	2013	70/10	19/77	11/6	0/8
Patrick Creek	R2	2018	45/82	18/7	40/0	0/7
North Fork Burnt River	R1	2007	0/3	58/68	42/29	0/0
	R2	2016	21/10	54/72	24/19	0/0
	R3	2016	24/35	67/45	9/11	0/3
	R3	2007	1/3	60/68	33/28	5/2
	R4	2016	17	71	6	3
	R4	2007	12/6	64/70	20/22	2/1
	R5	2007	26/7	48/77	24/11	2/5

1. Represents the percent contribution of sediment class compared to total grain size distribution

Potential sediment inputs from roads tend to occur during storm events. When this occurs, there are short-term increases in turbidity levels and decreased water quality. When roads contribute sediment during storm events, the sediment enters at points. Silt and clays move through as suspended load resulting in short-term increases in turbidity. Sand size particles settle out as flow drop. Potential sediment inputs from the stream banks and seeps occur during high flow events and as a result of bank trampling. Inputs during high flow events tend to move through the system.

Sediment Inputs from Roads

Sediment inputs from roads typically occur during storm events. Primary factors contribute to the amount and duration of sedimentation, factors like storm duration, the make-up of their construction, density of roads within the watershed, and the substrate that they are built upon. Roads tend to change the ability of a drainage basin's ability to absorb water into the soil profile. When this occurs, there are short-term increases in turbidity levels and decreased water quality throughout the drainage and stream system. When roads contribute sediment during storm events, the sediment usually enters at specific points in the system. Silt and clays move through as suspended load resulting in short-term increases in turbidity. Sand size particles settle out as instream energies decrease to levels incapable of maintaining them.

Factors such as road surface type (bare ground, grass, gravel, aggregate), soil texture, level of use (none, light, heavy), slope (lateral and linear), and maintenance determine the amount of sediment

generated. In turn, the effectiveness of the drainage features, buffer distance between road and stream, and road gradient influence the potential for sediment to be transported and delivered to the stream (Swift 1984). Road surfaces composed of grass or gravel decrease the amount of road surface that is eroded by traffic use or precipitation events and limits the development of ruts that can transport water and sediment to a stream compared to native surface roads as the hydrologic energies on the former tend to be offset by the nature of the material. Open roads have more sediment generated compared to closed roads because of the increased traffic use (Swift 1984); where increases in sediment production caused by traffic were found to persist after traffic ceased.

Stream Flow

Stream flows in the project area are characteristic of a snowmelt hydrograph. Peak flows usually occur in late March or early April in response to snowmelt and then decrease to summer low flows. By late June to early July streams are either dry or flow only as a result of groundwater inputs. Perennial streams in the Project Area are Gimlet Creek, China Creek, Camp Creek, Cub Creek, North Fork Burnt River, Geiser Creek, Sheep Creek, Mosquito Creek, Pinus Creek, Patrick Creek, and a couple of unnamed small tributaries.

Channel Shade

Liquori and Jackson (2001) found in their study of headwater streams that stream temperatures in scrub-shrub channels were lower when compared to adjacent reaches of forested channels. Light intensity levels for the scrub-shrub channels were up to three to four times lower than in adjacent forested channels. The effectiveness of riparian shrubs and scrub (i.e. here; alders, dogwood, and willows) in providing dense stream-side shade is a function of both abundance and size of the stream. The narrower the stream, the more influence the vegetation has upon the associated stream itself, directly. The effectiveness in riparian woody plants and steep hillslopes in shading the full width of headwater streams and contributing to microclimates that are unique to headwater streams was also noted by Anderson et al. (2007)

In the project area, streams are typically narrow (wetted widths 1 to 10 feet) making the site potential for vegetation to cast shade across the entire width, with the exceptions of the wider North Fork of Burnt River. Due to past fire suppression activities and mining, the site potential riparian vegetation has been replaced with conifers along many of the smaller streams. The conifers do not provide the dense shading which would occur with riparian vegetation which are typically dense close to the stream and not just an overstory. This riparian vegetation includes riparian trees (i.e. aspen/cottonwood/water birch), and riparian shrubs (dogwood, alder).

The vegetation type and mix vary between drainages (stream survey field sheets in Patrick Vegetation project file). In some drainages with very intermittent flow, only conifers provide the shade. Topography is also a primary contribution to shading as a number of the drainages are bordered by steep east and west facing hillslopes. The field surveys note that individual shrubs are resprouting and there is little middle-aged riparian shrub cover. The field surveys further note that there is a site potential for riparian shrub and tree cover along the streams surveyed, and therefore presumably throughout the Project Area.

Stream Temperature

The RMO for Water Temperature is that there is no measurable increase in maximum water temperature (7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period). Maximum water

temperatures below 59ºF within adult holding habitat and below 48ºF within spawning and rearing habitats (USDA Forest Service 1995a).

Stream temperatures are influenced by air temperatures, shade, discharge, aspect, groundwater inputs (seeps, springs, and hyporheic flow), water depths and widths. The CWA (1977) requires states to identify those waters within its boundaries with effluent limitations. Effluent limitations are pollution limitations which are designed to limit the quantities, discharge rates, and concentrations of pollutants that are discharged. ODEQ has established water quality standards under Section 303(d), for water quality impaired streams, necessary to meet CWA requirements in order to assure protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife. ODEQ water quality standard for temperature is based on the maximum 7-day running average. Temperature standards were developed based on temperature requirements of salmonids during different seasons and life stages. The temperature standard applicable to streams in the Patrick Vegetation project area is that water bodies must not be warmer than 68oF for use by redband trout.

There are two streams (North Fork Burnt River from Dry Creek to Unity Reservoir and Trout Creek) and four watersheds (Patrick Creek – North Fork Burnt River, Camp Creek, Trout Creek and Antelope Creek – North Fork Burnt River) listed for temperature impaired 303(d) listed streams within the Project Area according to the ODEQ database (ODEQ, 2021). Only 639 feet of Trout Creek are located within the project area and the remainder of stream is outside the project area. There are no proposed actions within the Trout Creek Riparian Habitat Conservation Area (RHCA). Since it is a small portion of the stream in the project area and no proposed actions are occurring along this portion of the stream, Trout Creek is not carried forward further in the analysis on temperature.

Stream temperatures were collected on Geiser Creek, Greenhorn Creek, Snow Creek, North Fork Burnt River, Trout Creek and Camp Creek over the course of several years (see Water Resources Specialist Report for tables). Many of the spot measurements exceed 68°F on the days measured and their shallow water depths (1 to 4 inches) as well as their low flows make these streams highly sensitive to air temperature. Stream temperatures are below the 68°F during portions of the year but exceed the 68ºF during some portion of the summer months given that the mean maximum monthly air temperatures are greater than 80°F in July and August. The presence of seeps or springs along a stream may be creating localized pockets of cooler temperatures but cannot be expected to be providing sufficient volumes, in and of themselves to keep stream temperatures below 68°F. Therefore, the stream temperatures are not all meeting the RMO.

Those streams not meeting the RMO for temperature based on stream temperature data include Geiser Creek, North Fork of Burnt River, Trout Creek and Camp Creek. Based on the stream temperature data, Snow Creek and Greenhorn Creek are meeting the RMO for temperature.

According to the Oregon Water Resource Department database (OWRD 2019b), there are water rights within the project area and encompassed private property for beneficial uses included irrigation, mining, livestock water, wildlife water, and fire protection. The Forest Service holds the water rights for all of the livestock water, wildlife water and fire protection water rights within the project area. These rights are each less than 0.01 cfs.

In contrast the water rights for mining or much larger, with the four largest are 10 cfs or greater (10 cfs from Camp Creek, 10 cfs from Pine Creek, 25 cfs from North Fork of Burnt River, and 22 cfs from Bennett Creek). All of the mining water rights are from the North Fork of Burnt River or its tributaries. All of the irrigation water rights divert from the North Fork of Burnt River with the

largest being 7.11 cfs. These water withdrawals, particularly those occurring during the warmer summer months, contribute to the warmer stream temperatures in the North Fork of Burnt River. Snow Creek and Greenhorn Creek do not have water rights for water withdrawals. Not having water diversions may contribute to the cooler stream temperatures found in these streams.

ALTERNATIVE 1 (NO ACTION)

Alternative 1 (No Action) would not authorize new activity in the project area. All current management activities would continue in the project area as currently authorized and permitted. Activities include wildlife and livestock grazing, recreation, woodcutting, road maintenance, and wildfire suppression.

Direct/Indirect Effects of the No Action Alternative

Soil Water Available to Plants

Under the No Action Alternative, the potential soil water available to plants for use is expected to decrease as overstory canopy cover and the number of canopy layers increase. Decreased soil water would occur because interception by branches, needles, and evaporation of rain and snow would decrease the amount reaching the ground and infiltrating. Water stress on both overstory woody plants and understory herbaceous vegetation is expected to increase.

Channel Morphology

Channel morphology in the forested portion of the project area is limited to changes in channel widths and depths as well as step-pool features. Channel morphology in the non-forested portion of the project area can adjust laterally or vertically as a pool-riffle channel type.

Bank stability is expected to continue to decline in areas lacking riparian vegetation; specifically, in those areas having limited rooted stream bank vegetation. As bank stability decreases, bank erosion potential in response to instream flows typically causes lateral shearing of the exposed soil; causing channel widening and incision. Although different soil types have various resiliencies to this, increased channel capacity and sediment laden high flows downstream are typically seen as the consequence of stream bank erosion. The result is a flashier hydrologic system favoring the decrease in the amount of water held within the drainage basin; and as applicable here, to this project area.

Channel Complexity (Large wood, debris jams, and pools)

Channel complexity is expected to remain for the most part as limited because increases in pools and debris jams throughout the project area depend upon wood inputs from both conifers and riparian woody plants adjacent to the streams. These contributions are expected to decrease due to the effects of increasing conifer shading reduces the riparian woody plants adjacent to streams, as discussed in the Silviculture Report (Cuzick 2019). Increased conifer encroachment could result in an increase in wood input from conifers. As a result, pool and debris jam development would be limited because riparian wood is the major contributor to pool formation and key large wood pieces are needed to create sites for debris jam formation.

Channel Substrate

Channel substrate is expected to continue in its current condition. Roads intermittently also contribute fine sediment during storm events. The amount of sedimentation from roads depends upon road surface material and slope, location, and drainage features. The amount and sources of sediment entering the streams would be expected to remain the same except in the case of a wildfire occurring in the project area.

Stream Flow

The magnitude, timing, pattern, and variability in stream flow would continue to vary as a function of climate, channel morphology, roads, vegetative cover, drainage-network density, and the condition of the seep and springs that border or contribute to the streams. Stream flow conditions are expected to continue in their current conditions. This can be described as less stream flows during the summer months, because of the increased tree cover in both riparian areas and uplands.

Stream Temperature

Many of the streams in the project area would still continue to exceed the 2010 ODEQ temperature standard of 68°F. Channel width, the quality and abundance of shade cover, air temperatures, seep/spring contributions, and stream flow magnitudes all dictate stream temperatures and patterns of variability therein. Dense near channel shade is provided by riparian woody plants. Dense near channel shade is decreasing through increasing conifer encroachment, which limits the dense near channel shade's ability to shade the stream channel. Across the majority of forested streams within the project area, conifers are closing the canopy over the stream and decreasing riparian hardwoods. Impacts from tree cover and stream flow also lessen the instream water that has the potential to warm faster. Water temperatures across the project area would be expected to increase in the case of a wildfire occurring in the project area. Loss of riparian hardwoods and their seed sources could take a longer time to establish after a wildfire if they were not already in enough cover to self-maintain following the disturbance.

Floodplains and Wetlands

No expected change from existing current conditions.

Potential Wildfire Effects Under the Alternative 1 (No Action)

Under the No Action Alternative, ladder and ground fuels would continue to persist. As a result, the risk of a large-scale, high severity wildfire in the project area would remain. Below are the potential effects that would occur to water resources if a large-scale, high severity wildfire were to occur.

Soil Water Available to Plants

Under the No Action Alternative there is an increased potential for a large-scale, high severity wildfire due to increased fuels. A large-scale, high-severity wildfire has the potential to increase surface runoff, soil erosion and stream flows during a storm event due to loss of ground cover, development of hydrophobic soils and soil sealing (Larsen et al. 2009). The magnitude of the increases would depend on the timing and magnitude of a precipitation event post fire, topography, residual ground cover and development of hydrophobic soils (Robichaud et al. 2000). While recovery of vegetation to pre-fire levels would occur about three years after a low-severity wildfire and 7 to 14 years after a moderate or high-severity wildfire respectively (Robichaud et al. 2000), hillslope and channel erosion combined with increases in channel capacity are changes. It is expected that soil erosion would result in a decrease in the available water capacity (AWC) of the project area soils.

Channel Morphology

A high severity wildfire would remove much of the finer and flashier vegetation along riparian corridors along with those of the corresponding adjacent uplands. Increased runoff and high stream flows leading to channel erosion and a loss of bank stability would be expected if a precipitation event were to occur shortly after a wildfire. Energy into the system would be regulated primarily on timing of the precipitation events and the vegetative growth patterns having the ability to control surface roughness as well as decrease erosive surface flows. Dead material left over from the fire

event would be expected to contribute to in-channel morphological processes, but the timing would be unknown as to the capacity and influence throughout the project area.

Channel Complexity (inchannel wood, debris jams and pool frequency)

A high severity wildfire in the riparian area could create a large number of standing dead trees but much of the smaller diameter wood may be consumed as well as some of the inchannel wood. Over time, some of the standing dead trees would fall and provide replacement for the lost inchannel wood. However, the timing of these inputs is unknown, and a loss of channel complexity could be a long-term impact.

Channel Substrate

The potential for increased sediment inputs post-wildfire depends on the timing and intensity of the precipitation that may occur afterwards. If the precipitation event occurs prior to vegetative ground cover re-establishing itself, then the project area would experience increased storm runoff; soil erosion inputs of sediment could be quite high. Large pulses of an assortment of size classes of sediment are expected following a wildfire. Riparian shrubs have shallower and more fibrous root systems than deeper tap rooted conifers.

Stream Flow

The impacts on stream flows would vary depending on the severity of the wildfire and both the timing and intensity of the precipitation events post-fire. Impacts range from minimal in the absence of precipitation to that of extensive if a large precipitation event occurs immediately following a burn event (Robichaud et al. 2000). Increasing stream flows can result in increased erosion of stream banks and channel bedding.

Stream Temperatures

A high severity wildfire would effectively remove any streamside vegetation which would ultimately result in a reduction in shade to the adjacent stream. Leach and Moore (2010) modeled stream temperatures for three scenarios related to canopy cover and wildfire. They found that net radiation below standing dead trees was twice that modelled for the pre-fire canopy cover. The increase in net radiation would contribute to increased stream temperatures post wildfire. The increased solar inputs as a result of a loss of both overstory and near stream shade would increase stream temperatures, with the amount of increase depending on factors such as channel widths, topography bordering the stream, existing vegetation, and river orientation.

Cumulative Effects of the No Action Alternative

There are no cumulative effects under the No Action Alternative because there are no new activities proposed. Existing environmental trends would continue.

Floodplains and Wetlands

No expected change from current conditions.

Compliance with Executive Orders and INFISH

INFISH Riparian Goals

Under the No Action Alternative, the potential for conifer encroachment in the riparian zone and a large-scale, high intensity wildfire is expected to remain or possibly increase. Examination of the INFISH Riparian Goals relevant to the project area found that the goals of riparian habitat diversity,

abundance, and productivity, sediment inputs, and thermal regulation within riparian zone would not move towards the desired condition for the project area.

INFISH Riparian Management Objectives (RMOs)

Under the No Action Alternative, the RMOs would be the same as existing condition and trends because there would be no activity inside the RHCA. However, over the long-term and in the event of a wildfire inside the RHCAs, stream temperatures and the amount of fines in the channel substrate would likely increase and continue to exceed the RMO values. Large wood in the channel could decrease immediately post-wildfire but would increase over time as standing dead trees fell into the streams.

ACTION ALTERNATIVES

Analysis of effects considers both the action alternatives and the Project Design Criteria that apply to those treatments. Analysis of effects also includes the effects of the other treatments in the area where appropriate (i.e. harvest, prescribed fire, non-commercial thinning) because there are synergistic effects between these treatments and expected changes in water resource parameters. Under Alternative 3 unlike Alternative 2, there would be no treatment in the RHCAs.

Due to synergistic effects between treatments, there are expected changes in water resource parameters. PDCs are designed to address some potential effects and either minimize or eliminate water resource concerns related to the proposed treatments and maximize benefits to water resources.

ALTERNATIVE 2 (PROPOSED ACTION)

Direct/Indirect Effects

The direct and indirect effects of Alternative 2 will be broken into two sections: Upland Harvest Units and Riparian Vegetation Restoration (RVR) Units. The Upland Harvest Unit section will discuss direct and indirect effects in the upland areas, whereas the RVR Unit section will discuss direct and indirect effects within the riparian areas. After the discussion of the Upland Harvest Units and the RVR Units, other project components will be analyzed for direct and indirect effects.

Upland Harvest Units

Upland Harvest Units are non-RVR units for which the following activities are proposed: commercial harvest, non-commercial/pre-commercial thinning and prescribed burning. Treatments will include Group Selection (HSG), Post and Pole Thinning (PP), Defensible Fuel Profile Zone (DFPZ), Aspen Restoration Release from Conifers (Aspen REL), Post and Pole (PP) and prescribed burning (Rx Burn).

These units are discussed together because they occur primarily in the uplands and their effects on water resources are similar. They are outside the RHCAs and range from 50 (Category IV streams) to more than 300 feet from a stream (Category I streams).

Soil Water Available to Plants

Defensible Fuel Profile Zone: Thin from Below Commercial Harvest and Post and Pole (DFPZ: HTH and PCT)

Vegetation treatment in these units would decrease canopy cover and remove the lower layers of canopy cover; thus, resulting in increased precipitation reaching the forest floor, potentially increasing the available soil water. More snowmelt on the ground that infiltrates the soil may also increase the amount of water available to deeper rooted and woody vegetation that tends to favor the expression of

those plants associated with riparian systems. Treatments will be selective to shift existing species composition within the units to better represent the desired Natural Range of Variation (NRV).

Thin from Below Commercial Harvest and Non-Commercial/Pre-Commercial Thin (HTH and PCT)
Vegetation treatment in these units would decrease canopy cover and decrease the lower layers of canopy cover; thus, resulting in increased precipitation reaching the forest floor, potentially increasing the available soil water. More snowmelt on the ground that infiltrates the soil may also increase the amount of water available to deeper rooted and woody vegetation that tends to favor the expression of those plants associated with riparian systems. Treatments will be selective to shift existing species composition within the units to better represent the desired Natural Range of Variation (NRV).

Aspen Restoration-Release with Thin from Below Commercial Harvest and Non-Commercial/Pre-Commercial Thin (Aspen REL)
Vegetation treatment in these units would decrease canopy cover and decrease the lower layers of canopy cover; thus, resulting in increased precipitation reaching the forest floor, potentially increasing the available soil water. More snowmelt on the ground that infiltrates the soil may also increase the amount of water available in the soil. Increased soil water availability will help promote aspen growth and regeneration in these units. Treatments will be selective to shift existing species composition within the units to better represent the desired Natural Range of Variation (NRV).

Prescribed Burning
Prescribed fire in harvest units would remove many of the trees that are less than 0.1-inch dbh and based on stand exam and LIDAR data, this size is abundant in large portions of the project area. These small seedlings are competing at least in part with understory vegetation for water in the upper 12 inches. Therefore, the removal of competing conifer seedlings, when combined with the harvest activities, would improve the amount of soil water available to plants by both increasing the amount of precipitation that reaches the ground and reducing competition for existing soil water.

Channel Morphology

There is No Effect to channel morphology because there would be no change in bank stability or increase in stream flows. Bank stability remains the same because the proposed activities are at least 50 feet from the stream channels or bounded by an existing road. The PDCs would maintain ground cover sufficient to prevent an increase in runoff during precipitation events. Therefore, there would be no increase in stream flows during storm events related to these activities. Activities under Alternative 2 are expected to result in an increase in forage production, grass and vegetative growth (Rangeland Resources Report 2019) which would further limit runoff potential by enhancing surface roughness and infiltration.

Channel Complexity (large wood, debris jams, and pools)

No direct effect to channel complexity from the proposed activities in these upland harvest units given their distance from the stream channels. Units in proximity to fish-bearing streams are approximately 300 feet from the stream. The remaining units are at least 150 feet from a perennial stream, 50 feet from an intermittent, non-fish bearing stream, or bounded by an existing road. Therefore, the potential contributions from the Alternative 2 upland harvest units to influence channel complexity via inputs of wood is already very low and no different to that of the No Action Alternative.

However, there is a potential indirect effect. Treatment activities would result in an increasing understory growth of shrubs, grasses, and forbs, with mixes varying as a function of plant associations and local environmental conditions. These woody species are potential sources of wood

into the stream and are anticipated to be of the appropriate size to offer complexity to the system and slows surface flow rates encouraging both sediment deposition and pool formation.

Channel Substrate

There will be no effect to channel substrate from the proposed Alternative 2 activities for these units in the short-term (<5 years) or long-term (5 to 20 years) because the ground cover, in many cases, the existing boundary road between the units and the stream channels would effectively trap sediment and prevent its delivery to the stream channel, and in addition, the PDCs would minimize soil disturbance, bare ground, and burn severity, and therefore sediment generation. Understory shrubs, grasses and forbs are expected to increase in response to increase water and light to the ground. Monitoring of vegetation response post-prescribed fire burn found that grass, forbs, and shrubs began to re-sprout within days after a spring burn. Following a fall burn, some re-sprouting was observed in the fall with a strong vegetative response the following year. As a result, ground cover would continue to be effective in preventing erosion.

Stream Flow

Alternative 2 will have No effects on stream flows as it pertains to increased runoff related to the removal of canopy cover because the PDCs would maintain ground cover and minimize soil compaction for all of the various unit vegetation prescriptions. Both the non-commercial thinning and prescribed fire activities in the units would be of low to moderate intensity and thus: 1) ground cover would remain relatively intact; 2) soil compaction would be minimal; and 3) the activities would occur over time. As a consequence, it is therefore expected that infiltration rates within the Project would not change and that shift in ground cover type and species (from conifer dominated to shrubs, grasses, and forbs) would enhance infiltration rates and further impede runoff.

It is possible that the proposed activities could increase stream flows later into the summer as a result of the ground receiving more snow and thus more inputs of water into the soil during the spring melt. The length of this increase is unknown and would vary as a function of soil types, groundwater flow paths, snowfall and melt patterns, as well as vegetative demands on soil water.

Stream Temperatures

Alternative 2 will have no effect to stream temperatures from the vegetation prescription activities because the activities in these units would maintain adequate distance from all streams (50 feet to 300 feet). Therefore, these activities would not decrease the overall amount of shade (both short and long term) provided to the stream or decrease stream-bank stability.

Riparian Vegetation Restoration (RVR) units

Under Alternative 2 there are 481 acres of commercial activities, 4,212 acres of non or precommercial activities and 5,070 acres of prescribed fire RVR units. Some units have multiple logging systems in order to adjust for site conditions. Non-commercial thinning is proposed for all RVR units. Thinning would be by hand and would occur up to the edge of the stream channel. Prescribed fire (underburning) is proposed and pile burning would occur when a slash pile is created within the Riparian Habitat Conservation Area to reduce overall fuel loading in the area.

Soil Water Available to Plants

There would be potential increases in the amount of soil water available to plants in response to harvest and non-commercial thinning. As canopy cover in the unit would decrease, the ground cover and a portion of overstory shade would remain largely intact. Therefore, while more precipitation would reach the ground as a result of conifer removal, infiltration would occur rather than runoff. The

result would be increased water into the ground and an increase in soil water available to plants, particularly to the understory shrubs, grasses and forbs.

Channel Morphology

The potential changes in channel morphology and bank stability in response to harvest, non-commercial thinning and pre-commercial thinning will be balanced. Some streambank trees may be felled that provide bank stability and the roots will remain in tact for about 5 years before they start decomposing.

Alternative 2 treatments would lead to an expansion of riparian woody plants and aspen due to more soil water and sunlight being available. This expansion of riparian woody plants and aspen would enhance bank stability and potentially channel bed stability by increasing cohesion via their root systems. Because the stability of the channel banks and beds would not change, the Width/Depth ratios would remain the same. The wetted W/D ratio would maintain existing condition because the system is sediment limited.

Channel Complexity (debris jams, inchannel wood, and pools)

Harvest and noncommercial thinning would decrease the number of trees per acre and canopy cover. The result would be an expansion of riparian woody plant and aspen and cottonwoods where site potential for these species is present. Over time, as these species expanded, there would be a shift in the type of species providing future inchannel wood. Because most of the streams are narrow (average width between 2 and 12.6 feet) and riparian woody plants and aspen are highly resilient to fire and able to resprout, these species are capable of providing wood over the long-term. Therefore, harvest and non-commercial/precommercial thinning of the conifers within the RVR units, when done in conjunction with upland harvest activities, are expected to directly and indirectly increase channel complexity.

An immediate increase in channel complexity would occur in the RVR units as a result of residual slash left in place when it is considered below acceptable fuel levels. This PDC would drop coarse wood (<10-inch diameter at bankfull) onto the valley and into the channel. For the tributary streams in the project areas, these pieces would allow for the development of debris jams as contributions from riparian woody plants and aspen entered the channel and interacted with the wood. The speed of riparian woody plants and aspen inputs into a channel would be more than under Alternative 1.

PDCs would immediately increase the amount of coarse wood material in the channel which would in time lead to increased pool frequency and the development of debris jams. Over time, increases in riparian woody plants along the stream banks would further increase near channel shade and thus decrease the rate of stream temperature increases with decreasing elevation. The increase in both riparian woody plants and aspen would provide future wood inputs and contribute to the development of both debris jams and pools.

Pool frequency is expected to increase over time as the large wood input (via residual slash and natural inputs) and debris jams create flow obstructions that lead to pool development. The timing of pool development is uncertain because it requires both flow obstructions and flows capable of scouring a pool below the obstruction.

Channel Substrate

The Alternative 2 activities would not increase percent fines into the channel substrate because of PDCs. PDCs related to skid trails and landings would minimize bare ground and the development of

channelized flow. Under Alternative 2, pool frequency and channel substrate would move towards attainment in all RVR units.

Stream Flow

Conifer canopy cover would decrease as a result of the proposed harvest and non-commercial thinning. However, existing ground cover in the units is close to 100% and the PDCs would maintain ground cover and minimize the soil compaction. Studies have shown that where ground cover is 65% or greater runoff rates are minimal (Larsen et al. 2009). Therefore, increases in runoff would occur from a decrease in conifer canopy cover.

Stream Temperatures

Changes in shade, channel widths, flow, and seep/spring inputs have the potential to impact stream temperatures. The impact of the proposed treatments on these factors was examined.

No reductions in summer stream flows would occur for the reasons discussed above under Stream Flow. The condition of the seeps and springs in these units would remain in their current condition and continue to contribute cooler groundwater to the streams. The parameter of shade has the greatest potential to change and affect stream temperatures. There are many factors that can influence shade. Aspect can influence shade with streams trending north-south being warmer than streams trending east-west. Confined valleys can have the adjacent hillslope shading the stream versus a wide valley that does not have topographic shading influences. Riparian hardwoods can provide more layers directly over the stream and can influence relative humidity and shade directly above the stream. Conifer stand age can influence the heights of the canopy and magnitude of shade. The stream gradient and channel dimensions also influence warming. The RVR treatments are designed to treat the conifers located in the understory and not influence shade provided by the overstory.

While stand conifer canopy cover and TPA in these units would decrease as a result of the proposed activities, the importance of that reduction on shade varies as a function of the above factors. Stream temperature would either maintain its existing condition or improve under Alternative 2, with the exception of pockets (non-commercial thinning) where shade is reduced over the short-term (3-5 years) until a higher quality shade (dense woody riparian vegetation) could establish in the disturbed gaps. The treatment is designed to thin conifers up to the streambank that occur in the understory (less than 10-inch dbh) of an existing canopy. Long-term (5-20 years) with the establishment of dense woody vegetation, stream temperature conditions would improve under Alternative 2.

Shade providing vegetation is primarily broken into two zones, the primary and secondary shade. Primary shade zones typically occur from the streambank and extend back 50 feet. There would be a short-term impact on approximately 670 acres of the 3,745 acres of RVR treatments in RHCAs to water temperature that would last approximately 3-5 years. Two streams are water quality impaired for temperature, North Fork Burnt River and Patrick Creek. Patrick Creek does not have proposed NCT treatments, but North Fork Burnt River has approximately 185 acres of NCT treatment. A PDC has been developed to minimize water temperature impacts of NCT treatments so that no more than 25% of the total RHCA area does not receive a treatment. Implementation of this PDC will moderate the short-term water temperature impacts over time so that they don’t occur at once to water quality impaired streams.

Pile Burning

Pile burning will occur in the Upland and RVR Units. The impacts of pile burning will be minimized by use of PDCs. Within the RHCA pile burning will be limited to piles four feet high and six feet in

diameter, composed of material generated within the RHCA. Machine work will be separated from the stream by a road at least 100 feet away from the channel for a Category 1 stream and at least 75 ft away from the channel for a Category 2 stream. The proposed action and the PDCs will eliminate sediment and nutrients from entering streams.

Existing and Temporary Roads: Maintenance, Construction, and Haul

Under Alternative 2 there would be 38.5 miles of temporary roads distributed across the project area. Any additional road crossings would be built according to the PDCs and the LRMP guidelines (USFS 1990) and would therefore not cause impacts to water quality within the streams. This analysis also includes roads added to National Forest System jurisdiction and roads closed associated with the proposed action.

Soil Water Available to Plants

Existing roads: Soil compaction on existing roads is currently high and infiltration rates very low. Therefore, soil water available to plants is currently low. There would be no change from existing condition as a result of maintenance and use of existing roads due to no change in soil compaction.

Temporary roads: There would be new linear areas of soil compaction, soil displacement, and reduced infiltration rates as a result of the 38.5 miles of new temporary roads. Upon completion of the harvest activities, the temporary roads would be closed to public access and would be scarified, seeded, and mulched. However, depending on the soil type, soil depth and the amount of compaction, this may or may not be sufficient to restore infiltration capacity or subsurface flow paths. Luce (1997) found that road infiltration rates rapidly dropped after one or two rainstorms even when the road was ripped or ripped and then mulched. The disturbed areas represent only a small percentage of the project area and are not expected to have any measurable effects on the overall AWC values within the subwatersheds.

Channel Morphology

Existing roads: No effect to channel morphology because the fillslopes along stream channels are well-vegetated and stable. Any changes have already occurred and are part of the existing condition.

Temporary roads: There would be a very localized (road width) change in the channel morphology at the road crossing site, but it would not result in bank destabilization because of the PDCs related to constructing a crossing. Upon completion of the project, the banks would be reformed to match the channel.

Channel Complexity (inchannel wood, debris jams and pool frequency)

Existing roads: No effect to channel complexity due to: 1) the open roads are existing and trees do not occur on the road template; and 2) closed roads tend to have small trees, if present, and their potential contribution to inchannel wood is low.

Temporary roads: No effect on channel complexity because the roads occur outside of true ecological riparian areas but are located within administrative Riparian Habitat Conservation Areas (RHCAs). Where the roads cross a channel, they would do so at an angle. Their area of influence as it pertains to decreasing future inputs of wood is very small (road template). Therefore, the impact of any removal of trees on channel complexity, when evaluated at the drainage scale, is non-measurable.

Channel Substrate

Eliminating a source of fine sediment inputs would help decrease the percent fines in the channel substrate.

Existing roads: If road sediments were delivered to the stream channels during a storm event sediment loading would occur. However, the potential for inputs would decrease under Alternative 2 as a result of upgrading and placement of additional road drainage features and upgrading road surfaces. These would prevent road rutting and would divert water off the road and into the vegetated fillslopes. Therefore, potential inputs would decrease under Alternative 2.

The reduction in sediment inputs from roads would decrease fines in the channel substrate. Inputs of fines from the existing roads during storm events would decrease as a result of the proposed maintenance and the addition and upgrading of drainage features.

15.66 miles of road are proposed for closure with approximately 1.81 miles located in RHCAs. Less vehicular traffic on these roads will increase ground cover (grass and forb growing directly on road prism) and decrease the chance of fines running off within proximity to streams. 10.52 miles of road are proposed for addition to the National Forest System as closed road. These roads will be used as long term timber management, but will remain in a closed road condition. These roads are existing on the landscape and will not require new ground disturbance. They currently are functioning like existing roads.

Temporary roads: 38.5 miles of temporary road would be used for the Patrick Project. Localized runoff from roads to the forest floor would occur due to temporary roads in upland areas. Thirty temporary road segments would be placed in RHCAs. Of the eight temporary roads that would be constructed in category 1 RHCAs, the closest a temporary road would be placed is 140 feet away from a stream. One of these eight temporary roads would be placed on an existing road prism, the other seven would require new disturbance. Four temporary roads would be placed in category 2 RHCAs. All of these would we above a road or in the outer section of the RHCA. Two of the temporary roads in Category 2 RHCAs would be built on an existing road prism. Eighteen temporary roads would occur in Category 4 RHCAs. Two of the 18 temporary culverts would occur on existing road prisms. Fifteen temporary crossings would occur over category 4, dry stream channels.

There is a potential for sediment loading from: 1) channel substrate if road sediments were delivered to the stream channels, and 2) bank instability at the crossings. Road drainage features and surfacing, installed or maintained as part of the Alternative 2, would prevent sediment inputs from occurring. Changes in channel morphology and bank stability at the crossings would limit the road template and be short-termed. Upon completion of the project, the channel banks would be recontoured.

Within the watershed for sediment impaired 303(d) listed streams (Geiser Creek, Trout Creek, and North Fork of Burnt River), temporary roads are proposed within the associated RHCAs. Drainage features would be installed as needed to prevent these roads from concentrating flow and directing any turbid runoff into a channel. In addition, PDCs would minimize use of the roads when wet and therefore minimize the potential for ruts developing which could funnel water into the channels.

There would be no effect on channel substrate because: 1) the PDCs would ensure that stream banks remain stable and are vegetated; and 2) drainage features and surfacing would be installed and maintained as needed to prevent the roads from eroding and contributing sediment into the stream channels. Therefore, there would be no additional sediment entering the streams during storm events.

Stream Flow

Existing roads: Inputs of water from roads during storm events and the spring melt are expected to decrease as a result of upgrading the drainage features and improvements in the road surfacing which divert water onto the fill slopes. However, reductions in stream flow related to the drainage features would be non-measurable because current inputs are low due to existing drainage features and road design. The closed roads added to the National Forest System would not impact stream flow since they already exist on the landscape. Closed roads will be storm proofed as resources are available.

Temporary roads: No effect on stream flows because channel crossings would be built according PDCs and guidelines in the LRMP (USFS 1990). Drainage features would be installed as needed to prevent these roads from concentrating flow and directing it into a channel. In addition, PDCs would minimize use of the roads when wet and therefore minimize the potential for ruts developing which could funnel water into the channels. The increase in the drainage density as a result of the additional crossings would be minimal and distributed over the project area.

Stream Temperatures

Existing roads: No effects to stream temperatures because the open and closed roads are existing and the road-related changes to stream flows, stream-side shade and groundwater inputs, related to the roads, have already occurred. Maintenance would occur in the road bed and not alter factors influencing stream temperatures. The closed roads added to the National Forest System would not impact stream temperatures since they are not located near the inner riparian areas.

Temporary roads: Temporary roads are proposed within the RHCAs for temperature impaired 303(d) listed streams (Trout Creek, Patrick Creek and North Fork Burnt River). No effect on stream temperatures because stream crossings would be constructed and maintained according to the PDCs. Any change in bank shade would be limited to the template.

Other Project Components

Initiate Natural Regeneration of Aspen

No effects to water resources except for a possible long-term but local increase of the water holding capacity of the soils in the stands. This would be due to increased amount of decaying organic matter on the ground (aspen leaves) and in the soil (roots). However, the effect would be small in area.

Snag and Large Down Wood Debris Creation

Where snag and large down wood debris creation is part of the upland harvest treatments, there would be no measurable effect on water resources because the amount of downed wood and snags would influence only small areas. Increases in the amount of precipitation reaching the ground as a result of these two activities would be small compared the increases that occurred as a result of the harvest, non-commercial thinning and prescribed fire activities.

Where these activities are part of the RVR treatments, the effects would be the same as described under the analysis of RVR units for dropped wood.

Juniper Removal

Juniper Removal occurs in the uplands. The only water resources it has the potential to effect is soil water available to plants. The removal of juniper would increase the amount of precipitation that reaches the ground and is available to infiltrate and would decrease competition for the soil water. Therefore, the effects to soil water would be the same as those described for the upland harvest units.

Fuels Reduction Activities (Non-Commercial Thinning, Prescribed Fire, and Pile Burning)

The analysis for Fuels Reduction Activities addresses both Upland and Riparian Vegetation Restoration Units.

Conifer stands in many of the proposed treatment units are densely stocked with small diameter trees and numerous pockets of large accumulations of both surface and ladder fuels. These characteristics allow for easy transition from surface fires to crown fires and the development of non-typical fire severity stand replacement fires. Non-commercial thinning and prescribed fire would remove trees greater than or equal to 10-inch dbh. Additionally, Alternative 2 provides for pile burning and fuels dispersal and removal (FDR).

Under Alternative 2, ladder and ground fuels would be decreased resulting in a reduction in the potential severity and scale of a wildfire. The shift to fire resilient understory as a result of the proposed actions would result in rapid recolonization and resprouting and some ground cover would remain. The effect of decreasing wildfire severity on water resources is discussed below.

Soil Water Available to Plants

The reduction in fuels and subsequent decrease the potential wildfire severity would decrease the potential for soil sealing and increased runoff by retaining some ground cover (Larsen et al. 2009). Therefore, while more precipitation would reach the ground post-fire because of the loss of over and understory vegetation, infiltration, instead of runoff, would be more likely to occur thereby limiting the potential for soil erosion and a loss of top soil. As a result the impacts to soil water would be less and the water-holding capacity and soil productivity of the project area would be greater than the No Action Alternative.

Channel Complexity (inchannel wood, debris jams, pools)

The reduction in fuels and subsequent decrease in potential wildfire severity along and just outside the stream/riparian corridors would potentially decrease the number of standing dead trees while protecting some of the existing in channel wood. The shift to riparian woody plants and aspen, both which typically resprout after a low to moderate severity fire, would result in rapid recovery of live vegetation. Channel complexity would increase from the Alternative 2 treatments and would indirectly be supported through subsequent natural wildfire events as they would tend to be much less severe and as a consequence, further contributed to riparian plant regrowth and deadwood falling into the adjacent streams.

Channel Morphology

A reduction in fuels and subsequent decrease in potential overall wildfire severity in the stream/riparian corridors would increase the survival chances of bank stabilizing riparian woody plants and their potential in-channel wood supplies. Alternative 2 treatments would encourage fire tolerant riparian plant species to thrive under low and moderate severity wildfires which would in turn also support faster regrowth of this plant community in which post-fire precipitation events would offer roughness to slow surface flows while stabilizing soil profiles along the stream networks within the Project area. Over time, channel bank and bed stability could ultimately become much more resilient to various changes in environmental pressures and potential degrading ecosystem variables discussed here consistently throughout this report.

Channel Substrate

The Water Erosion Prediction Project (WEPP) Model is a physically based erosion simulation model built on the fundamentals of hydrology, plant science, hydraulics, and erosion mechanics. The WEPP

Model was used to assess sediment erosion in many of the project area watershed (**Error! Reference s ource not found.** in Watershed Specialist Report in Project File). Methods used for running the model are summarized in the Soils Report (Young 2019). The analysis results are summarized in the specialist report. The summary shows that pretreatment there is not expected to be sediment erosion. Lows amounts of erosion are expected from post treatments in some watersheds including Bennet Creek, China Creek, Geiser Creek, 8 unnamed tributaries to North Fork Burnt River, Earl Spring Creek, Petticoat Creek, King Spring Creek, Camp Creek tributary, and Gimlet Creek. Sixteen of the 38 watersheds analyzed showed a potential for sediment erosion post treatment. This provides for a potential of an average annual total sediment erosion of 0.135 tons per acre across the watershed which is 9.440 average annual tons for the project area.

Alternative 2 treatments propose to thin and reduce both ground and ladder fuels in the treatment units. Along the stream network system within the project area, there are multiple treatment units proposed to reduce potential wildfire severity. Reduction here concerning this capacity decreases soil erosion potential and sediment inputs into the channels because controlled thinning and prescribed burns reduce severity of the uncharacteristic wildfire; hopefully, initiating riparian health and species reproductive success and recruitment. Ground cover and live bank vegetation would be retained and PDCs would be implemented as a result, the amount of fine sediment in the channel substrate is not likely to increase.

Riparian ecosystem function, specifically, herbaceous roughness (i.e. forbs, grasses, downed material) decreasing surface flow energies and root matter holding capabilities to decrease lateral erosion of the stream bank will work towards attainment of desired conditions throughout the project area in regard to channel substrate throughout the stream networks.

Stream Flow

A reduction in finer fuels like small (<1-inch dbh) trees, limbs and brush and the subsequent decrease in potential wildfire severity decreases runoff potential during precipitation events because ground cover would remain, creating surface roughness, promoting infiltration, and preventing soil sealing (Larsen et al. 2009). The proposed activities would result in the expansion of more fire resilient species that would recover more quickly post fire. Therefore, while stream flows could still increase in response to a precipitation event, the amount of peak flow increase would still be less than under the No Action Alternative, providing a more sustained base flow.

Stream Temperatures

A reduction in streamside ground, ladder, and overall finer fuels in the project area decreases potential wildfire severity in these areas and actively selects for those early seral riparian plants. Recovery of the treated riparian patches would be faster under these proposed, low to moderate severity burns and mechanical treatments compared to a potential wildfire; or high-severity burns. Therefore, while some increase in stream temperatures could be temporarily expected post-treatment, the increase would be less than that of the No Action Alternative. As noted by Leach and Moore (2010), net radiation below standing dead trees was twice that modelled for the pre-fire canopy cover. The retention of some live riparian woody plants and overstory, therefore, would decrease the impact to stream-side shade compared to the No Action Alternative.

Cumulative Effects Under Alternative 2

Past, present and reasonably foreseeable activities in the project area that have the potential for effects to overlap in time and space with the proposed actions are current livestock grazing, water diversion, recreation, woodcutting, road maintenance, and wildfire suppression and historic mining. However,

only current livestock grazing and larger water diversions for irrigation and mining have the potential for measurable cumulative effects because of the scale of their use and types of impact to stream/riparian areas.

Under Alternative 2 there is the potential for a cumulative effect from livestock grazing on 1) stream temperatures, 2) channel substrate, 3) channel complexity, and 4) bank and bed stability because project activities could lead to increased access and use of the riparian vegetation by livestock. Cumulative effects will be minimized by use of grazing management practices which are already in place for the grazing allotments.

Under Alternative 2 there is the potential for a cumulative effect on stream temperature with implementation of the proposed actions and existing larger water diversions for irrigation and mining. The cumulative effects will be minimized long-term by development of dense woody riparian vegetation which will shade the stream and implementation of project PDCs.

When considering potential cumulative effects of livestock with the proposed action, two livestock effects were examined: 1) browse pressure on the riparian woody plants and aspen and 2) trampling of stream banks. Both wild ungulates and livestock browse riparian woody plants and aspen. Livestock impacts to these species appear to be largely confined to late summer and fall (Parson et al. 2003). Cumulative effects will be minimized and eliminated by use of PDCs and grazing management practices which are already in place for the grazing allotments.

ALTERNATIVE 3 (Proposed Action with no activities in RHCAs)

Direct/Indirect Effects

Direct and Indirect Effects are similar with Alternative 2 and Alternative 3 for the Upland Harvest Units.

The effects would vary between Alternative 2 and 3 for the Riparian Vegetation Restoration (RVR) units, as Alternative 3 would not include harvest activities in the RHCAs. Therefore, the direct and indirect effects of Alternative 3 would be similar to Alternative 1, except in regard to prescribed burning. For prescribed burning in RVR units, the effects would be similar to that of Alternative 2.

The direct and indirect effects of Alternatives 2 and 3 are compared in Tables 22-24 in the Water Resources Specialist Report and will are synthesized in this document.

Cumulative Effects

The cumulative effects of Alternative 3 would be similar to Alternative 2 for the Upland Harvest units and less for the RVR units. Also described in Table 24 in Water Resources Specialist Report.

COMPLIANCE WITH EXECUTIVE ORDERS AND INFISH Orders

Clean Water Act

Under Alternative 2 and 3, the project would be in compliance with the Clean Water Act because of the implementation of the PDCs. Of particular interest in this compliance are the 303(d) listed streams including temperature impaired streams (Trout Creek, Patrick Creek and North Fork Burnt River) and sediment impaired streams (Geiser Creek, Trout Creek, and Patrick Creek). PDCs were designed to reduce water quality impacts to waterbodies (shade reductions due to conifer cover reductions near the stream) until riparian hardwoods got established and maintained through the planning for the project. One of the PDCs is for adding coarse wood to these streams to physically

block the stream surface, capture sediment and increase hyporheic flowpaths in these streams. Another PDC limits the conifer canopy cover to a proportion of the total project area to minimize impacts. These treatments will ensure riparian hardwoods are present in the Patrick Project Area over the longer term (up to about 40 years) and will provide shade if a wildfire occurs, years after the project happens.

Only 639 feet of Trout Creek are located within the project area and the remainder of stream is outside the project area. There are no proposed actions within the Trout Creek Riparian Habitat Conservation Area (RHCA). Since it is a small portion of the stream in the project area and no proposed actions are occurring along this portion of the stream, Trout Creek is not carried forward further in the analysis on temperature or sediment.

Executive Orders 11988 (Floodplain Management) and 11990 (Wetlands)

Under Alternative 2 and 3, the project would be in compliance with EO11988 (Floodplain Management) for the following reasons: 1) No commercial mechanical activity would occur with the active floodplain; 2) development and protection of these features would be enhanced by PDCs. The project would also be in compliance with Executive Order 11990 (wetlands) because no commercial mechanical activity would occur within the wetlands and seeps.

INFISH Riparian Goals

Under Alternative 2 and 3, there would be positive movement toward attainment of the INFISH Riparian Goals identified as relevant to the project area.

INFISH Riparian Management Objectives (RMOs)

Non-Riparian Vegetation Restoration Units

None of the activities proposed in the upland units would alter any of the Watershed Condition Indicators as the Project activities are outside the range of influence. For more detailed discussion of the effects of activities in these units see earlier discussion under Action Alternative, Direct/Indirect Effects (above).

Riparian Vegetation Restoration Units

Within the 3rd through 6th order streams, five RMOs apply to the forested project area. Two additional RMOs apply to non-forested areas but are not carried forward within this analysis as the treatment units are forested. Under Alternative 2, pool frequency and channel substrate would move towards attainment in all RVR units. The Alternative 2 activities would not increase percent fines into the channel substrate because of PDCs related to skid trails and landings would minimize bare ground and the development of channelized flow. The large wood RMO would be reached long-term as additional riparian woody vegetation established.

The stream temperature RMO would either maintain its existing condition or move towards attainment. It could gradually move towards attainment through the addition of NCT materials being felled instream and sorting sediment. These NCT materials would form debris jams as flood waters rack them together. As water flows through these debris jams, it incrementally cools water through the process of hyporheic flow. Dense shade offered by riparian hardwoods would also maintain cooler water temperature longer instream. The stream temperature could increase on a short-term basis (3-5 years) for a long-term gain of stable, dense shade. This is because treatment would decrease average conifer canopy cover. However, the reduction in canopy cover would be less along the stream because of the presence of riparian woody plants and aspen. Finally, the wetted W/D ratio would maintain existing condition because the system is sediment limited.

The removal of conifer encroachment would result in the expansion of riparian woody plants including aspen. The increase in riparian woody plants along the stream banks would increase bank stability due to its greater rooting density and decrease the contribution of fines from the stream banks (Simon et al 2006). Eliminating a source of fine sediment inputs would help decrease the percent fines in the channel substrate.

PDCs and proposed treatments would lead to increase the amount of riparian woody vegetation, which will provide a long-term increase in large wood material in the channel which would in time lead to increased pool frequency and the development of debris jams. Project treatments under Alternative 2 would also increase near channel shade and compensate for the removal of overstory conifer shade. Over time, increases in riparian woody plants along the stream banks would further increase near channel shade and thus decrease the rate of stream temperature increases with decreasing elevation. The increase in both riparian woody plants and aspen would provide future wood inputs and contribute to the development of both debris jams and pools.

Existing and Temporary Roads: Maintenance, Construction and Use

Existing roads: The only RMO with a potential to be affected would be channel substrate if road sediments were delivered to the stream channels during a storm event. However, the potential for inputs would decrease under Alternative 2 and 3 as a result of upgrading and placement of additional road drainage features and upgrading road surfaces. These would prevent road rutting and would divert water off the road and into the vegetated fillslopes. Therefore, potential inputs would decrease under Alternative 2 and 3. The reduction in sediment inputs from roads would help move the channel substrate RMO towards attainment.

Temporary roads: Two RMOs have the potential to be affected within the 3rd through 6th order streams: 1) channel substrate if road sediments were delivered to the stream channels, and 2) bank stability at the crossings.

Road drainage features and surfacing, installed or maintained as part of the Alternative 2 and 3, would prevent sediment inputs from occurring. Changes in channel morphology and bank stability at the crossings would limit the road template and be short-termed. Upon completion of the project, the channel banks would be recontoured. Therefore, there is no effect of the temporary or existing roads on these RMOs.

Aquatics

Environmental Consequences

This report analyzes the effects of proposed activities on aquatic species for the proposed Patrick Project. The analysis area for this report is the same geographic area as the project area. There are no effects anticipated to reach areas downstream of channels in the project area from treatments. Effects to aquatic species and habitat are expected to remain within the project area boundary.

Indicators used in this analysis are water quality and fish habitat. For the indicator water quality, units of measure are stream temperature and turbidity (from inputs of fine sediment). For the indicator fish habitat, units of measure are number of pieces of large woody debris per mile, pool frequency per mile, and channel and bank stability (measured as a percentage of streambank surveyed). For this analysis the measure for these are a change, for example increase in water temperature, increase or decrease in large wood counts.

Indicators and Measures for fish and aquatic resources

Indicator	Measure
Water Quality	Stream temperature, turbidity levels (sediment)
Fish Habitat	Large woody debris, pool frequency, channel, and bank stability

Indicators and measures are derived from INFISH RMOs. In general, direct effects to fish and water resources in vegetation projects are primarily related to sediment input from project actions which occur at the same time and place as these resources. Indirect effects are primarily related to impacts which are caused by an action where effect occurs later in time or is farther removed in distance from fish and water resources. Cumulative effects occur from present and reasonably foreseeable future actions that overlap in time and space with the effects of the Patrick project. Time frames for the direct/indirect effects analysis for fish and aquatic habitat are short term (immediately to 5 years) and long term (5-20) years.

Other effects disclosures include: Aquatic MIS, and Aquatic PETS (proposed, endangered, threatened, and sensitive) species.

Direct effects to fish and aquatic resources could occur from the following activities due to proximity to aquatic species and habitat:

- Replace 3 culverts with aquatic organism passage structures

Indirect effects to fish and aquatic resources could occur from the following activities due to their proximity to aquatic species and their habitats:

- Commercial harvest in RHCAs in 481 acres (Alternative 2)
- Pre commercial and noncommercial thinning in RHCAs 3742 acres (Alternative 2)
- Fuels treatments of 3525 acres of thin and pile and burn
- Broadcast burning; approximately 36,000 acres under-burn in all acres where vegetation cutting has occurred
- Skid trails or landings in RHCAs (Alternative 2)
- Opening closed roads and associated road maintenance in RHCAs (Alternatives 2 and 3)
- Realignment of road segments in RHCAs (Alternatives 2 and 3)
- Culvert installations on 16 category 4 stream crossings on temporary roads (Alternative 2)
- Construct .90 miles of temporary road within RHCAs (Alternative 2)

Road Related Activities

ALTERNATIVE 1 – NO ACTION

There is a high density of roads in some subwatersheds in the Patrick Project area as well as hundreds of miles of roads in various condition in RHCAs, see Fish and Aquatic Habitat Existing Conditions report. Many roads are poorly located in draw bottom areas on fishbearing streams such as Gimlet Creek, FS road 7386. There are 487 known stream crossings. Twenty-six culverts are confirmed or suspected barriers to fish passage. All barriers would remain, blocking fish and aquatic organism from accessing habitat upstream of crossing.

Ninety percent of road stream crossing structures in the project area are blocked with debris, collapsed, or filled with rock or native substrate and need maintenance (Rabe Consulting 2018). Under the no action alternative, these would remain or be treated as routine road maintenance funds are available. These activities include installing, replacing, or removing road stream crossings structures, such as culverts on open and closed roads.

ALTERNATIVE 2 and 3 – ACTION ALTERNATIVES

Road related activities are the same for Alternative 2 and 3, with the exception that under Alternative 3 no temporary road construction and associated culvert installation would occur in RHCAs.

Road stream crossings

Direct Effects

Three culverts on fishbearing streams in the project area that do not currently meet ODFW Fish Passage Policy (2017) passage design criteria would be replaced in Alternative 2 and 3. Short term effects to fish and aquatic organisms from increased sediment and turbidity, would be mitigated by following Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources (2008). ODFW fish passage design criteria would be followed. This would provide short- and long-term benefits to fish and aquatic organisms by improving connection to upstream habitat.

Direct effects from these activities would be limited. Initial pulse of sediment into the channel after construction and when channel through the road crossing is re watered would temporarily increase suspended sediment and turbidity. Effects from increased sediment would be short term and local. Effects to water quality, fish and fish habitat from culvert replacements would be short term. Foltz (2008) found that 95% of culvert related sediment occurred in the first 23 hours after culvert removal in streams where flows were low. Where flow locations were higher, 40-95% of the culvert related sediment occurred in the first two hours. Culvert installation and removal in the Patrick project would be similar to low flow sites, since work would be required to occur during low flows. Sediment concentrations and turbidity would be expected to return to preconstruction levels within 48 hours after replacement. Jakober (2002) found sediment concentrations decreased to near pre-project levels within 24 hours after culvert replacement on the Bitterroot National Forest.

Road Design PDCs and National and Regional Water and Soil BMPs (see Appendix B) would be followed. Following BMPs, such as replacing culverts when flows are low and conditions are dry, bypassing flow around construction, and working within in water work window (ODFW 2008), will minimize short term, local effects to fish and aquatic organisms from sediment input and turbidity related to construction of in channel work.

Indirect Effects

Indirect effects to fish and aquatic organisms could occur from road related activities, such as culvert replacement, in Category 2 channels (perennial non-fishbearing), depending on proximity of stream crossing to fishbearing streams downstream.

In Alternative 2, 16 culverts would be installed on Category 4 channels to construct temporary roads. These activities are not expected to cause indirect effects to water quality from ground disturbance and related sediment input and therefore are not expected to cause indirect effects to fish and aquatic species and habitat because these channels have intermittent flow and culvert work can occur when channels are dry. Culverts installed on temporary roads would be removed after project activities are complete.

For culvert replacements on perennial non fishbearing streams (Category 2) or intermittent streams (Category 4) on closed or open roads, long term effects would include an improvement to water quality and run off patterns by appropriately sizing, placing and/or designing the culverts. Replacing and maintaining this infrastructure would improve road crossing function, eliminate some of the erosion problems caused from culvert plugging with debris. This would improve the existing conditions (Alternative 1) where 90% of road stream crossings in the project area not functioning properly.

Following installation of the temporary culverts, periodic spikes in sediment input are expected during the first winter season in response to precipitation events that may mobilize sediments from disturbed areas. Sedimentation may also occur throughout the site recovery period until fill slopes stabilize (2 to 3 years following installation). An additional spike of sediment input would occur when the temporary culverts are removed after the project is completed. Measurable increases in fine sediment following culvert replacement projects on the Wallowa Whitman National Forest were found to rarely extend downstream more than 1/8 mile (0.125 miles), with the majority of impacts occurring along the channel margin (personal communication - Alan Miller, Fisheries Biologist, Wallowa Valley RD, Wallowa-Whitman National Forest).

Increase in find sediment associated with in water work would produce short term elevated turbidity. Road maintenance can reduce sediment delivery to stream channels through improved drainage and reduced erosion of the road surface by directing water off of the road. Maintenance keeps roads in a condition suitable for travel and prevents severe erosion from failure of the drainage system (Luce and Black 2001).

Temporary roads in RHCAs-Alternative 2

Approximately .90 miles of temporary road would be constructed within Category 1, 2 and 4 RHCAs. See Road Stream Crossings on Category 4 streams described above. Indirect effects to fish habitat could occur because a little over .35 miles of these temporary roads would-be built-in Cat 1 RHCAs. All temporary roads would be obliterated after commercial harvest haul activities are complete.

Potential effects from building road in RHCAs include periodic spikes in sediment from construction or obliteration during the first runoff in response to precipitation events that can mobilize sediments from disturbed areas. Sedimentation may also occur throughout the site recovery period until fill slopes stabilize (2 to 3 years following construction). The majority of these effects are expected to be short-term and mitigated by following PDCs and BMPs. Erosion control, such as seeding, or mulching would occur to stabilize obliterated road prisms and prevent erosion. Eroded material is not expected to exit the buffers between the closest adjacent stream channels and the temporary roads.

Temporary roads in RHCAs-Alternative 3

No temporary roads would be constructed in RHCAs in Alternative 3 because no timber harvest would occur in RHCAs. Compared to Alternative 2, the risk of increased sediment and turbidity into stream channels from culvert installations and sedimentation from cut and fill slopes from building temporary roads in RHCAs would be avoided in Alternative 3.

Neither alternative is expected to affect the measure for increased sediment in streams by building temporary roads in RHCAs.

Opening closed roads in RHCAs

Fine sediment levels in streams have been shown to increase as the density of roads in a watershed increase (Cederholm and Reid, 1987). No new system roads would be constructed in alternative 2 or 3; however, some currently closed roads would be reopened to access harvest units or for log truck hauling and heaving equipment mobilization. Closed roads that would be opened for hauling activities located within Category 1, 2, and 4 RHCAs would adhere to PDC designed to minimize impacts to water quality, fish and fish habitat.

Opening closed roads for timber sale activities would occur in a phased manner with only a portion being open at any one time. The actions associated with opening and reconstructing closed roads as well as traffic on closed roads associated with mobilizing equipment and log haul could have indirect effects on water quality and fish habitat at stream crossings and where roads are adjacent to channels. The amount of sediment entering stream channels depends on how close the road is to the channel, the size of the riparian buffer between the road and stream channel, the slope, and how much downed wood is on the ground that could capture sediment.

Alternative 2 and 3 have the same amount of miles of closed roads to open within RHCAs, therefore there is no difference in indirect effects. Because these roads will be used during project implementation, increased levels of overall erosion and fine sediment contribution compared to current conditions may occur. Effects to water quality, fish, and fish habitat would likely be short term, and all closed roads that are opened for project activities would be returned to “storage” after project activities are complete. Because some of these roads would receive necessary maintenance such as culvert maintenance or ditch maintenance, some erosion issues could improve under Alternative 2 and 3.

Road closures

Post vegetation treatment road closures would occur in Alternative 2 and 3. Approximately 15.66 miles of road that currently operate as open would be closed. This includes .42 miles of roads within Category 1, .73 miles within Category 2 and .66 miles within Cat 4 RHCAs. Closing these roads reduces potential sediment into channels. Vegetation would be able to reestablish in these RHCAs because regular maintenance that includes brushing would not occur on these roads. This could stabilize slopes and increase shade production. This is a small amount of road miles compared to total road miles in RHCAs in the project area, however, there would likely be some beneficial effect to function of riparian areas in these locations.

Road relocation

The section of the FS 7638 road up Gimlet Creek that is located in close proximity to the stream channel would be relocated in alternative 2 and 3. This road produces sediment that enters Gimlet Creek during wet conditions/run off event. Relocating this road will be a long term benefit to Gimlet Creek by reducing sediment input into the stream.

Road Activities

Indicators and Measures

Indicator: Water Quality

Measure: Stream Temperature

Stream temperatures are high at all monitored sites in the project area, except Snow Creek downstream of the confluence with Greenhorn Creek. There could be some increase in solar radiation from vegetation canopy loss that could increase stream temperature where brushing occurs in RHCAs to open closed roads in Alternative 2 and 3. This is expected to occur in a relatively small percent of RHCAs, be local and is not expected to increase overall stream temperature in Category 1 streams. Following BMPs, and avoiding vegetation removal in RHCAs, would mitigate effects to stream temperature from road related activities.

Measure: Sediment

In the five fishbearing streams where substrate was measured and percent fines were calculated in the project area, percent fines exceeded 20%. No streams met the RMO for amount of fines.

Local, short term increases in sediment and turbidity would occur from culvert installations, replacements and removals associated with road maintenance in alternative 2 and 3. Relocating roads in RHCAs (Gimlet Creek) and building temporary roads in RHCAs in Alternative could cause sedimentation into the stream channel from overland flow. This is not expected to be enough to be measurable.

Relocating poorly located, draw bottom roads in RHCAs would have a long term benefit, particularly where these roads have chronic sediment inputs into stream channels. For more information on sediment delivery to stream channels from road related activities, see Water Resources Effects Analysis report.

There would be an overall reduction of 1.81 miles or open roads in RHCAs in both alternatives. This includes .42 miles located in Cat 1 RHCAs. This would cause localized benefit to water quality by reducing erosion and sediment caused from vehicle use.

The measure sediment would be maintained. Levels of fines in Category 1 channels is not expected to increase or decrease from project activities. Therefore, fishbearing streams are expected to continue to exceed the INFISH RMO for fines.

Indicator: Fish Habitat

Measure: Large Wood

One of six fishbearing streams surveyed in the project area met the INFISH RMO for amount of large wood. Road activities would not affect the amount of large wood in channels. Trees within RHCAs that are considered hazard trees along roadsides would be cut and left within the RHCA. Removal of standing dead or live trees in RHCAs would be avoided as much as possible. This would preserve future large wood recruitment into stream channels.

The measure for large wood would not be affected in alternative 2 or 3. Current amount of large wood in streams would be maintained.

Measure: Pools

No fishbearing stream surveyed in the project area meets the INFISH RMO for number of pools per mile. Reduction in pools would not occur because wood recruitment would not be affected. All trees and slash in RHCAs produced from brushing roads near channels or stream crossings or cutting hazard trees would be left on the ground or in the stream channel see PDC for roadside leave trees. Because BMPs and road PDCs would avoid removing wood in RHCAs, wood-forming scour pools are not expected to be affected.

The measure pools would be maintained.

Measure: Channel and Bank Stability

All fishbearing streams surveyed in the project area meet the INFISH RMO for bank stability. Road related activities in Alternative 2 and 3 are not expected to affect channel and bank stability.

The measure channel and bank stability would be maintained.

Vegetation Treatments

This section analyzes the effects of treatments that would occur in Riparian Habitat Conservation Areas (RHCAs).

There are no direct effects to fish and aquatic species or habitat from vegetation treatments in Alternative 2 or 3. This section analyzes the indirect effects from commercial, pre-commercial, and non-commercial harvest of trees in RHCAs, as well as fuels treatments in RHCAs.

ALTERNATIVE 1 – NO ACTION COMMERCIAL HARVEST, PRE COMMERCIAL, AND NON COMMERCIAL THINNING

No vegetation treatments including commercial, pre commercial, non commercial or fuels treatments would occur in Alternative 1.

Overstocked stands would continue to be present within the project area and current fuel conditions would remain. Effects from forest fires on the Boise National Forest in 1992 and 1994 resulted in increased surface erosion and lage pulses of fine sediment throughout systems following during the first year in three watersheds in the study (Rieman et al. 1995). Effects to fish habitat in this study found pools filled with new material. In stream reaches with high intensity burn effects, shading from riparian cover was eliminated. Wood in stream channels was often burned as well.

An increase in sediment yield to streams resulting from wildfire has the potential adverse effect to the growth and survival of salmonids and other aquatic organisms. Increased concentrations of sediments and increased sedimentation rates can adversely affect spawning habitat, rearing habitat, overwintering habitat, and cause lethal effects to salmonids through increased egg mortality, reduced egg hatch, a reduction in the successful emergence of larvae (fry), and sediment induced death of juvenile and adult fish (Anderson, 1996). Fines in the Patrick Analysis area are above levels found to limit emergence from redds and increase mortality of eggs and alevin (Kondolf 2008) in current condition.

Habitat for aquatic species in the Patrick PA is in degraded condition. High water temperatures, high fine sediment levels, fragmented habitat, and lack of habitat complexity are the existing aquatic habitat conditions (see Water Resources and Fish and Aquatic Habitat Existing Conditions report). Two waterbodies in the project area are currently listed as impaired for stream temperature under Category 5 Assessment Category for 303(d) Listing (ODEQ 2012a). More information on this is

available in the Existing Condition Report for Fish and Aquatic Resources and the Water Resources report. In addition, sediment producing roads, such as the 7386 road up Gimlet Creek, would continue to constrict channels and processes. In Alternative 1, measures for water quality and fish habitat, derived from INFISH RMOs, would be maintained, and could potentially degrade further with high intensity wildfire.

ALTERNATIVE 2 – PROPOSED ACTION COMMERCIAL HARVEST

In Alternative 2 ground-based harvest and cable harvest (skyline) would occur in 481 acres in RHCAs. This includes 424 acres in the outer 200 feet of Category 1 buffers (leaving a 100 feet no commercial harvest activity buffer) and 55.5 acres of commercial harvest in the outer 75 feet of Category 2 buffers (leaving a 75 feet no commercial harvest buffer). Category 4 stream channels would not have commercial harvest within the 50 feet RHCA buffer. Logging systems used for harvest in RHCAs would be in wood processing, meaning no whole tree yarding would occur.

Indirect effects to water quality and fish and aquatic habitat may occur from these activities. Indicators and measures are discussed below.

Indicator: Water Quality

Measure: Stream temperature

Stream temperatures are high throughout the project area in all monitored sites except Snow Creek downstream of the confluence with Greenhorn Creek. In Alternative 2, there would be a reduction of trees in the outer 200 feet of Category 1 RHCAs and 75 feet in Category 2 RHCAs. Because approximately 1 site potential tree height would remain in the inner 100 and 75 feet of the RHCA, increase in solar radiation to the stream channel is not expected from commercial harvest activities. The measure stream temperature would be maintained in Alternative 2.

Measure: Sediment

It is difficult to equate soil erosion directly to sedimentation rates. Obstructions in the path (i.e. downed wood, grass/forb cover) between the sediment source and the stream reduce the risk of indirect sediment delivery to the stream. Adequate filter strips (in terms of size, ground cover and downed material) slow or prevent sediment movement downslope of disturbed areas. INFISH riparian no activity buffers described above have long been recognized as a mitigation measure to reduce sediment transport to streams. The structural complexity of roots and herbaceous vegetation, in addition to the absorption capability of the duff layer, limits excess sedimentation to the aquatic system. Surface runoff slows down when it comes in contact with herbaceous shrubs, mature trees and the duff layer on the forest floor and sediment is deposited within the riparian buffer before it reaches the watercourse (Decker 2003).

The effect of increasing sedimentation rates to stream channels from changes in overland flow patterns would occur but is expected to be minor due to the 100 feet buffer on Category 1 streams and 75 feet no activity buffer on Category 2 streams. See Water Resources Effects Analysis and Soils Resources Effects Analysis for more information.

The measure sediment is expected to be maintained at current levels in Alternative 2.

Indicator: Fish and aquatic habitat

Measure: Large Wood

There is not expected to be a change in large wood recruitment into stream channels because no harvest within approximately one site potential tree height on Category 1 and 2 streams would occur.

The measure large wood would be maintained.

Measure: Pools

Ground disturbance from commercial harvest is not expected to fill pools and affect fish habitat because of the 100 feet no activity buffer on Category 1 streams. Trees in the RHCA that would naturally die, fall, and provide ground cover, obstruction on the floodplain that reduce indirect sediment delivery into streams would remain in the 100 feet no activity buffer on Category 1 streams and the 75 feet no activity buffer on Category 2 streams, and there would be no commercial harvest in the 50 feet no activity buffer on Category 4 streams. In addition, slopes over 30% would not have ground-based equipment harvest, which would prevent hillslope erosion that could enter channels. The quantity and quality of pools would be maintained with proposed commercial harvest.

The measure pools would be maintained with proposed commercial harvest in alternative 2.

Measure: Channel and Bank Stability

No change expected due to minimum no activity buffers and no activity on or near stream banks.

The measure pools would be maintained at current conditions.

ALTERNATIVE 3 COMMERCIAL HARVEST

Effects to fish and aquatic resources in alternative 3 are the same as alternative 1 because no commercial thinning would occur in RHCAs. All indicators and measures would be maintained in current condition. Riparian conditions could degrade further due to risk of high intensity wildlife on overstocked stands.

ALTERNATIVE 2 PROPOSED ACTION PRE COMMERCIAL AND NON COMMERCIAL THINNING

Non commercial and pre commercial thinning activities would thin in RHCAs in Alternative 2. This activity would reduce the density of conifers 10” DBH or less in RHCAs.

Current stocking levels for trees less than 10” DBH is estimated at 900 to 1300 stems per acre (estimated using FSveg data GIS) in the Patrick PA. In Alternative 2, variable density thinning prescriptions would be used to treat understory trees. Post treatment densities would vary depending on stand conditions including species composition, existing riparian vegetation, and fuel loading. Post treatment conditions in RHCAs would have approximately 100 to 150 trees per acre. One riparian vegetation objective is to enhance conditions for hardwood species in riparian areas. Thinning in these areas would focus on removing small diameter conifers around desired hardwoods species. Stream shade reduction to streams where canopy cover is removed from thinning activities could occur. Studies have shown varying effects to stream temperature on shade removal from riparian areas, but current studies modeling stream temperature scenarios on the Middle Fork John Day River and the Upper Grande Ronde and Catherine Creek have determined that shade from riparian vegetation is critical in offsetting rising stream temperature as a result of climate change (Wondzell et

al 2018, Justice et al 2016). There are multiple factors that contribute to water temperature. Under certain conditions shade from riparian vegetation most effectively cools the water.

In alternative 2, non commercial thinning would occur in pockets within linear RHCAs. Reduction in stream shade by canopy cover removal is expected to be a short-term effect, lasting 3-5 years. Dense woody riparian vegetation may establish within the gaps where thinning occurs. These treatments would thin conifers in RHCAs up to the streambank. These would be understory trees in an existing canopy. The expectation of this activity would be an establishment of dense woody riparian vegetation in the long term. This could improve stream temperature conditions. See Water Resources effects analysis for more discussion on effects to water temperature from riparian treatments including canopy cover removal.

Additional long-term benefits of thinning dense, young, uniform stands is well documented (Spies et al. 2013). Spies et al found that the greatest potential ecological benefits of thinning to accelerate the development of older forest structure (large trees, large dead trees, spatial structural and compositional heterogeneity, etc.) comes in dense uniform plantations less than 80 years old and especially less than 50 years old. A well-known effect of precommercial, small diameter tree thinning is increased diameter growth of the residual trees caused by the redistribution of the environmental resources among a smaller number of selected trees. When number of stems per hectare is very large, the leaf area of each tree can be very limited, and few carbohydrates are then available for height development. In this scenario, stagnation of growth can occur (Pothier 2002). In a study of tree growth after thinning, Homyack et al. (2004) found that six to 11 years post thinning forest stands had a greater overstory structure than similar untreated stands. In contrast, unthinned stands gained little overstory structure indicating that the application of pre-commercial thinning was responsible for the accelerated height and diameter growth (Homyack et al. 2004). Increased growth of riparina vegetation could improve. For more benefits of thinning see Silviculture Resource Report.

Increased growth of selected trees retained in riparian areas can improve future sources of large wood. Rentmeester (2004) conducted a thinning study focused on the production of snags as the primary recruitment mechanism along mainstem stream channels. Results indicate that silvicultural thinning resulted in increased diameter growth within residual trees. Faster diameter growth meant that trees were larger when they died and therefore the number of snags above the target diameter were greater. Abundance of large diameter snags increased by 20-74% under thinning scenarios relative to unthinned stands (Rentmeester 2004).

In alternative 2, a total of 1,998 acres within the entire 300 feet buffer on each side of Category 1 channels would be thinned and 762 acres within the entire 150 feet of Category 2 channels would be thinned. Additionally, 982 acres of Category 4 RHCA buffers would be thinned. In alternative 2 acres that have received commercial harvest would be thinned after harvest (PCT) and acres that did not receive commercial harvest would be thinned (NCT). In NCT units, residual slash would be left in place in areas that don’t have ground fuel loading concerns. The PDC that would apply to these areas would leave small diameter wood and slash in riparian areas or put thinned material directly into the channel. Acres that are PCT would have 253 acres grapple piled and 213 acres hand piled.

Indicators and measures are discussed below.

Indicator: Water Quality

Measure: Stream temperature

Thinning trees on streambanks and within RHCAs would remove canopy that could reduce direct shade on the stream. Canopy cover removal and effects to solar radiation on stream is expected to be minimal since trees that are thinned would be understory and overstory, larger diameter trees would remain. According to Reeves et al (2016) adequately sized and stocked riparian areas could offset the potential effects of climate change on water temperature. If the proposed treatments accomplish this without affecting shade and solar radiation to the stream channel, there could be a long-term positive effect to RHCAs. There is potential for the short term effect of increased stream temperature as a result of loss of stream shade, however, long term improvement on stream temperature from riparian vegetation recover or reestablishment could occur if thinned gaps or patches allow for dense hardwood species to develop. Trees larger than 10" DBH or outside of thinned patches, would be retained in RHCAs. This is expected to offset shade reduction by canopy loss.

The measure stream temperature could be affected since shade producing trees can be thinned. However, an increase in solar radiation that could cause increases in stream temperature is expected to be avoided by thinning in patches and not continuous streamside thinning and leaving overstory trees.

Measure: Sediment

All NCT thinning would cut and pile trees by hand or disperse residual slash in the RHCA or stream channel. Hand thinning eliminates the risk of ground disturbance and sediment load to stream channels. Where appropriate, slash would be spread out for ground cover to further reduce hillslope sediment runoff reaching stream channels. In PCT unit's sedimentation into channels would be reduced by leaving no activity buffers of 100 feet for Cat 1, 75 feet for Cat 2 and no PCT in Cat 4 RHCAs. For more information see Water Resources and Soils Resources Effects Analysis.

Because no equipment and subsequent ground disturbance would occur within 100 feet of Category 1 fish streams in PCT and NCT units, and slash from thinning would be scattered for ground cover to reduce hillslope sediment runoff the measure sediment in stream channels would not increase. Current levels of fines would be maintained.

Indicator: Fish and Aquatic Habitat

Measure: Large Wood

Reduction in future wood recruitment of small diameter wood to stream channels would occur. However, in NCT units, any streamside thinning of understory trees would be placed directly in the stream channel. There would not be a reduction of large wood recruitment as only understory trees less than10" DBH would be removed.

This indicator large wood would be maintained in the short term and potential for larger sized wood to be recruited to stream channels would be improved in the long term due to stand density reduction and increased growth in residual trees. Small wood, trees under 10" DBH would increase by direct treatment in NCT units.

Measure: Pools

Thinning in NCT units would occur through RHCAs up to stream banks. Where thinning occurs immediately adjacent to stream channels or near stream streambanks, slash and small trees would be

placed in the channel, these small trees often create pool forming debris jams in small channels in the project area. Adding thinned material directly to the channel would result in an immediate increase in channel complexity. These smaller debris jams can move with high flows compared to the duration of larger diameter wood creating scour pools. Because thinning would retain large trees in the forest stands for long term wood recruitment, and wood is associated with scour pools, there is not expected to be a decrease pool habitat.

The indicator pools would be maintained within the project area and improved locally where NCT places wood in the channel.

Measure: Channel and Bank Stability

Thinning up to stream banks streambanks in NCT units is expected to have the long-term effect of improved growth and health of hardwoods, which is expected to increase streambank stabilization and improve channel complexity and dynamics. In addition, only understory trees would be removed from streambanks in NCT units and this would not be continuous but would occur in patches. Larger, overstory tree would remain, providing stability to stream banks.

The measure channel and stream bank stability is not expected to change in alternative 2.

ALTERNATIVE 3

Effects to fish and aquatic resources in alternative 3 are the same as alternative 1 because no commercial thinning, precommercial thinning or noncommercial thinning would occur in RHCAs. All indicators and measures would be maintained in current condition. Riparian conditions could degrade further due to risk of high intensity wildlife on overstocked stands.

Fuels Treatments-Alternative 2 and 3

RHCAs

Alternatives 2 and 3, propose burning activities that result in low severity fire in RHCAs in the project area. Burning would occur when fuel moisture levels are high. No active lighting would occur in RHCAs. Fire would back into RHCAs from adjacent upslope areas. Low intensity fires that burn in a patchy distribution would occur in RHCAs. Tree mortality from prescribed fire in RHCAs would primarily be understory trees (≤ 8” dbh). Understory trees of this size typically do not provide stream shade.

Riparian shrubs are not expected to be impacted as a result of the proposed burning because they are present in the moister riparian areas. Where the above ground portions of riparian shrubs are impacted by fire, they would likely sprout back relatively quickly because the low severity fire would not be hot enough to destroy root crowns.

In alternative 2, where thinning has occurred in RHCAs, lighting of hand and machine piles or jackpot fuels is permitted if slash is placed into piles approximately four feet high and six feet in diameter or smaller. Machine piling would occur within the portion of the RHCA where ground based harvest occurred in commercial harvest units (see Vegetation Treatments for no activity buffers on all stream categories). NCT units would have thinned vegetation piled by hand for fuels treatments or thinned vegetation would be dispersed and not burned in areas that are lacking ground cover.

Because no vegetation treatment activities would occur within RHCAs in Alternative 3, effects to fish and aquatic resources would be the same as Alternative 1. Degraded fish and aquatic habitat would be maintained in its current condition. Current habitat and conditions would be expected to be

maintained in the short term and long term trends would be expected to continue. The risk of increased sediment yield from fire in riparian areas where stand conditions are dense and overstocked would continue in Alternative 1 and 3 (see alternative 1 description pages 14-15). Alternative 2 would have additional ground disturbance in the outer buffers of RHCAs in commercial harvest units. The no activity buffers described in Vegetation Treatments in this report is expected to maintain measures at current conditions. In alternative 2, low intensity fires that would burn in a patchy distribution in RHCAs are not expected to measurably affect measures in the short term and would improve RHCA conditions in the long term if riparian hardwood vegetation reestablishes.

Broadcast Burning-Alternatives 2 and 3

Upland prescribed fire units will be ignited as determined in prescribed fire burn plans, down to the outer RHCAs. Within RHCAs fire will be allowed to continue to burn and spread, usually as a backing fire, without further influence from ignition sources. Fire backing into RHCAs would be low intensity fire. Under circumstances where unmanipulated fire activity threatens to exceed a maximum burn prescription parameter and/or control of the burn is threatened, hand ignition would continue into the RHCA as necessary. Instances of hand ignition within RHCA buffers is expected to be rare and typically only occur with unexpected changes in wind direction.

Due to the low intensity burn in RHCAs, these activities are not expected to affect measures in either alternative.

Cumulative Effects

The cumulative effects analysis area for aquatic resources is the same as the analysis area used for the direct and indirect effects analysis to watershed process and aquatic habitat. Potential cumulative effects are analyzed by considering the proposed activities in the context of present and reasonably foreseeable future actions. Reasonably foreseeable future actions are defined as within the next 5 years., Refer to Appendix A of the Patrick Project EA for a list of projects and activities occurring in the analysis area that were considered for cumulative effects to fish and aquatic habitat.

Activities that pose a risk of cumulative effects (adverse or beneficial) are discussed in this section. Cumulative effects risk is rated as:

- Low – insignificant or discountable cumulative effects on aquatic habitat may occur. Insignificant effects are defined as effects that a person, based on professional judgment, would not be able to meaningfully measure, detect, or evaluate. Discountable effects are those that are extremely unlikely to occur.
- Moderate – insignificant cumulative effects on aquatic habitat are likely to occur. A moderate rating assumes potential effects on habitat. The level of effects will not result in measurable changes in survival rates or population levels of aquatic species with special management status (i.e. ESA-listed, MIS, or Sensitive).
- High – measurable cumulative effects on aquatic habitat are likely to occur. Measurable effects are likely to result in changes in survival rates and population levels of aquatic species with special management status (i.e. ESA-listed, MIS, or Sensitive). A high rating assumes obvious adverse effects on habitat and aquatic species with special management status.

Cumulative Effects Alternative 1

There are no cumulative effects under the No Action Alternative because there are no new activities proposed. Existing conditions and trends would persist in the project area.

Cumulative Effects Vegetation Treatments Alternatives 2 and 3

Past and current management activities have had and continue to have impacts to aquatic habitat and aquatic species in the Patrick PA. These impacts have been incorporated into the existing condition description and have likely resulted in a decline in aquatic and riparian habitats in the analysis area compared to the period prior to intensive management activities. Current activities on Forest Service lands are managed under the standards and guidelines of INFISH which were developed to speed the recovery of riparian and aquatic habitats.

Livestock grazing is rated as a moderate risk for negative cumulative effects with the vegetation treatment activities proposed under alternative 2. Currently the majority of riparian areas in the project area are open to grazing. This risk rating is based on the likelihood that increases in fine sediment are likely to occur from the two activities (road activities and grazing in RHCAs) that would be additive to potential measurable increases in fine sediment from bank trampling by livestock, where livestock access stream channels. In addition, in alternative 2, livestock access to stream channels could increase because non commercial thinning is proposed in all RVR units (4,693 acres) up to the stream channel. Streambank stability is currently meeting RMOs in all surveyed reaches, however changes in access to stream channels by livestock where vegetation is currently dense could occur. In addition, changes in access to livestock grazing from non commercial thinning near streambanks could increase grazing pressure near streams and have the cumulative effect of increased streamside vegetation removal. Therefore, there is a moderate risk of negative cumulative effects to measures streambank stability and stream temperature with a change in grazing patterns by increased access.

In Alternative 3, where no mechanical treatment would occur in RHCAs and where no hand thinning and burning would remove vegetation in RHCAs, there is a low risk of negative cumulative effects from livestock grazing.

The risks of cumulative effects from other activities are rated as low in both alternatives (see Appendix A).

Riparian stream and floodplain restoration as well as riparian meadow restoration would occur in a project called Austin Vegetation Management on the Malheur National Forest, which is adjacent to the project area. These activities are in a different basin and watershed and therefore would not overlap with effects to fish and aquatic species or habitat

Road Treatments Alternative 2 and 3

Routine road maintenance activities in the Patrick PA, along with the road maintenance, relocation and closures proposed under alternative 2 and 3 would likely result in a cumulative effect of short-term increase and then long term minimal decrease in sediment and erosion rates in the project area. The measure sediment is expected to have a longer-term benefit from cumulative effects addressing road maintenance and associated drainage patterns.

Proposed, Endangered, Threatened, and Sensitive Species (PETS)

Botanical Resources

Determinations and Conclusions

Federally Listed Species

Pinus albicaulis (Whitebark pine)
Pinus albicaulis is found on thin rocky soils near timberline and are unlikely in the project area but appeared on the official USFWS letter. The project area extends to elevations just over 6000 ft. No whitebark pine were noted, but if trees are discovered, a protective measure will call for a 30 ft. buffer in which whitebark remain and other tree species are thinned. Therefore, as long as a protective measure is followed, the Patrick project would have **no effect** to *Pinus albicaulis.*

Spiranthes diluvialis (Ute ladies tresses)
From USFWS ECOS species profile https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=2159 accessed 7/3/2019:

"When Ute ladies-tresses was listed in 1992 it was known primarily from moist meadows associated with perennial stream terraces, floodplains, and oxbows at elevations between 4300-6850 feet (1310-2090 meters). Surveys since 1992 have expanded the number of vegetation and hydrology types occupied by Ute ladies'-tresses to include seasonally flooded river terraces, sub irrigated or spring-fed abandoned stream channels and valleys, and lakeshores. In addition, 26 populations have been discovered along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, roadside barrow pits, reservoirs, and other human-modified wetlands. New surveys have also expanded the elevational range of the species from 720-1830 feet (220-558 meters) in Washington to 7000 feet (2134 meters) in northern Utah. Over one-third of all known Ute ladies-tresses populations are found on alluvial banks, point bars, floodplains, or ox-bows associated with perennial streams."

Habitat in Patrick project area looked promising. However, we surveyed over 80% of habitat mapped by the GIS model, and no plants were found. We did find a hybrid Spiranthes. I recommend the location of the hybrid be protected as if it were an R6 Sensitive species. Due to extensive surveys, our confidence level is high that Spiranthes diluvialis does not exist on the project area, therefore the Patrick project would have **no effect** to Spiranthes diluvialis.

R6 Special Status Species

The Regional Forester's Special Status list of 2015 was used because project fieldwork was done before the 2019 list was available. Both 2015 and 2019 lists (USDA-Forest Service) and can be found at https://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/ . Many special status plants have potential habitat on the project area due to the wide variety of habitat types dry to moist and various soil and rock types. We noted that some sensitive plants were co-occurring with weeds. Table 4 in the Botanical Resources Specialist Report (Project File) lists sensitive species occurrences, which overlap with weed occurrences. Weedy grasses are currently not recorded but are of concern. Table 78 below lists those special status species that are known or suspected in the project area following the 2018 fieldwork and gives a determination for each. All other species on the full R6 special status plant list are given an effects determination of **"NI-No Impact"** due to not being known in the area or not suspected to have potential habitat.

Table 78. Plants from the R6 Special Status species list documented or suspected in the project area and Determination Statement (rows highlighted are documented in project area)

Scientific Name	Common Name	Documented /Suspected?	Det. Alt. 1 (No action)	Det. Alt. 2 (Action alternative includes RHCAs)	Det. Alt 3 (Actions excluded from RHCAs)
Achnatherum wallowaensis	Wallowa ricegrass	S	NI	NI	NI
Botrychium ascendens	Upward-lobed moonwort	S	NI	MIIH	MIIH
Botrychium campestre	Prairie moonwort	S	NI	MIIH	MIIH
Botrychium crenulatum	Crenulate moonwort	S	NI	MIIH	MIIH
Botrychium lineare	Slender moonwort	S	NI	MIIH	MIIH
Botrychium lunaria	Moonwort	S	NI	MIIH	MIIH
Botrychium minganense	Gray moonwort	S	NI	MIIH	MIIH
Botrychium montanum	Mountain grape-fern	D	NI	MIIH	MIIH
Botrychium paradoxum	Twin-spiked moonwart	S	NI	MIIH	MIIH
Botrychium pedunculosum	Stalked moonwort	S	NI	MIIH	MIIH
Calochortus longebarbatus var. peckii	Peck's long-bearded sego-lily)	S	NI	MIIH	MIIH
Carex cordillerana	Cordilleran sedge	S	NI	MIIH	MIIH
Carex diandra	Lesser panicled sedge	S	NI	MIIH	NI
Carex diurscula	Spikerush sedge	S	NI	MIIH	NI
Carex lasiocarpa var. americana	Slender wooly sedge	S	NI	MIIH	NI
Carex parryana	Parry's sedge	S	NI	MIIH	NI
Carex retrorsa	Retrorse sedge	S	NI	MIIH	NI
Carex scirpoidea ssp. stenochlaena	Alaskan single spike sedge	S	NI	MIIH	NI
Castilleja viscidula	Sticky indian paintbrush	S	NI	MIIH	MIIH
Cicuta bulbifera	Bulb hemlock	S	NI	MIIH	NI
Cypripedium fasciculatum	Clustered lady's-slipper	S	NI	MIIH	NI
Eleocharis bolanderi	Bolander's spikerush	D	MIIH	MIIH	MIIH
Erythranthe inflata	Disappearing monkey flower	S	NI	MIIH	MIIH
Isoetes minima	Midget quillwort	S	NI	NI	NI
Listera borealis	Northern twayblade	S	NI	MIIH	MIIH
Lomatium tarantuloides	Spider biscuitroot	S	NI	NI	NI
Luina serpentina	Colonial luina	S	NI	NI	NI
Lycopodium complanatum	Ground cedar	S	NI	MIIH	MIIH
Ophioglossum pusillum	Adder's tongue	S	NI	MIIH	MIIH
Phacelia minutissima	Dwarf phacelia	S	NI	NI	NI
Plueropogon oregonus	Oregon semaphore grass	S	NI	MIIH	MIIH
Pyrola dentata	Toothed white-vein wintergreen	S	NI	MIIH	MIIH

Note: updated with R6 Regional Forester's Special Status Species List 2015

Susp- Suspected potential habitat is within the project area, but no known sites as of this BE date.

Doc- Documented population(s) within the project area.

BI – Beneficial Impact

MIIH- May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend towards Federal Listing or Cause a Loss of Viability to the Population or Species Activities or actions that have effects that are immeasurable, minor or are consistent with Conservation Strategies would receive this conclusion. For populations that are small - or vulnerable - each individual may be important for short and long-term viability

A **NI -** No impact determination is given to Alternative 1 (no action) for documented or suspected rare, based on the highly probable effect that doing no thinning or prescribed burning will not affect most plant species. The exception is Eleocharis bolanderi, which is documented overlapping the noxious weed Ventenata dubia and sometimes other noxious weeds in seasonally moist non-forested openings with shallow soils, which it occupies. Ventenata dubia is currently untreated and likely to

continue to increase and suppress native plants including ELBO, regardless of lack of management actions.

A MIIH may effect habitat or individuals but will not lead to federal listing determination is given for Alternative 2 (proposed action) for documented or suspected rare species that would normally be affected by forest thinning or burning including riparian areas, with the understanding project protection measures are noted for any known or discovered TES species. These protection measures would serve to reduce any impacts on most known or suspected sensitive plant populations. A No Impact determination is given for Alternative 2 for rare species in non-forested openings under the condition that protection measures are followed there as well.

A **MIIH** determination is given for Alternative 3 (actions excluded from RHCAs) for documented or suspected rare species that would normally be affected by forest thinning or burning with the understanding project protection measures are noted for any known or discovered TES species. Because riparian areas would be excluded, a **NI** determination is given for riparian species. A No Impact determination is given for Alternative 3 for rare species which are in non-forested opening under the condition that protection measures are followed there as well.

Impacts to the ponderosa pine/sagebrush community is of concern for several reasons:

1. Sagebrush as sage grouse habitat: Sagebrush habitat in Patrick PA is about 4 miles from known sage grouse habitat. Despite lack of current use by sage grouse, maintaining potential/historic habitat should be a goal. Wallowa-Whitman Forest Plan (1990) Standard and Guideline 2 Vegetation Manipulation specifies "provide and maintain ecologically sound distribution and abundance of plant and animal communities...maintaining all native and desirable species and communities".

2. Importance of conserving sagebrush (shrub steppe) and associated plant species as native plant communities is recognized in planning documents including the following:

   The Oregon Conservation Strategy (accessed 7/9/2019 at http://www.oregonconservationstrategy.org/strategy-habitat/sagebrush-habitats/) particularly emphasizes the important of basin big sage in the Blue Mountains region, and recommends caution with prescribed fire. The Oregon Natural Areas Plan (2015; https://inr.oregonstate.edu/orbic/natural-areas-program)"... is designed to include examples (of diversity of ecosystems) to assure at least one good example of each ecosystem type, geologic formation and at-risk species is represented in each ecoregion in which they naturally occur." The Plan lists Ponderosa pine-western juniper/big sagebrush-bitterbrush vegetation mosaic as a Medium Priority habitat for conservation, which currently is unrepresented in the program.
   USFS R6 regional planning document Terrestrial Restoration and Conservation Strategy (TRACS 2012; https://www.fs.usda.gov/detail/r6/plants-animals/wildlife/?cid=stelprdb5440388) also recognizes the sage steppe biome as a priority habitat for conservation and restoration in the Blue Mountains ecoregion.

3. Research, including that summarized in the newly released "Science Frame work for Conservation and Restoration of Sagebrush Biome Part 2" USDA 2019 at https://www.fs.usda.gov/treesearch/pubs/57911 and Part 1 https://www.fs.fed.us/rm/pubs_series/rmrs/gtr/rmrs_gtr360.pdf

concludes that it is best to exclude fire including prescribed fire, from intact sagebrush biomes which have weedy species adjacent.

Cumulative Effects

Future projects would have protection measures for known rare plants. Field surveys and any new sites are routinely added to the NRM database and are available for review when new projects are proposed. Ongoing actions such as camping, hunting and other public uses will not have cumulative impacts on any sensitive plant population because most of those activities occur on hardened sites where rare plants are not located: campsites, trails, and roads.

Therefore, as long as protective measures are followed, cumulative effects are not likely to occur to rare plant resource as a result of the project alternatives.

Similarly, cumulative effects of fire and weeds along with thinning are likely to the Ponderosa pine/ sagebrush plant association unless protective measures are followed. It is also entirely possible that other public uses may add to the disturbance level, but these were not apparent in 2018.

Wildlife

The following proposed, endangered, threatened, or sensitive species (PETS) of wildlife are listed on the Regional Forester's Sensitive Species List (2019; Table 79). The following table is a preliminary evaluation of which species have potential habitat within the project area. Those species without habitat and/or not believed to be present near the project area were removed from further consideration because there would be no effect from this project.

Table 79. Summary of PETS Species and Effect Determinations

Species	Status	Habitat	Determination	Rationale
Canada Lynx	Threatened	Historic	No Effect	Not present
Bald Eagle	Sensitive	Potential	No Impact	Trees over 21" dbh would not be harvested so roost trees would not be impacted.
Bighorn Sheep	Sensitive	No	No Impact	Not present
Gray Wolf	Sensitive	Potential	No Impact	Not present. No denning or rendezvous sites are within the project area and prey species would not be adversely affected.
Wolverine	Proposed Threatened	No	No Impact	Not present
Upland Sandpiper	Sensitive	No	No Impact	Not present
Lewis Woodpecker	Sensitive	Potential	No Impact	Trees over 21" dbh would not be harvested so large ponderosa pine habitat near riparian habitat would not be altered.
White-headed woodpecker	Sensitive	Known	No Impact	Currently very little suitable habitat exists but this project could create additional habitat
Greater Sage Grouse	Sensitive	No	No Impact	Not present
Bufflehead	Sensitive	No	No Impact	Not present
Columbian Sharp-tailed Grouse	Sensitive	No	No Impact	Not present
Silver-bordered Fritillary	Sensitive	No	No Impact	Not present
Gilette's Checkerspot	Sensitive	No	No Impact	Not present

Species	Status	Habitat	Determination	Rationale
Rocky Mountain Tailed Frog	Sensitive	No	No Impact	Not present
Columbia Spotted Frog	Sensitive	Known	MIIH[1]	Stream crossing by equipment would not occur in perennial streams and the scale of activity within the RHCAs is at a scale that would not lead to a decline in the population of the species.
Poplar Oregonian	Sensitive	No	No Impact	Lack of large-scale basalt talus within the project area makes the occurrence of this species unlikely
Columbia Gorge Oregonian	Sensitive	No	No Impact	Lack of large-scale basalt talus within the project area makes the occurrence of this species unlikely
Blue Mountainsnail	Sensitive	Potential	MIIH[1]	It is unlikely this species occurs within the project area, due to its rarity, but the presence of riparian habitat provides potential habitat
Shiny Tightcoil	Sensitive	Potential	MIIH[1]	The presence of dry and moist multi-story old forest within the project area makes this species likely to occur.
Fir Pinwheel	Sensitive	Potential	MIIH[1]	The presence of dry and moist multi-story old forest within the project area makes this species likely to occur.
Umatilla Megomphix	Sensitive	Potential	MIIH[1]	There is potential habitat for this species within the project area based on the presence of conifer forests and riparian areas. Primary threats to this species are considered to be logging and grazing.
Thinlip Tightcoil	Sensitive	No	No Impact	Not present
Black Swift	Sensitive	No	No Impact	Not present
Harlequin Duck	Sensitive	No	No Impact	Not present
Black Rosy Finch	Sensitive	No	No Impact	Not present
Wallowa Rosy Finch	Sensitive	No	No Impact	Not present
Townsend's Big-eared Bat	Sensitive	No	No impact	Not present
Spotted Bat	Sensitive	No	No impact	Not present
Fringed Myotis	Sensitive	Potential	MIIH[1]	Potential occurrence. Roost trees potentially affected but all trees over 21 inches dbh (which have the highest likelihood of being roost trees) would be retained. All snags would be retained unless they pose a safety hazard.
Western Bumblebee	Sensitive	Potential	MIIH[1]	Potential occurrence. Prescribed burns have the potential to eliminate food plants and overwintering insects, however burning also has the potential to renew flowering plants as long as diversity of unburned and burned areas is retained.
Suckley cuckoo bumblebee	Sensitive	Potential	MIIH[1]	This species of cuckoo bumblebee is a known parasite of colonies of Bombus occidentalis and as such could be impacted by effects to western bumblebee.
Morrison bumblebee	Sensitive	No	No impact	Surveys across the Wallowa-Whitman from 2014-2018 have not detected this species. The lack of open, dry scrub in the project area makes this species unlikely to occur.
Intermountain Sulphur	Sensitive	Potential	MIIH[1]	Potential meadow habitat disturbed.

Species	Status	Habitat	Determination	Rationale
Yuma Skipper	Sensitive	No	No impact	Not present

1. MIIH – May Impact Individuals or their Habitat but will not lead to a trend toward federal listing or result in a loss of viability.

Aquatic Species

Regional Forester's Aquatic Special Status Sensitive Species List

Regional Forester's aquatic Sensitive Species on the Wallowa-Whitman National Forest analyzed for the Patrick Project are found in Table 80.

Table 80. Regional Foresters Aquatic Sensitive Species List for the Patrick Project.

Regional Sensitive Species	Habitat Description	Wallowa-Whitman NF occurrence status	Known Current Distribution	Habitat Present in Patrick Project Area
Pacific lamprey *Entosphenus tridentatus*	Post spawning ammocoetes burrow for 5 - 7 years in areas of low velocity and fine substrates.	Documented	Pacific lamprey are widely distributed, occurring with salmon and steelhead.	No
Redband trout *Oncorhynchus mykiss*	**Redband, a resident form of steelhead, have similar habitat preferences, and also occupy small, colder headwater tributaries.**	**Documented**	**Broadly distributed, occupying (in smaller numbers) wherever adult steelhead occupy habitat and above barriers to steelhead.**	**yes**
Western Ridged mussel *(Gonidea angulata)*	**Occur in streams of all sizes of low to mid-elevation watersheds. Common in stable stream reaches, tolerant of fine sediments and occupy depositional areas.**	**Suspected**	**Broadly distributed west of the Continental Divide, CA to BC. It is mainly distributed east of the Cascades.**	**yes**
Shortface lanx *(Fisherola nuittalli)*	Found in cold, unpolluted, medium to large streams with fast-flowing, well oxygenated water and cobble boulder substrate, and is generally found at the edges of rapids.	Documented	Snake River, John Day River, Imnaha River	No
Columbia pebblesnail *Fluminicola fuscus*	Large tributaries and rivers on upper surfaces of stable rocks. Requires cold water with high oxygen content.	Documented	Lower Snake River	No

Regional Sensitive Species	Habitat Description	Wallowa-Whitman NF occurrence status	Known Current Distribution	Habitat Present in Patrick Project Area
A freshwater snail *Taylorconcha insperata*	Rivers, tributary deltas and back eddies, cobble, small boulder substrates with moderate periphyton densities and detrital deposition (Richards et al. 2005)	Documented	Lower Snake River and middle Owyhee River	No

Redband trout are a confirmed Regional Forester's sensitive aquatic species and western ridged mussels are suspected sensitive aquatic species in the Patrick Project area.

Redband Trout (Region 6 Sensitive Species, Wallowa-Whitman NF Management Indicator Species)

Redband trout, the resident form of *Oncorhynchus mykiss,* are a Region 6 sensitive species and a WWNF management indicator species. Redband trout in the project area likely shared a common gene pool with Snake River steelhead prior to the construction of the Hells Canyon Dam Complex (Hells Canyon, Oxbow, and Brownlee dams). Redband trout are widely distributed in the Patrick project area and occupy all Category 1 streams: approximately 19.8 miles of habitat.

Abundance in Analysis Area

Abundance surveys for redband trout have not occurred in the North Fork of the Burnt River Watershed. Their abundance is not known.

Effects of the Alternatives

Alternative *1*

Alternative 1 of the Patrick Project ***May Impact Individual redband trout and their Habitat*** but will not likely contribute toward federal listing or loss of viability to the population or species (MIIH).

Watershed and aquatic habitat conditions would likely remain in their current condition for the next 5 years. The majority of the timbered stands in the project area represent fuel models that are likely to exhibit moderate to severe fire severities. Wildfires typically result in increases in fine sediment for three to five years, depending on the severity (Neary et al., 2005). Adverse impacts to aquatic habitat would likely occur where fine sediment levels exceed the 20% threshold. These levels would likely decrease spawning success for redband trout and could affect survival of juvenile salmonids. Increases in stream temperatures could occur depending on the severity of fire in riparian areas and how streamside vegetation would be impacted. Survival of redband trout could be reduced if water temperatures exceed 64oF for extended periods.

Alternatives 2, and 3

Alternatives 2 and 3 of the Patrick Project ***May Impact Individual redband trout and their Habitat*** **(MIIH)** but will not likely contribute toward federal listing or loss of viability to the population or species. Impacts to redband trout may result from short-term increases in fine sediment (see Road

Related Activities section). Short-term increases in sediment may occur from road activities including relocating roads near steams and culvert replacements on fish streams and perennial streams that occur upstream of fish habitat. Improvement of drainage features is expected to decrease sediment inputs for a long-term benefit to water quality. Replacement of culverts that are fish passage barriers with culverts using stream simulation would benefit fish and aquatic organisms by connecting upstream and downstream habitat and movement of organisms. There are not expected to be effects to redband trout from building temporary roads in RHCAs in alternative 2 since the majority of these roads are in Category 4 RHCAs and there are no stream crossings on Category 1 or 2 streams. Temporary roads would be decommissioned and rehabilitated post project activities to restore natural drainage patterns.

Alternatives 2, and 3 are expected to improve the natural fire regime in the long-term in the project area. Vegetation treatments are not expected to have significant effects on fish habitat or water quality.

Cumulative Effects

There is a minor risk of cumulative effects to redband trout habitat from the proposed activities in Alternative 2 and grazing activities in the Patrick analysis area. An increase in access for livestock to streambanks where noncommercial thinning occurs throughout RHCAs may affect streambank stability and stream temperature if increased grazing occurs. Increases in fine sediment from bank trampling can reduce spawning success and overall fitness of redband trout. Grazing, where livestock has access to streams can also cause streambank stress and bank sheer and overwidening of streambanks and can impact riparian vegetation. Increased access for grazing streamside vegetation may decrease shade and increase solar radiation and therefore increase stream temperature. There are no riparian treatments in alternative 3, so there would be no cumulative effects from vegetation treatments in RHCAs.

Alternative 2 and 3 proposed road activities, such as culvert installation on fish bearing streams, combined with ongoing road maintenance activities, may produce a low risk of cumulative effects. Effects would be short term additive sediment and turbidity from stream channel construction associated with road stream crossings. These effects would be minimized by following INFISH standards and guidelines, road maintenance BMPs, and project PDCs. In the long-term, road maintenance activities would reduce adverse effects to aquatic habitat by reducing overall erosion rates from the road system and improving water quality by maintaining stream drainage patterns.

Western Ridged Mussel (Region 6 Sensitive Species)

Western ridged mussels were designated a Region 6 Forester's Sensitive Species during the development of the 2008 and 2015 R6 Sensitive Species List. Initially, western ridge mussels were suspected to be present on the Wallowa-Whitman NF based a review of occurrence records. Additional record reviews and data searches by WWNF personnel revealed that western ridged mussels were historically present in large numbers in the Snake River and confirmed that western ridge mussels are currently present in the Snake River, Hells Canyon portion, on the Hells Canyon NRA. The current Snake River western ridge mussel population is suspected to be at very low levels compared to pre-European settlement. Relic shells of western ridge mussels were collected by personnel from the Wallowa Mountains Office of the WWNF during a monitoring trip on the Hells Canyon portion of the Snake River in October of 2010. Western ridge mussels were also documented in the Powder River (1963) and Grande Ronde River (pre-1929) downstream of the WWNF.

Abundance in Analysis Area

The presence of western ridge mussels is suspected on the WWNF but has not been confirmed and therefore has not been confirmed in the analysis area.

Effects of the Alternatives

Alternative 1

Alternative 1 of the Patrick Project will have ***No Impact on Individual western ridge mussels and their Habitat*** (NI), Watershed and aquatic habitat conditions would likely remain in their current condition for the next 5 years. Although levels of fine sediment are elevated in stream channels that have been surveyed, current aquatic habitat conditions in the analysis area are not likely limiting for western ridge mussels.

The majority of the timbered stands in the project area are represented by fuel models that are likely to exhibit moderate to severe fire severities in the case of a wildfire. Wildfires typically result in increases in fine sediment for three to five years, depending on the wildfire severity (Neary et al., 2005). Western ridge mussels would be vulnerable to impacts from large-scale wildfires that result in large increases in fine sediment and changes in peak flows. Western ridge mussels are adapted to habitats with fine sediment; however, large influxes of fine sediment could result in the burying of mussel beds and the death of individuals. Western ridge mussels require stable streambeds for mussel beds to develop. Increases in peak flows that scour streambed substrates destroy existing mussel beds.

Alternatives 2 and 3

Alternatives 2 and 3 of the Patrick Project ***May Impact Individual western ridge mussels and their Habitat*** (MIIH) but will not likely contribute toward federal listing or loss of viability to the population or species. Impacts to western ridged mussels may occur as a result of short-term increases in fine sediment (see effects Road Related Activities section).

Current levels of fine sediment in the six streams where substrate/particle size information was collected and analyzed indicate high levels of fines at channel cross sections where these measurements were taken. In these areas short-term potential increases in fine sediment from proposed prescribed burning, thinning, and transportation system activities are unlikely to result in measurable, long term increases in fine sediment in streams in the analysis area.

Under Alternative 2 and 3, the only short-term potential measurable increases in fine sediment in aquatic habitat would likely occur in the vicinity of culvert replacement and installation/removal of temporary culverts or in areas where road relocation or reconstruction occurs near stream channels. Increases in fine sediment are expected to be minimal and short term and within habitat tolerances for western ridge mussels.

Overall, a decrease in erosion from road surfaces is expected as a result of the proposed road improvements and relocations in both action alternatives. Both alternatives would also maintain a more natural fire regime in the long-term in the project area. Both of these long-term outcomes would have beneficial impacts to western ridge mussels and their habitat in the analysis area.

Commercial and non-commercial thinning activities would occur in RHCAs under Alternative 2. In addition, temporary roads constructed in RHCAs as well as 16 road crossings in Category 4 RHCAs could contribute to sedimentation in stream channels.

Cumulative Effects

Due to their lack of mobility, there is a moderate risk of cumulative effects to western ridge mussel habitat from the proposed activities and ongoing road maintenance and grazing activities in the analysis area. Both of these activities can result in increases in fine sediment in aquatic habitat. Increases in fine sediment can reduce reproductive success and overall fitness of western ridge mussels.

For ongoing road maintenance activities, short-term effects from road maintenance activities are minimized by following INFISH standards and guidelines, road maintenance BMPs, and project PDCs. In the long-term, road maintenance activities reduce adverse effects to aquatic habitat by improving drainage patterns and reducing overall erosion rates from the road system. Potential cumulative effects from ongoing grazing activities would be minimized by adhering to INFISH Standards and Guidelines for grazing activities and WWNF Forest Plan standards and guidelines for utilization.

MIS Effects Analysis

Fish habitat in the analysis area generally does not meet INFISH RMOs for pool frequency, LWD, width to depth ratios, stream temperature and fine sediment. (see Fish and Aquatic Habitat Existing Conditions report).

Short term increase in fine sediment in stream channels would occur as a result of culvert installation, removal, and replacement activities in alternatives 2 and 3. Short term direct effects to water quality and fish from the three culvert replacements on fish streams would occur from an increase in sediment from channel construction. This is work would be completed in the in-water work window (ODFW 2008) to avoid impacts to fish at vulnerable life stages. Sediment pulses would be short term and background levels of turbidity is expected to return to background levels within 24 hours after construction (Jakober 2002). Replacing these culverts with culverts that meet fish passage requirements will have short- and long-term benefits to fish. Road relocation and reconstruction within RHCAs could contribute sediment into channels that would have a short-term effect on water quality and fish habitat by increasing sediment input into channels. The predicted increases, however, are likely to be short term and local and elevated sediment levels and increase in turbidity would be mitigated by conducting these activities when flows are low. Best management practices as well as project level PDCs (see Appendix B) would limit the short-term effects to water quality and fish habitat. Road maintenance including relocating roads and improving drainage will have short- and long-term benefits water quality in the project area.

Fine sediment entering stream channels would decrease when road maintenance activities are complete. The proposed action would also improve vegetative conditions and maintain the natural fire regime in the long-term in the project area. Project activities would not contribute to a negative trend in viability of redband trout on the Wallowa-Whitman National Forest.

Transportation

The following summarizes the complete effects analysis for transportation in the project file. The analysis area lies substantially (99.9%) within 6 sub-watersheds none of which are anadromous (MA 18). A summary of the current road densities for the operational (existing) road system are summarized below:

Table 81. Open Road Density (ORD) for Existing Road System

			Open Road Information			
Subwatershed	**Management Area**	**Area (sq mi)**	**OBML Open Rd (mi)**	**OPML Open Rd (mi)**	**OBML Open Rd Density (mi/sq mi)**	**OPML Open Road Density (mi/sq mi)**
Antelope Creek-North Fork Burnt River						
	3	1.38	1.39	2.66	1.01	1.65
Camp Creek						
	1	19.69	33.08	63.95	1.68	3.25
	1W	1.90	3.37	3.54	1.77	1.86
	3	2.44	4.61	5.14	1.89	2.11
	15	2.58	2.21	3.22	0.85	1.25
	18	0.03	0.05	.05	1.49	1.62
Headwaters North Fork Burn River						
	1	9.33	9.33	18.56	1.3	1.99
	3	1.39	3.48	3.59	2.51	2.59
	3A	8.44	12.22	16.83	1.45	1.99
	15	1.22	2.50	2.68	2.06	2.20
Patrick Creek- North Fork Burn River						
	3	4.28	1.86	1.95	0.43	.46
	3A	7.55	7.28	11.18	0.96	1.48
	15	0.78	0.00	0.00	0.00	0.00
Petticoat Creek-North Fork Burn River						
	1	5.67	8.82	9.68	1.56	1.71
	3	6.31	7.55	7.83	1.20	1.24
	3A	1.10	3.03	3.03	2.75	2.75
	15	1.10	1.93	3.15	1.75	2.85
Trout Creek						
	1	0.43	1.83	2.34	4.25	5.44
	3	0.42	2.10	2.10	4.95	4.95
Grand Total		76.04	106.64	161.48	33.86	41.39

1. Miles shown are calculated from GIS, in areas where the square miles are less than 0.1 mi/mi2, the road density has been rounded to zero.

In some management areas open road density appears very high in relation to forest plan target values, but this is due to the fact that only a very small amount of acreage exists in the project area (slivers of land tend to skew densities and should be cautiously considered during any evaluation of these numbers). Although the proposed actions will add 10.52 miles of road to the system, the objective maintenance level will be ML1 (stored) so the open road density will not change. In addition, the roads are currently unauthorized, and will be effectively closed by timber sale related

operations, so the effective open road density will be decreased. (These closures are not reflected in the operational road density numbers in this report, as the roads are not system roads).

Condition of Existing Roads

The result of reduced maintenance over the last 25 years due to declines in budgets can be seen across the project at all levels of the open transportation system. Impacts of an unmaintained transportation system include increased hazards to public safety, decreased hydraulic function, and a decreased efficiency of the transportation system. All of these consequences have residual impacts to the local economy and environment. "Road maintenance is one of the most influential actions to effectively reduce sedimentation and enhance water quality" (North Fork Burnt Watershed Analysis, Cumulative Effects Amendment, May 2000).

Direct, Indirect and Cumulative Effects –Transportation

A sustainable roads analysis for the forest is currently being developed in accordance with the 2005 Travel Management Rule, Subpart A. Because of its unavailability for use, resource specialists have been consulted during on-the-ground field reconnaissance to assist in providing recommendations based on resource impacts, effectiveness, and sustainability. The effects (direct, indirect and cumulative) of all alternatives would be similar for maintenance level 3-5 roads. Alternative 1 is the no-action alternative and studies the effects to the transportation system of not performing the work identified in this document. Alternatives 2 and 3 have effects on the transportation system that are not substantially different from each other.

Alternative 1- Transportation

Direct and Indirect Effects

Alternative 1 would not use or change the existing transportation system, and access to the area would remain the same. Road maintenance on the majority of the road system would be deferred until future entries into the area could provide this work. Maintenance on main system roads described previously would continue to be provided on a 5-8 year cycle, or as funds become available. Road densities and number of miles of road open to the public for access would remain the same. Roads that are closed and still being used would continue being used. The Forest Service would continue to reinforce berms, construct or implement new physical closures to move the open road densities towards the objective maintenance level. No roads would be improved with reconstruction or timber sale maintenance, and no change in the management of the road system would occur.

Alternative 2 & 3- Transportation

Direct and Indirect Effects

Effects related to roads are generally addressed as impacts to other resources such as aquatics, soils, invasive weeds, and wildlife. To address the effects on the transportation system this analysis will focus on road density and maintaining a road system to a physical standard for safe operation by the intended users.

No alternative would increase open road densities. None of the alternatives include adding permanent Forest Service roads, open or closed, to the transportation system. The Forest Plan states:

"Analyze projects which will require construction of new roads or which require opening old roads, with the intent of meeting specific management area road density guideline during the activity.

If the analysis indicates that meeting these guidelines during project activity is important in meeting the resource management objective, and if the project will require an open road density in excess of the guideline, then mitigation of the effects of adding open roads will take place where practicable." (Forest Plan, 4-36)

Temporary Roads

Approximately 38.5 miles of temporary road would need to be used for vegetation management activities for the project. Temporary roads will not be added to the system and will be rehabilitated or blocked at completion of logging activities, so will not increase the road densities in the project area.

Road Maintenance and Reconstruction

Under this project, all roads with a Maintenance Level 2 or higher are assumed to receive maintenance and/or reconstruction commensurate with use and existing condition. Maintenance/reconstruction activities are listed and described in Project Design Criteria in chapter 2. These activities will be prioritized for user safety and environmental benefit. Additionally, Maintenance Level 1 roads in the project area will receive maintenance/ reconstruction if the road is required for commercial haul by the project. In both Alternatives 2 and 3, there are approximately 154 miles of stored roads (Operational ML 1) which will need to be opened for use. Upon completion of haul over these roads, they will be water barred and stored. 7.71 miles of Objective Maintenance Level 1 roads that are currently operating as open and will be used by this project will be stored at the conclusion of the project. If these roads end up not being used by the project supplemental funding will be needed to store the roads. All Objective Maintenance Level 1 roads that will have a closure device installed have a previous decision that stored them. This analysis also recommends changing the objective level of maintenance on another 7.6 miles of road. The remaining 50.4 miles of Objective Maintenance Level 1, Operational Maintenance Level 2 road segments will remain open post project.

There are 181 miles of open, ML 2-5 road that would be utilized for commercial haul for Alternative 2. This TAR is recommending changes to the objective ML's for 7.6 miles across 5 road segments. The commercial operation would use and maintain these roads, and upon completion of contract activities 173.4 miles would remain open as recommended by the existing objective maintenance level.

In accordance with 16 USC 537, deposits for surface rock replacement would be collected from the purchaser or contractor for commercial haul over roads with aggregate surfacing. In lieu of deposits, commercial users may perform maintenance or provide materials proportionate to their share of collections (36 CFR 212.5 (d) (3)).

It is estimated that the road maintenance costs would range between $1,500-$2,000 per mile. If spot rocking is required, these costs would increase. Haul and placement costs for spot rocking are estimated to be approximately $20/cy (or approximately $30,000/mile). These costs would vary depending on haul distances, location of the source, and the type of material being used. Reconstruction costs for this project area are estimated to range between $10,000-$75,000 per mile depending upon the level of the proposed reconstruction.

Existing Non-System Road Conversion

Under this project, 10.52 miles of non-system roads (existing road templates, not included in Forest road system) will be added to the system, as they are determined necessary for planned and future

management activities. At the conclusion of use under this project, the roads will be placed in an Objective Maintenance Level 1 status and will have a closure device installed.

Table 82. Haul Route Post-Harvest Road Management Recommendations for Change

Non-system Road Numbers	Segment Length (mi.)	Non-system Road Numbers	Segment Length (mi.)
1000362	0.36	1055115	0.66
1000365	0.05	1065196	0.15
1000378	0.18	1900083	0.14
1035050	0.38	1900097	0.39
1035060	0.14	1900161	0.27
1040231	0.41	1900164	0.13
1040245	0.20	1900204	0.28
1044103-two segments (.04/.22)	0.26	1900207	0.21
1044143	0.12	1900336	0.89
1044144	0.02	1900365	0.54
1044145	0.02	1900399	0.80
1046164	0.27	1900424	0.87
1046178	0.10	7350161	0.61
1046218	0.45	7380231	0.29
1046221	0.20	7380283	0.31
1046224	0.12	7386415	0.15
1055031	0.20	7386520	0.37
Grand Total Undetermined Road Miles from both columns=10.52 miles			

Road Management

Management of the transportation system in the Patrick Analysis Area is not proposed to change except as outlined in Table 83 below. The reconstruction and maintenance activities associated with this project will allow for a more safe, efficient, sustainable, and responsible management of the transportation system. The changes listed below will not affect the effectiveness or efficiency of the transportation system and does not affect access to dispersed camping, mining claims or private property. The changes listed below would benefit elk and other wildlife. Included in the table is roads that have past NEPA decisions to change their Objective Maintenance level to ML1 but are operating as open. These roads will be implemented under this decision after post-harvest.

Table 83. Haul Route Post-Harvest Road Management Recommendations for Change

Roads Recommended for Change Post-Harvest					
Road Number	**Segment Length (mi.)**	**Current Management**		**Recommended Future Management**	**Reason**
		Objective	**Operational**		
1000340	1.42	Objective ML 2	Operational ML 2	Objective ML 1	Seasonal public traffic is causing resource damage. Road is unimproved with no surfacing. Does not access dispersed camping, mining or private property. Benefit for Elk and other Wildlife.
1000375	0.79	Objective ML 2	Operational ML 2	Objective ML 1	Seasonal public traffic is causing resource damage. Road is unimproved with no surfacing. Does not access dispersed camping, mining or private property. Benefit for Elk and other Wildlife.
1940040	2.22	Objective ML 2	Operational ML 2	Objective ML 1	Road is closed on Malheur end. Recommendation is based on wildlife concerns. Road segment has been operational ML 1 for 10 years.
1035125	3.36	Objective ML 2	Operational ML 2	Objective ML 1	Does not access dispersed camping, mining or private property. Benefit for Elk and other Wildlife.
1035310	.07	Objective ML 2	Operational ML 2	Objective ML 1	Tributary to 1035125. Very short segment. Implement storage with project. Does not access dispersed camping, mining or private property. Benefit for Elk and other Wildlife.
Total	**7.86 miles**				

Roads from Past Decisions Proposed to Implement Under this Decision after Post-Harvest					
Road Number	Segment Length (mi.)	Current Management		Recommended Future Management	Reason
		Objective	**Operational**		
1046065	0.69	Objective ML1 Geiser TS.	Operational ML 2	Objective ML 1	Road will be needed for future resource management. Road does not access any public or private interests (ie. mining, camping, private land)
1055100	1.22	Objective ML 1 Jack TS	Operational ML 2	Objective ML 1	Road will be needed for future resource management. Road does not access any public or private interests (ie. mining, camping, private land) Benefit for Elk and other Wildlife.
1055113	1.15	Objective ML 1 Jack TS	Operational ML 2	Objective ML 1	Road will be needed for future resource management. Road does not access any public or private interests (ie. mining, camping, private land). Benefit for Elk and other Wildlife.
7380120	.80	Objective ML 1 Jack TS	Operational ML 2	Objective ML 1	Road will be needed for future resource management. Road does not access any public or private interests (ie. mining, camping, private land).
7380160	2.10	Objective ML 1 Jack TS	Operational ML 2	Objective ML 1	Road will be needed for future resource management. Road does not access any public or private interests (ie. mining, camping, private land). Benefit for Elk and other Wildlife.
Total	**7.80 miles**				

The changes in road management listed above will change the open road densities in the project area once implementation is complete. The following table exhibits this information. Storing 7.86 miles of objectively open roads and implementing the storage of 7.80 miles of previously objectively closed roads.

Table 84. Post-Harvest Open Road Densities (as recommended)

Subwatershed	Management Area	Area (sq mi)	Open Rd (mi)	Existing Open Road Density (mi/sq mi)	Alt 2 & 3 Open Rd Density (mi/sq mi)
Antelope Creek-North Fork Burnt River					
	3	1.38	1.39	1.01	1.01
Camp Creek					
	1	19.69	33.08	1.68	1.68
	1W	1.90	3.37	1.77	1.77

	3	2.44	3.52	1.89	1.44
	15	2.58	2.21	0.85	.85
Headwaters North Fork Burn River					
	1	9.33	12.10	1.30	1.30
	3	1.39	3.48	2.51	2.51
	3A	8.44	9.35	1.45	1.11
	15	1.22	1.94	2.06	1.59
Patrick Creek- North Fork Burn River					
	3	4.28	.75	0.43	.17
	3A	7.55	6.94	0.96	.92
	15	0.78	0.00	0.00	0.00
Petticoat Creek-North Fork Burn River					
	1	5.67	7.63	1.56	1.35
	3	6.31	7.55	1.20	1.20
	3A	1.10	2.36	2.75	2.14
	15	1.10	1.93	1.75	1.75
Trout Creek					
	1	0.43	1.83	4.25	4.25
	3	0.42	2.10	4.95	4.95

1. Miles shown are calculated from GIS, In areas where the square miles are less than 0.1 mi/mi2, the road density has been rounded to zero.

Forest Plan direction to meet open road density was discussed above. There are management areas within some of the subwatersheds where open road densities are still above forest plan. In the Camp Creek subwatershed which has the most area in the Patrick Project, management area 1W will continue to remain above Forest plan direction of 1.5 road miles per square mile. 1W is winter range and these roads will be closed during the winter months as outlined in the Forest Plan “On winter ranges adequate road closure will normally result from snow” (Forest Plan, 4-60). While MA 3 will decrease under the proposed action and meet the Forest Plan direction of 1.5 road miles per square mile.

In the Headwaters North Fork Burn River subwatershed, MA 3 there is no change within the Alternatives; therefore, the open road densities will continue to be above the plan direction of 1.5 road miles per square mile. Petticoat Creek-North Fork Burn River subwatershed, MA 3A is still above the forest plan direction of 1.5 road miles per square mile but with the proposed action alternative the MA 3A will decrease. Trout Creek subwatershed open road densities remain the same after the proposed action and still exceeds both MA 1 and MA 3.

Extending the closure period for the Patrick Creek Cooperative Travel Management Area to include three days prior to archery deer and elk season through the close of the last elk season will reduce vehicle access in the travel management area during the time frame of late August to mid-November. This could lead to more people concentrating in a smaller network of roads that are available to vehicles during this period and increasing wear and tear maintenance on these roads.

Cumulative Effects

Commercial Harvest and Post-Harvest Activities

Effects of projects proposed in the foreseeable future will have a positive impact on the transportation system. Much needed maintenance and reconstruction activities will occur across most open roads in the project area. These activities will make the system safer, more efficient, and more resilient. Additionally, the many of the activities will be performed in order to improve the impacts to local waterways. Negative impacts of wear and tear from timber haul will be mitigated by the road maintenance requirements of pre-haul, during-haul, and post-haul operations. In addition, the surface rock replacement deposits by the timber purchaser would provide a means to maintain/repair/replace the crushed aggregate, should it wear out due to the timber haul. Timber Sale road maintenance should provide a beneficial effect to the road system beyond the close of the project. Some risks to monitor in the post project environment is the potential increase of runoff and debris flow through ditch relief and stream crossing culverts. These risks will be most evident in the spring during snow melt and spring rain events.

Travel Management

To comply with the 2005 Travel Management Rule (TMR) the WWNF began a planning effort to designate roads, trails, and areas for public motor vehicle use in 2007. The 2012 WWNF TMP FEIS displays a range of alternatives meeting the intent of the TMR and the effects of implementing them. Because this planning effort for Subpart B is not currently active, the range of alternatives from the TMP FEIS was not considered the best representation of a reasonable range of potential effects that could occur upon implementation for use in this analysis. However, an effort was made to field verify actual road status and compare the benefits to multiple resources to maintain the existing status or change status. While a specific number of miles of designated routes (roads and trails) will not be known until a decision is made, the analysis from the WWNF TMP FEIS indicates that designated routes could range from a potential high of approximately 6,700 miles to a potential low of approximately 2,600 miles and x-country motor vehicle use would be managed. Once final analysis is complete and a decision is made, the roads, trails, and areas designated for motor vehicle use by the public will be displayed on a Motor Vehicle Use Map (MVUM).

Soils

Spatial and Temporal Context for Effects Analysis

The analysis area forms the boundary for the direct, indirect, and the cumulative effects in this soil analysis. It consists of the proposed actions within each analysis area. This analysis area was selected because it is where the effects of implementing the proposed activities would occur. The effects on soils would not extend beyond the analysis areas proposed for treatment. Natural and human-induced erosional processes may transport detached soil to a new location, if this occurs it is unknown if some portion of this material will end up outside of the project boundary.

The temporal boundaries for analyzing effects start from the initiation of historic forest activities, because soil disturbance can remain on the landscape for many decades. Short-term impacts are considered to be within 15 years and long-term effects being those that last for more than 15 years. Effects that are eliminated by the natural course of a single growing season are not considered effects because they are so short lived.

Affected Environment

Existing Condition

Table 85. Resource indicators and measures for the existing condition

Resource Element	Resource Indicator	Measure	Existing Condition
Soil Productivity	Detrimental Soil Conditions	Acres of detrimental soil conditions	3,930
	Droughty Soils	Acres of droughty soil types treated	0
Soil Erosion	Erosion Potential	Tons/acre of hillslope erosion modeled from WEPP	0
		Acres of soils with high erosion potential	20,144
		Miles of temporary roads on high erosion potential soil	0
Slope Stability	Landslide Potential	Acres of slopes with increased landslide potential	1,685
		Miles of temporary roads on slopes with high landslide potential	0

Alternative 1 - Direct/Indirect Effects

Soil Productivity

The No Action alternative would not cause short-term effects on the soil resource over and above existing condition. No additional road building, timber harvest, prescribed burning, or fuel reduction would disrupt natural soil processes.

Physical Soil Characteristics

The No Action alternative would not cause soil compaction, rutting, puddling, or soil displacement. Undisturbed soils would remain so. Soil productivity in areas where past timber management compacted soils would slowly improve as plant roots, soil organisms, and freeze-thaw events loosen the soil. Most soil disturbances would recover after 70 years (Gonsior, 1983). Sites that are slightly compacted would recover in fewer than 70 years. Displaced, rutted, and puddled soils would have reduced productivity for a longer time than compacted soils.

Organic Matter

Standing dead trees would eventually fall over and contribute coarse woody debris and additional organic material would be recruited through natural mortality. Fine-woody debris would remain on site. Soil organisms would decompose the organic materials adding humus to the soil. Nutrients associated with this material would slowly become available for plant growth. As the tree canopies close and shade the soil surface, decomposition rates would slow, allowing organic matter and nutrients to accumulate on the soil surface. This process would continue until another major disturbance, such as fire or a windstorm, opens the tree canopy and speeds up the recycling process again.

Soil Biological Activity

Microorganism populations would fluctuate with the changes in microclimate and supply of organic matter on the soil surface. These changes would be in response to the changing vegetation as a result of natural events such as fire, wind throw, and other sources of natural vegetation mortality. Any changes would be buffered by the capability of the soil microbial communities to adapt to changing conditions on very short time scales (Schmidt et al., 2007).

Soil Erosion

No action would allow any current soil erosion to decrease as vegetation returns to soils that lack plant cover. Wildfires could cause short-term increase in soil erosion. Soil erosion rates would fluctuate with natural changes in vegetation and associated ground cover.

Soil Stability

No action would not change the risk of mass failures within the project area. Most slopes are considered currently stable. Mass failures are unlikely with no management actions.

Alternative 2 and 3 – Direct/Indirect Effects

Project Design Criteria for soil resources are located in the Project Design Criteria section in the Soils Specialist Report (Project File) and in Appendix B. The PDCs will also be discussed in the upcoming effects analysis sections.

Soil Productivity

Since the 1990 Forest Plan, the level of concern for maintaining soil productivity has greatly increased. This increase has been accompanied with implementation of management practices that protect the soil. These changes include the use of excavators instead of dozers for mechanical site preparation, use of designated skid trails, operating when soils are dry or when winter conditions would protect soil productivity, harvester-forwarder systems, and use of slash layers to reduce effects on skid trails. In addition, vegetation management projects are audited for compliance with BMPs and are monitored as specified in the NEPA decision, both of which contribute to better results.

Table 6 in the Soil Resources specialist report (project file) shows the expected new and total DSCs for proposed action alternatives in this project. The final DSCs were calculated by adding existing DSCs with the new DSCs expected to result from the proposed activities. Alternatives 2 and 3 have 52 units that are expected to exceed the standard threshold of 20 percent detrimental soil conditions. There are some units in both alternatives that are small in size and may exceed the minimum acceptable soil productivity conditions by less than one half of an acre, because of the limited acreage these units are not included for rehabilitation activities based on calculations having a margin of error, and professional knowledge and experience. Soil rehabilitation activities would occur after ground-based activities are complete and the contractor would be required to decompact landings and used or old skid trails as needed to bring DSCs below 20% (Soil PDC 2). If subsoiling or ripping is not feasible then equipment would only operate on existing disturbed areas, under winter harvest conditions, with alternate harvest methods such as hand felling or using harvest-forwarder systems (Soil PDC 2). If decompacting is not feasible then equipment would only operate under winter harvest conditions (Soils PDC 2). If none of these actions are feasible, then the particular treatment area would be excluded from mechanical activities. All action alternatives will ensure that soil productivity will move toward a net improvement in soil quality. Additional protection of the soil resource would be afforded by having ground-based operations only when soils are dry, snow covered, or frozen. Grapple piling and burning generates minimal DSC and is prescribed in NCT and PCT treatments. Hand treatments would not be expected to result in any additional detrimental impacts.

All temporary roads used for this project would be hydrologically obliterated after use. Subsoiling of temporary roads may occur as a post-sale area improvement activity where conditions are appropriate. Non-system roads that are used for project activities will be returned to their pre-use condition. Rehabilitation of non-system roads used for project implementation, will be proposed for KV funding for improvement of hydraulic function, watershed condition, and soil productivity.

Several studies discuss the effectiveness of subsoiling as a soil restoration activity. Seedling survival and growth can be improved by 39 percent after decompacting soils (Froehlich and McNabb, 1983). Subsoiling restores biological processes that are reduced by soil compaction (Dick et al., 1988). In general, tilling or scarifying a compacted soil improves productivity by reducing the resistance of soil to root penetration and providing improved soil drainage and aeration to enhance seedling establishment and tree growth (Bulmer, 1998). These conditions also improve the environment for soil microorganisms. Soil restoration is not the immediate result of ripping, planting, or any other activity. The goal of soil restoration is to create favorable conditions for impaired soils to being the recovery process.

In Alternative 2, there are 21,880 acres of droughty soil types that will be treated. In Alternative 3, there are 19,298 acres of droughty soil types that will be treated. Treatment on droughty soils will help restore soil moisture and plant community ecological processes to adapt to climate change and build forest resiliency.

There are 2,113 acres of shallow soils (<25cm), considered sensitive, within Alternative 2 activity areas. In Alternative 3, there are 2,003 acres of shallow soils (<25cm), considered sensitive. Project design criteria specifies shallow soils and meadows will be avoided unless over ground/snow conditions. Shallow soils won't be used for skid trails, slash piles, or log landings unless no other location is practical and there is an existing prism, in which case ground-based equipment will remain within the existing prism as much as possible (Soil PDC 4).

There are 504 acres of clay-dominated soils in Alternative 2 activity areas and are considered a sensitive soil type. In Alternative 3, there are 462 acres of clay-dominated soils in proposed activity areas and are considered a sensitive soil type. Clay soils tend to hold onto moisture and are not appropriate for road use (Soil PDC 4). Operation on these soils will only occur during frozen ground/snow or dry conditions to mitigate compaction and rutting (Soil PDC 3 and 4).

Alternative 2 has 10,715 acres of thick ash cap soils. Alternative 3 has 9,476 acres of thick ash cap soils. These soils are characterized with low bulk density, high porosity, and high-water holding capacity. They tend to be non-cohesive and because of their relatively low strength, are highly susceptible to both vibratory and compressive compaction. Controlling compaction involves use of low impact equipment selection, use of designated skid trails, and limitation of operations to dry seasons or when the ground is frozen. Ground-based activities on ash soils will be mitigated by only operating when ground conditions are dry, frozen, or snow covered (Soil PDC 3).

Alternative 2 has 8,325 acres of soils with an excess of soil moisture either yearlong or on a seasonal basis. Alternative 3 has 7,431 acres of sensitive soils with an excess of soil moisture either yearlong or on a seasonal basis. These soils have an increased potential for compaction and deep rutting and require special design criteria. Spring and early summer harvest on these soils will be avoided, and if this is not possible, ground-based equipment will operate on a bed of slash maintained at >12 inches to mitigate compaction and rutting as much as possible (Soil PDC 5).

In Alternative 2, there are 774 acres of hydric soils, which are wetland soils formed under saturated conditions. In Alternative 3, there are 221 acres of hydric soils, which are wetland soils formed under saturated conditions. When identified during implementation, these soils would be buffered appropriately as wetlands to meet national and regional laws and regulations (see Aquatics Report).

All proposed units would leave live vegetation. Most of the living grass, forb, and shrub components would be retained in all the proposed activity areas. Many live trees would remain on all the sites.

The material that remains in all the activity areas would provide an active, microorganism-rich organic layer on the soil surface. Coarse woody debris (greater than three inches in diameter) would be retained at approximately 5 to 10 tons per acre on dry ponderosa pine sites and 7 to 15 tons per acre on mixed conifer sites (Adapted from DeBano, Neary, and Ffolliott, 1998) (Soil PDC 11). Adequate organic matter reservoirs will be retained for nutrient cycling and maintenance of long-term site productivity by minimizing disturbance and piling of decaying large woody debris during fuel treatments. Fine organic matter (commonly referred to as the duff layer) will be retained over at least 65 percent of an activity area following both harvest and post-harvest operations.

Limiting hand pile size to less than 50 square feet could reduce surface organic horizon loss and limit soil heating. Pile burning when duff is moist or wet can reduce organic matter loss and soil heating (Soil PDC 15). The amount of nutrients lost as particulate matter would be minor. Ash from burned hand piles would contain nutrients available to emergent vegetation, but no significant increases in nitrogen and phosphorus are anticipated (Seymour et al., 2005).

Under Alternative 2, there are 1,196 acres of low productivity soils not capable of producing or maintaining adequate fine organic matter if slash is removed. Under Alternative 3, there are 889 acres of low productivity soils not capable of producing or maintaining adequate fine organic matter if slash is removed. Special design criteria will mitigate potential loss of organics on these soils by ensuring fine slash is left on site (Soil PDC 16).

Because the amount of detrimental physical soil changes would be minimized and because organic matter in various forms would remain on the proposed units, the effects to soil microorganisms would be minor. Soil microorganisms are mobile. They can quickly re-colonize disturbed sites from adjacent, undisturbed sites. A variety of organic matter would remain on all sites, including living trees and other forest vegetation. In addition, the organic layer on the soil surface would be retained over at least 80 percent of the area, providing habitat and nutrients for soil microorganisms.

Soil Erosion

Displacement and erosion, the loss of topsoil, is a long-term and perhaps a permanent loss of soil productivity. However, management practices outline in the Project Design Criteria would reduce the occurrence of displacement and erosion to within the Region 6 Soil Quality Standards.

Alternative 2 and 3 treatments for each hillslope were modeled to determine potential erosion after both thinning and prescribed fire treatments. Alternative 2 mean average annual soil loss is 0.14 tons per acre (Table 86). The 30-year return period analysis estimates up to 10% probability of 0.16 tons per acre of erosion within the first year following implementation of treatments. Alternative 3 mean average annual soil loss is 0.09 tons per acre (Table 86). The 30-year return period analysis estimates up to 10% probability of 0.08 tons per acre of erosion within the first year following implementation of treatments. By way of comparison, the average annual erosion on Oregon cropland in 2015 was 1.7 tons per acre per year. A ton of soil spread across an acre would be as thick as a dime.

Erosion potential is highest within the first year following ground-disturbance, wildfire, or prescribed fire. This project will be implemented across approximately 10 to 15 years. This makes it very likely that actual erosion rates across the project area will be less than modeled.

Table 86. Potential Soil Erosion modeled in WEPP for Alternative 2 and 3

Alternative	Potential Erosion Rate (tons/acre)	Potential Total Erosion (tons)
No Action	0.0	0.0

Alternative	Potential Erosion Rate (tons/acre)	Potential Total Erosion (tons)
Alt 2	0.14	9.4
Alt 3	0.09	5.7

Sediment from the permanent transportation system has direct effects on water quality and is not a component of the soil quality assessment process. These effects are evaluated in the Water Resources Section of this EA.

Management activities that leave organic matter on the soil surface reduce soil erosion potential (Megahan, 1981; Megahan, 1986; Robichaud et al., 1993). The dominant surface erosion hazard when the forest floor has been disturbed, with ground-based activities proposed is slight to moderate. Alternative 2 has 6,944 acres and Alternative 3 has 6,173 acres of soil types (>1 acre in size) with high erosion hazard. Alternative 2 has 4,130 acres and Alternative 3 has 3,597 acres of soil types (>1 acre in size) with very high erosion hazard. Together, soils with high and very high erosion potential make up 39% of ground-based activities in Alternative 2 and 33% of ground-based activities in Alternative 3. To reduce surface erosion potential, disturbed areas within these units would be required to have a minimum of 60 to 90 percent effective ground cover following cessation of any soil-disturbing activities (R6 Soil Quality Standard) (Soil PDC 12). Any increase in overland flow from existing areas of compacted soil is likely to be buffered by existing forest floor and/or new accumulations of woody debris.

The lack of compactive forces in hand thinning activities, would not result in a significant reduction in infiltration rates over undisturbed soil. Although reductions in effective ground cover would be expected at burn pile locations, the lack of accompanying increase in overland flow and the rapid establishment of live plant cover would reduce short-term soil erosion. No long-term soil erosion is anticipated from this treatment. Soil erosion would be unlikely to occur because of the small diameter thinning treatments.

Landscape Burning

Landscape burning would leave many areas unburned, providing a buffer for any increase in overland flow. Post-fire vegetative response would be rapid, regardless of burn severity and areas that burn intensely would have sufficient organic material and vegetative response to reduce risks to soil erosion (Robichaud and Waldrop, 1994; Robichaud and Brown, 1999; Lentile et al., 2007). Soil erosion rates would decrease, as vegetation and effective ground cover are re-established. It is recommended that this project utilizes extended burn periods so that only portions of the watershed are incrementally impacted over the intended time frame. This should allow burned areas to recover and potential sediment movement or delivery to be minimal, especially if riparian buffers are maintained.

Erosion is expected from temporary roads, where native surfaces are exposed to rainfall impact and overland flow. In Alternatives 2 and 3, there are 18.5 miles of new temporary road construction and 7.9 miles of temporary roads on non-system road templates totaling 26 miles of temporary roads proposed on soils with high erosion hazard when used as native surface roads or trails. These roads would likely have short-term increases of soil erosion above 2 tons per acre per year. Erosion rates would decrease, as roads are obliterated immediately following use. All ground-disturbing activities are required to have the minimum effective ground cover after completion of activities, in order to prevent erosion from exceeding background erosion rates.

Road maintenance is planned for most open roads in the project. Maintenance will also occur on stored roads needed to access designated treatment areas. Culvert installations and replacements would cause some short-term soil erosion during the construction phase but would result in improved road drainage and a reduction of road failure risk during high flow events (Burroughs, 1989). Stump grubbing is only done in order to allow for road grading within drivable road template. It is expected to cause some short-term soil erosion, similar to road grading.

Road reconstruction activities will remain within the existing road prism. Reconstruction activities include replacement of stream crossing structures (e.g., major culverts and bridges), and realignment of less than 0.5 miles in length of existing roads where significant safety, transportation or hydrologic concerns exist. Road relocation and realignment completely removes a road from areas of concern or changes the placement to reduce or eliminate negative impacts caused by the road on the surrounding ecosystems. One road proposed for realignment is within an RHCA along a stream which is producing sediment to the stream and eroding the road template. Realignment requires removal of enough of the old road prism to allow the surface and subsurface water drainage networks to regain their natural function and pattern. Heavy equipment (dozers, compactors, graders, and excavators) are used for removal and reconstruction. Benefits of realigning a road include restored flood plain structure and function, and reduced risks of road failures from catastrophic storm events. Realignment can cause considerable disturbance to an area and short-term increased soil erosion but would result in improved road drainage and reduced road failure risk during high flow events. Techniques to help reduce negative effects to riparian areas are soil bioengineering and erosion control devices (i.e., sediment barriers, retention structures, and mulches or erosion fabrics). Long-term erosion would decrease after road realignment since the road will be moved away from Gimlet Creek and road design will be improved. Other road segments, also less than 0.5 miles in length, may be identified for re-alignment prior to project implementation, and would follow the PDCs, therefore the expected effects would be similar to those described above.

Soil Stability

A majority of the project area has high rates of slope stability and are well-suited for proposed activities. The majority of ground-based treatments are planned for areas with slopes less than 30 percent, which greatly reduces the risk of mass failures. The occurrence of any mass-failure occurring on well-suited slopes as a result of implementation of proposed actions is unlikely.

Vegetation Treatments

In Alternative 2, there are 1,651 acres of proposed treatments on slopes with increased potential for landslides or existing landslides. In Alternative 3, there are 1,511 acres of proposed treatments on slopes with increased potential for landslides or existing landslides.

The headscarp of the landslide area on the 1040 road has a moderate likelihood of slope failures following post timber harvest. The rest of this landslide was determined to be low hazard and will likely not have significant stability problems due to harvesting. The headscarp area may have minor stability problems in the dry season, but no significant reduction in stability is expected. A PDC requires that the area be monitored the first two years following a timber harvest and if it appears that landslide movement is occurring (slumping, change in slope, etc), then a field inspection should be done by a qualified professional engineer (Soil PDC 10).

Other landslide areas with low hazard level include sites along the 1042-105 road and the 1046-35 road. Normal logging practices will not significantly decrease terrain stability (See Geotechnical Engineering Report).

Other landslide areas with moderate to high hazard level include sites along the 7380 road, 1046-160 road, and the 1055-300 road. It is recommended these areas have at least a Terrain Survey Intensity Level (TSIL) - D assessment to better define recommendations. There is a high likelihood that slope failures will occur post logging especially if all trees are removed (Soil PDC 10). Due to recent landslide activity evidence and landslide mapping, the hazard area along the 7380 road has a moderate to high risk of creep, slumping and earthflows. A field inspection of these areas should be made by a qualified specialist prior to project activities in order to assess the stability of the terrain in detail, which may reduce the hazard level in some or all areas (Soil PDC 10). As a mapped landslide composed of a fine-grained sedimentary geology, RD 1046-160 has a moderate-high risk for slump or earthflows. No recent movement is visible from aerials, but field verification would be required in order to reduce the hazard level (Soil PDC 10). On the northwest slopes of RD 1055-300, there is a possibility of rockfall, but due to the unknown properties of the rock, the hazard level of high was chosen to be on the conservative side. The head of the slide is mapped on SLIDO as part of a large landslide and due to its fine-grained sedimentary geology, a moderate-high hazard level was chosen for the entire landslide. After a field investigation by a professional engineer, this hazard may be reduced (Soil PDC 10).

Road Activities

In Alternative 2 and 3, there are 4.1 miles of new temporary road construction and 1.3 miles of temporary roads on non-system road templates totaling 5.5 miles of temporary roads proposed on landslide prone areas.

The 1040 RD landslide will have no road construction near the headscarp during the wet season or near any wet areas with slopes greater than 30 degrees (Soil PDC 10). Also, the area will be monitored years following a timber harvest and if it appears that landslide movement is occurring (slumping, change in slope, etc), then a field inspection should be done by a qualified professional engineer (See Geotechnical Engineering Report).

Other landslide areas with low hazard level include sites along the 1042-105 road and the 1046-35 road. Normal road construction will not significantly decrease terrain stability. Periodic maintenance of ditches is expected due to sloughing along road cuts. It should be noted that RD 1046-35 lies within two intersecting faults. If this had been a landslide, it likely would have been triggered by a seismic activity since the area is fairly dry and has no sign of movement (Soil PDC 10).

Other landslide areas with moderate to high hazard level include sites the 7380 road, 1046-160 road, and the 1055-300 road. It is recommended these areas have at least a Terrain Survey Intensity Level (TSIL) D assessment to better define recommendations. These areas will have no new road construction during wet season or when the ground is saturated due to high likelihood of slope failures (Soil PDC 10). Due to recent landslide activity evidence and landslide mapping, the hazard area along the 7380 road has a moderate to high risk of creep, slumping and earthflows. A field inspection of these areas should be made by a qualified specialist prior to any new road construction in order to assess the stability of the terrain in detail which may reduce the hazard level in some or all areas (Soil PDC 10). As a mapped landslide composed of a fine-grained sedimentary geology, RD 1046-160 has a moderate-high risk for slump or earthflows. No recent movement is visible from aerials, but field verification would be required in order to reduce the hazard level (Soil PDC 10). On the northwest slopes of RD 1055-300, there is a possibility of rockfall, but due to the unknown properties of the rock, the hazard level of high was chosen to be on the conservative side. The head of the slide is mapped on SLIDO as part of a large landslide and due to its fine-grained sedimentary

geology, a moderate-high hazard level was chosen for the entire landslide. After a field investigation by a professional engineer, this hazard may be reduced (Soil PDC 10).

Cumulative Effects

The risk of cumulative effects was assessed within each proposed activity area. Cumulative effects consist of the impacts from all past, present, future, and proposed activities overlapping in time and space within the project area. The estimated cumulative effects for each activity area from implementation of an action alternative are displayed in Table 8 of the Soil Resources Specialist Report (project file), and summarized in Appendix A. These predicted cumulative detrimental soil condition values are based on implementation of all required Project Design Criteria (PDC). See associated PDCs for the Soil Resource in Appendix B.

Noxious Weed Management will overlap in time and space with this project, however, does not create any ground disturbance and therefore in unmeasurable. The Wildlife Enhancement Closure Area would reduce OHV and cross-country travel within the closure area for part of the year, which reduces the potential for soil impacts.

Dispersed camping occurs primarily during hunting season and can occur throughout the project area since there is currently no restriction on cross-country motorized travel. Dispersed camping could create limited areas of soil compaction and displacement but would be too limited in aerial extent to measure. The large winter and summer trailhead, Blue Springs Summit is used by motorized trail users, skiers and snowmobilers. Trail maintenance could create limited areas of soil displacement and puddling but would be too limited in aerial extent to measure, and unlikely to measurably increase in the foreseeable future.

OHV use within the project area occurs on 10 miles of trail #01972, however OHV use is permitted on most roads within the project area and cross-country. Cross-country travel and OHV could create limited areas of soil compaction, displacement and puddling but would be too limited in aerial extent to measure and unlikely to measurably increase in the foreseeable future.

Firewood cutting and Danger Tree Removal could create limited areas of soil compaction, displacement, and puddling from skidding trees and off-road wood retrieval but would be too limited in aerial extent to measure.

Road maintenance occurs only within the road prism right-of-way is not part of the productive land base, therefore soil productivity concerns are not applicable. National BMPs will be implemented to ensure erosion control measures and slope stability. Road maintenance improves long-term road drainage and sediment delivery concerns.

The Wallowa-Whitman Travel Management Plan would manage cross-country motor vehicle use and limit use to designated roads, trails, and other areas. This would allow user-created roads and trails to recover and grow back over. This would increase soil productivity and reduce soil erosion caused by ground-cover removal from cross-country travel. Additionally, there is potential for additional access for cattle into project units that were previously inaccessible, however impacts would be too limited in aerial extent to measure.

There is currently active grazing in the Alder Springs, Elmwood, Hale, North Burnt River, Snow Creek, Upper Middle Fork, West Burnt River and Whitney Range allotments. Most grazing impacts are within riparian areas and water development areas. Grazing impacts could occur within areas of riparian proposed activities; however, fencing will be used to mitigate any potential effects from

grazing. Grazing impacts near water development areas could have limited areas of compaction or trampling of soil, however the potential soil impact would be too limited in aerial extent to be counted in DSC calculations (Page 3 of Region 6 Supplement No. 2500.98-1, USDA Forest Service, 1998).

These ongoing and reasonably foreseeable activities are not expected to add to adverse cumulative watershed effects for the soil resource because of their limited aerial extent.

Table 87 display the total acres of detrimental soil conditions expected from the proposed activities. The action alternatives are designed to reduce the amount of detrimental soil conditions by implementing the project design features described in Chapter 2.

Table 87. Detrimental Soil Conditions by Alternatives

Description	Alternative 2	Alternative 3
Acres of DSC from Past Activities	3,930	3,930
Acres of DSC from Proposed Activities	2,375	2,370
Acres of Cumulative DSC	6,300	6,295

Restoration efforts would be undertaken in units where DSCs are expected to exceed 20 percent. Restoration activities to improve soil conditions would include ripping heavily used skid trails and landings. The goal would be to reduce soil compaction and meet the direction provided in Region 6 Supplement 2500-98-1. Several studies discuss the effectiveness of ripping as a soil restoration activity. Seedling survival and growth can be improved by 39 percent after tilling of compacted soils (Froehlich et al., 1983).

Subsoiling restores biological processes that are reduced by soil compaction (Dick et al., 1988). In general, tilling or scarifying a compacted soil improves productivity by reducing the resistance of soil to root penetration and providing improved soil drainage and aeration to enhance seedling establishment and tree growth (Bulmer, 1998). These conditions also improve the environment for soil microorganisms. Soil restoration is not the immediate result of ripping, planting or any other activity. The goal of soil restoration is to create favorable conditions for impaired soils to begin the recovery process.

Duration of Effects

Displacement and erosion, the loss of topsoil, is a long-term and perhaps a permanent loss of soil productivity. However, management practices outline in the Design Criteria would reduce the occurrence of displacement and erosion to within the Region 6 Soil Quality Standards and Guidelines.

Compaction may last from 10 to 70 years (Gonsior, 1983). Monitoring of 40-year old activities within this project area averaged between 3 and 15 percent DSC, indicating recovery of compacted soils has occurred.

Reductions in organic matter content reverse quickly as vegetation is established. Organic debris accumulates on the surface and roots grow and are decomposed in the soil. These organic materials break down and release nutrients and improve the quality of the soil by improving its structure and reducing compaction and other DSCs. Loss of organic matter is a short-term change lasting about 10 years once vegetation returns to the soil.

Light and moderate severity burned areas have minor effects well within the natural range of variability for wildfire. Areas burned under conditions that produce light or moderate burn severity

would vegetate quickly due to viable seeds or roots that could produce more plants and the complement of microorganisms and nutrients remaining on site (Ryan and Noste, 1985).

Changes in soil microorganisms are not permanent. Recovery would occur as soon as organic matter is present in the soil, which could be immediately after the proposed management is carried out.

Soil erosion would be controlled using erosion control measures. In addition, bare soils would naturally recover or be re-vegetated with native seed. Any erosion that occurs would be short-lived, most likely occurring during the time between the soil disturbance and the implementation of erosion control measures.

Summary of Environmental Effects

Table 88. Summary of Indicators and Measures by Alternative

Resource Element	Indicator	Measure	Alternative 1	Alternative 2	Alternative 3
Soil Productivity	Detrimental Soil Conditions	Acres of total detrimental soil conditions	3,930	6,300	6,295
	Droughty Soils	Acres of droughty soil types treated	0	21,880	19,298
Soil Erosion	Erosion Potential	Tons/acre of hillslope erosion modeled from WEPP	0	0.14	0.09
		Acres of soils with high/very high erosion potential	20,144	11,074	9,771
		Miles of temporary roads on high erosion potential soil	0	26	26
Slope Stability	Landslide Potential	Acres of slopes with high landslide potential or existing landslides	1,685	1,651	1,511
		Miles of temporary roads on slopes with high landslide potential or existing landslides	0	5	5

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and plans

The Organic Administration Act of 1897 authorizes the Secretary of Agriculture to establish regulations to govern the occupancy and use of National Forests "…to improve and protect the forest within the boundaries, or for the purposed of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States." The project would ensure continued water flows and productive lands that ensure a continuous supply of timber through implementation of BMPs and PDCs. The Bankhead-Jones Farm Tenant Act of 1937 authorizes and directs a program of land conservation and land utilization, in order to correct maladjustments in land use, and thus assist in controlling soil erosion, preserving natural resources, mitigating floods, conserving surface and subsurface moisture, protecting the watershed of navigable streams, and protecting the public lands, health, safety, and welfare. The project would comply with The Bankhead-Jones Farm Tenant Act by ensuring we are mitigating soil erosion, preserving natural resources, and conserving surface and subsurface moisture through implementation of BMPs and PDCs. The project, with described mitigations and BMPs in place, would meet the intent and direction of the Multi-Use Sustained Yield Act of 1960. Sustained yield means achieving and maintaining into perpetuity a high-level annual or regular periodic output of renewable resources without impairment of the productivity of the land.

The NFMA requires that Forest Service regulations implementing NFMA specify guidelines to ensure that timber will be harvested from NFS lands only where "soil, slope, or other watershed conditions will not be irreversibly damaged." 16 USC 1604 (g)(3)(E)(i). Region 6 Soil Quality Standards identified as FSM R-6 Supplement 2500-98-1 were set forth to meet the direction of NFMA to manage NFS lands without permanent impairment of land productivity and to maintain or improve soil quality. In addition, NFMA amends section 18 of Knutson-Vandenberg Act (KV). This amendment authorizes the use of KV funds to protect and improve the future productivity of the renewable resources of the National Forests, including soil and water. This project will prioritize KV funds for rehabilitation of temporary roads created on non-system historic road templates that are only required to be returned to existing condition after use (Soil PDC 14). The project complies with 36 CFR 219.20, which requires conservation and protection of soil and water resources. Regional guidance is available from the Region 6 FSM for Watershed Protection and Management 2500-98-1. Regional policy states:

"Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area. (This includes the permanent transportation system). In areas where less than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 20 percent. In areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality."

Invasive Species

The following summarizes the complete effects analysis for invasive species in the project file.

The potential for each of the proposed activities to increase the establishment and spread of invasive species is described using the following qualitative scale:

- NO – Project activities have no potential to introduce or spread invasive species.
- LOW – Activities identified as low would create little to no bare soils and have extremely limited potential for the introduction of invasive plant material to the project area. If left untreated, invasive species within these areas would not spread from current locations or expand from current levels at rates higher than those found in the absence of project activities.
- MODERATE – Moderate level activities are those that, with recommended mitigation could be treated and reduced to pre-project levels, but without the implementation of these measures could begin to spread beyond current levels.
- HIGH - A high level activity is one that is very likely to create opportunities for the spread and introduction of invasive species which could not be mitigated with prevention measures. To control a population of invasive species established under high intensity activities would likely require an increase in invasive treatment activities (including herbicide use) and funding in order to control the infestation.

In order to analyze the effects of project activities on the potential establishment or spread of invasive species, a qualitative estimate for the potential of the impact has been established for each action. They are based on the amount of ground disturbance proposed, the likelihood of spread of an existing site or new sites being established and the proximity of current invasive species sites. An activity with little new ground disturbance and no known invasive plants in the vicinity would be rated as having a low potential for invasive species establishment while an area that proposes large scale ground

disturbance with invasive plants nearby might be rated as a high. Likewise, if an activity would create little to no ground disturbance and there are no known invasive species infestations nearby it would be rated as a "No" potential for spread while activities that propose large scale new ground disturbance with invasive plants on site might be rated as having a high potential for spread.

Direct/Indirect Effects

Alternative 1 will have no direct effects from project activities within the project boundary. The risk of a stand replacing large-scale wildfire is increased due to increased fuel loading, and the potential for invasive species spread and establishment would increase beyond the rate found naturally. This effect, plus continuing risks from other types of activities occurring in the analysis area, would favor the expansion of invasive species within the project area to levels beyond that found without large-scale wildfire activity.

Table 89. Estimated comparison of environmental effects to invasive plants

Estimated Effect1	Alt. 1 No-Action	Alt. 2 Proposed Action	Alt. 3 No RHCA Veg. Trt.
Potential to establish	4	3	2
Potential to spread	4	3	2

1. Estimated effect is based on increases (from pre-project levels) in establishment and spread of invasive species due to project level activities or their lack under alternative 1. Higher number equates to higher risk but is only used for comparison between alternatives and is not an estimate of the intensity of the effect.

Although risks are present with or without project activities, the danger of invasive species establishment due to project activities under Alternatives 2 and 3 is increased (although slightly lower under Alternative 3). However, the potential to spread invasive species under either of the action alternatives is likely less than under the no action. This is due in large part to the reduction in wildfire risk associated with the action alternatives (slightly more risk under Alternative 3 due to a smaller reduction in overall fuel loading). With implementation of project design features to reduce and control the introduction and spread of invasive species we can minimize the impacts that do exist. Specific mitigations and required standards would continue to reduce the chances of new introductions, spread, and establishment of invasive plants and we could predict a spread and establishment rate at the natural level for either of the action alternatives

Cumulative Effects – Alternative 2

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Generally, the risk of large-scale wildfire combined with unregulated travel, road use, private land activities, and grazing has the greatest chance for cumulative effects on invasive plants within the watershed area. However, predicting wildfire occurrence is problematic. Large-scale and intense wildfire disturbance would create ideal areas for the introduction and spread of invasive plants. With increasing numbers of wildfires, the numbers of invasive species could increase (Merriam, et al., 2006), with the largest increases found in those areas with pre-existing invasive plant populations. One benefit of this project is the decrease of current fuel loading and therefore the risks of uncontrolled wildfire, so future large-scale burns should be reduced. This reduction may further decrease the risk for areas outside of the treatment area boundaries (Merriam, et al., 2006).

Of the activities with predictable timetables, the effects of activities of this alternative (increased risk of ground disturbance, transportation of invasive plant materials, and reduction in competition) coupled with road maintenance, private land activities, and grazing have the highest possibility of detrimental cumulative effects within the watershed. Roads are a vector of weed spread and transport,

thus unregulated road use, construction of temporary roads, and re-opening of previously closed roads increases this risk. Travel management decisions (expected in the future on this forest) should reduce this risk by ending unregulated road use and cross-country vehicle traffic. Further, the immediate closure and restoration of temporary and closed roads after project use will reduce the risk to invasive species. Grazing could also increase the risk of spread and introduction of invasive species. Livestock are vectors of plant material and can transport seeds and other plant reproductive material over many miles. Another unknown factor is the large amount of disconnected private land holdings inside the project area boundary. The invasive plant management practices on these lands is outside the knowledge and authority of the USFS.

Resource Indicator and Measure 1- Potential to establish

Ground disturbance that would occur in concert with that resulting from project activities would be caused by grazing, OHV travel, irrigation ditch maintenance, road maintenance, and unknown activities on private land. The combined effects of these areas of ground disturbance would have a **Moderate** cumulative effect over the effected watershed being considered. Active invasive plant monitoring and treatment would mitigate these effects on USFS land. Private land invasive plant management within the area being considered is unknown.

Resource Indicator and Measure 2 – Potential to spread

The existence of invasive plant sites in the area of analysis combined with human, machinery, and animal movement are means of the potential for the spread of invasive plants due to project activities. Grazing, OHV travel, road travel and maintenance, and travel through private land are factors contributing to these phenomena. In addition, invasive plant spread into RHCAs compounds their spread by facilitating the dispersion of seed downstream through water movement.

Table 90. Resource indicators and measures for alternatives 2 and 3 cumulative effects

Resource Element	Resource Indicator	Measure /Project	Alternatives 2 and 3 Cumulative Effects
Invasive seed source	potential to spread (decreased)	Noxious Weed Management	Reduces the extent and amount of invasive plant sites throughout the project area through on-going treatments of existing invasive populations.
Ground disturbance, movement, and introduction of invasive plant material	potential to establish and spread	Recreation – OHV Use	Unregulated use of off highway vehicles poses a risk to the establishment and spread of invasive species due to the movement of plant material on equipment and the ability to introduce these materials to random areas that are difficult to identify for treatment. Re-opening roads and opening up stands with fuel reduction treatments in the Patrick project increases the potential for introduction and spread of invasive plant material.

Resource Element	Resource Indicator	Measure /Project	Alternatives 2 and 3 Cumulative Effects
Decreased ground disturbance, movement, and introduction of invasive plant material	potential to establish and spread (decreased)	Roads & Trails – Travel Management Plan	Designating roads, trails and areas has the potential improve the compliance with the Patrick post-sale road management plan because use will only be allowed on designated roads and trails. Limiting this use will minimize the potential introduction and spread of noxious weeds.
Ground disturbance or transportation of non-native plant material	potential to establish and spread	Special Uses - Irrigation Ditches	Maintenance and repair of most Special use facilities can create situations that favor the establishment and spread of invasive plants by disturbing ground and carrying seeds to un-infested areas. Regional standards along with noxious weed requirements which are part of the special use permits would help to reduce the risk of this potential effect. Patrick project activities overlap many of these sites and would increase the potential for spread of invasive species.
Ground disturbance or transportation of non-native plant material	potential to establish and spread	Grazing Allotments	Cattle are vectors for invasive plant seeds. Opening up the forest with fuel reduction practices along with creating seed beds through ground disturbance increases the potential for cattle to transport noxious weed seeds into new areas and increase spread
Equipment and materials travelling on road systems shared by project	potential to establish and spread	Private Land Activities	Potential for weed seeds to be carried from private land which may not have an active invasive plant management program to locations that intersect with project activities

Cumulative Effects – Alternative 3

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

The cumulative effects of project activities under alternative 3 will occur in a similar fashion to alternative 2. However, since there is less treatment proposed there should be a reduced risk of cumulative effects. The reduced risk to invasive non-native species is only due to the reduction in disturbance and introduction events that are expected with the elimination of RHCA vegetation treatment activities.

Resource Indicator and Measure 1- Potential to establish

The cumulative effects on the potential to establish for this alternative are estimated to be less than those in alternative 2 due to the decrease in the correlated acres of ground disturbance.

Resource Indicator and Measure 2 – Potential to spread

The potential to spread is estimated to be less due to the lack of entry into RHCAs to perform vegetation treatments. The elimination of these treatments would mitigate the compounded potential to spread by the dispersion of seed through downstream water movement. However, the inclusion of prescribed burn activities in this alternative would cause some potential for spread into RHCAs.

Table 91. Resource indicators and measures for alternative 3 direct/indirect effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2 Direct/Indirect Effects
Ground disturbance	potential to establish	21,614 acres of ground-based logging	Moderate
Ground disturbance	potential to establish	43 miles temporary roads 0.5 miles draw bottom road relocated.	Moderate
Invasive seed source	potential to spread	1100 acres of invasive plant inventory in project area	Moderate
Ground disturbance	potential to establish	8,802 acres of mechanical treatments	Moderate
Ground disturbance/ competition disruption	potential to establish	36,032 acres of prescribed burning	Moderate
Ground disturbance	potential to establish	Amount of piles/acres associated with 8,802 acres thinning plus 21,614 acres harvest	Moderate

Table 92. Summary comparison of proposed activities and resultant environmental effects to invasive plants

Resource Element	Indicator/Measure	Alt 1	Alt 2	Alt 3
Potential to establish	Acres of ground-based logging	No logging would take place. MODERATE EFFECT– related to fuel loading risk vs. maturing seral stage of stand	21,879 acres MODERATE EFFECT	21,614 acres MODERATE EFFECT – slightly less than alt 2
Potential to establish	Miles of temporary roads	No temporary roads would be built. Draw bottom road would not be relocated. NO EFFECT	43 miles temporary roads 0.5 miles draw bottom road relocated MODERATE EFFECT	43 miles temporary roads 0.5 miles draw bottom road relocated MODERATE EFFECT

Resource Element	Indicator/Measure	Alt 1	Alt 2	Alt 3
Potential to spread	Acres of invasive plant inventory in unit	1100 acres of invasive plants exist in units. These would be treated systematically and reduced over time until natural wildfire comes through. MODERATE EFFECT	1100 acres MODERATE EFFECT	1100 acres MODERATE EFFECT
Potential to establish	Acres of mechanical non-commercial thinning treatments	No mechanical non-commercial thinning treatment would take place. HIGH EFFECT – related to fuel loading	8,802 acres MODERATE EFFECT	8,802 acres MODERATE EFFECT
Potential to establish	Acres of prescribed burning	No prescribed burning would take place. HIGH – related to fuel loading	36,032 acres MODERATE EFFECT	36,032 acres MODERATE EFFECT
Potential to establish	Acres of grapple/landing pile burning	No pile burning would take place. NO EFFECT	Amount of piles/acres associated with 8,802 acres thinning plus 21,879 acres harvest MODERATE EFFECT	Amount of piles/acres associated with 8,802 acres thinning plus 21,614 acres harvest MODERATE EFFECT– slightly less than alt 2

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

The Forest Plan (as amended by the 2005 Region 6 ROD, amendment RF #5) provides direction for the control of noxious weeds and other competing vegetation where such activities are not precluded by management area direction. The goals focus on maintaining or enhancing ecosystem function to provide for long-term integrity and productivity of biological communities, treatment of priority infestations, and monitoring the effects of all activities to reduce the impacts of invasive plants. The site-specific treatment requirements are further amended by the Wallowa-Whitman National Forest Invasive Plant Treatment Program EIS (USDA, 2010). The Patrick Project is consistent with these goals through adherence to the EIS and the Forest Plan.

Range

Existing Condition

The Patrick Project Analysis area is approximately 48,794 acres and includes the following Range allotments: Camp Creek, Alder Springs, Snow Creek, North Burnt River, Elmwood, Hale, Whitney, Cree, and West Burnt River allotments on the Wallowa-Whitman National Forest Whitman Ranger District. Table 93 describes the total acres of lands within each allotment in the project area, the current management, and the grazing system of each allotment.

Table 93. Allotments within Patrick Vegetation Project

Allotment Name	National Forest Acres	Acres within Project Area	Percent Allotment Acres in Project Area	Livestock Numbers (Cow/Calf)	Type of Permit	Season of Use/Grazing Strategy
Alder Springs	22,448	3,124	14%	357	Term	6/1-10/15/Rotation
Camp Creek	23,757	15,200	64%	0	Vacant	-
Cree	579	9.9	1%	4	Term On/Off	5/1-10/20/Season Long
Elmwood	685	155	23%	4	Term On/Off	6/1-10/31/Season Long
Hale	1,223	459	38%	8	Term On/Off	6/1-10/31/Season Long
North Burnt River	19,151	15,061	79%	53	Temporary	6/1-9/30/Deferred
Snow Creek	17,464	12,810	73%	259	Term	6/15-9/30/Rotation
West Burnt River	13,517	940	7%	191	Term	6/1-9/30/Rotation
Whitney	805	479	68%	4	Term On/Off	5/15-10/31/Season Long

The following activities associated with the Patrick project are of such limited and constrained nature that they would have no effect on rangeland resources or range management activities: snag retention, fuelwood removal, road reconstruction/maintenance, jackpot burning, roadside hazard tree removal, and aspen restoration treatment.

Table 94. Summary of Effects to Rangeland Resources by Alternatives

Est. Effect*/Rationale	No-Action	Alt. 2	Alt. 3
Modification to Annual Grazing Management	-	+	+
Forage Availability	-	+	+
Livestock Distribution	-	+	+
Range Improvements	-	0	0

1. Effect intensity: 0 designates no change from current, - designates potential adverse effect, + designates potential beneficial affect

Alternative 1

Direct/Indirect Effects

Benefits to rangeland condition, livestock distribution, and forage available would not occur because no project activities would occur. Further canopy closure and decreases in forage availability would continue and potential changes in livestock distribution through reductions in suitable rangelands

would continue. Damage to range improvements would not occur as project activities will not be authorized.

This alternative would produce and propagate a forest condition that has a large amount of natural fuels. High levels of natural fuels could result in large catastrophic fires burning the landscape. Wildfires would likely be more damaging to the forage base that supports livestock grazing in the short term than prescribed fire because fire intensities would likely cause mortality in desirable forage plants.

Alternative 2 and 3

Direct/Indirect Effects

Direct and indirect effects on rangeland resources do not significantly vary other than acres treated. The resulting reduction in canopy closure following treatment within each unit would allow an increase in herbaceous and shrubby vegetation for 10-20 years until tree regeneration converts treated stands back to a closed canopy arrangement. Follow-up maintenance burns would retard this process and allow for improved forage availability for wildlife and domestic ungulates (cattle). These treatment acres would show an increase in understory vegetation following completion, providing additional forage resources for wildlife and permitted livestock.

The thinning activities in Alternatives 2 and 3 would reduce canopy cover and potentially increase understory vegetation growth. This increase in the understory vegetation would convert unsuitable rangelands (those currently not available for forage utilization due to dense canopy cover or lack of understory vegetation) to suitable rangelands. The reduction in canopy cover would reduce competition for resources to the understory and over the mid to long term (4-20 years) would create a general shift in the plant association seral stage from late to early and increase above ground biomass of the understory (Reigel et al. 1992), thus increasing available forage.

Cumulative Effects

Treatment under project activities would likely benefit rangeland resources and grazing activities. Since major threat of negative effects to these resources is wildfire, the reduction in fine and ladder fuels should help reduce the risk of impacts. Project activities should reduce the risk of reductions in livestock grazing by reducing the risks of uncontrolled wildfire.

The only reasonably foreseeable future action which would overlap in time and space within this project area which may have potential to have long-term affect to rangeland resources is Noxious Weed treatment. This project focuses on invasive non-native vegetation treatment to reduce impacts to native vegetation and soil resources. Reducing or preventing establishment of invasive species will allow native plants to maintain dominance, providing forage for native species, cover for migratory birds and small mammals, and protect soil from surface erosion.

No other present or reasonably foreseeable future activities would overlap in time and space with the project area, nor would they have a measurable cumulative effect on rangeland resources.

Consistency with Laws and Policy

Alternatives 1, 2, and 3 would be consistent with the Wallowa-Whitman Land and Resource Management Plan, all range standards and guidelines would be met (WWNF Forest Plan, 4-51 to 4-54).

Rangeland resources and the Patrick project meet these condition requirements through enforcement of all utilization measures as outlined in the Forest Plan and all amendments, as well as the range mitigation and monitoring measures prescribed for the Patrick project. Enforcement and administration of Forest Plan standards are achieved through allotment management plans and annual operation instructions that outline required actions of grazing permittees.

Wilderness, IRAs, and Undeveloped Areas

From the mid-1970s through 2001 the Forest Service maintained a roadless area inventory of undeveloped lands that was used and updated for RARE, RARE II, and in support of Land and Resource Management Planning completed in 1990. During that time, these lands were called "roadless areas" or "inventoried roadless areas" (IRA). With completion of the Roadless Area Conservation Rule (RACR) in 2001, these lands ceased being an "inventory", and IRAs became a designation with fixed boundaries and prohibitions set by that rule and Forest Service regulation (36 CFR 294).

The 2006 handbook for wilderness evaluation (FSH 1909.12 Chapter 70) is reflected in the 2008 Forest Service NEPA regulations (36 CFR 220). In the regulations, potential effects to "inventoried roadless areas" and "potential wilderness areas" are factors in determining what the appropriate NEPA document would be for a project.

The 2012 planning rule for land management planning for the National Forest System became effective 30 days following the publication date on May 9, 2012. The Forest Service released proposed planning directives for public review and comment in February 2013. Over 16,000 comments representing diverse communities and interests from across the country shaped the final planning directives. The final planning directives were released and became effective January 30, 2015. The planning rule is very clear that application of the criteria for inventory of areas that may be suitable for inclusion in the National Wilderness Preservation system (FSH 1909.12, Chapter 70) is at the land management planning (Forest Plan) level only.

The term "other undeveloped lands" is presented and used in this document to provide a consideration for the unroaded areas identified during public scoping efforts.

Existing Condition

Wilderness and Inventoried Roadless Areas

The USDA Forest Service, Pacific Northwest Region (PNW or Region 6) covers approximately 27.2 million acres within the states of Oregon and Washington. These acres represent approximately 27% of the total acreage of both states combined. These 27.2 million acres are managed based on the land allocations designated within the respective National Forest Land and Resource Management Plans. However, the management of designated Wilderness areas and the management of Inventoried Roadless Areas are overriding and common among all Forests within the Pacific Northwest Region and across the nation. In Region 6, there are approximately 4 million acres of Inventoried Roadless Areas (15% of the total National Forest System Lands) and approximately 5 million acres of Wilderness (18%).

There are no inventoried roadless areas or wilderness areas within the Patrick project area.

Preliminary Administratively Recommended Wilderness Area

The Blue Mountains Forest Plan Revision (BMFPR) completed an extensive analysis of lands that could be considered for preliminary administratively recommended wilderness areas (PARWA).

There are no PARWAs in the Patrick project area.

Other Undeveloped Lands

Oregon Wild provided a map identifying the Czar Springs Unroaded Area and requested that commercial logging and roads be excluded from the area. The Forest Service is proposing a mixture of commercial thinning, non-commercial thinning, and prescribed burning within this area.

This identified area, approximately 1500 acres, includes closed system roads and user created roads, as well as acres of previous harvest. The area includes portions of land that border Maintenance Level 3 (ML3 – passable to passenger vehicles) FS Road 507 and wildland urban interface areas.

Opportunities for Solitude

The identified undeveloped area has some opportunities for solitude, but not a large number. The area is bordered by forest roads on all sides which provides easy access for visitors wanting to visit the forest

Apparent Naturalness

Apparent naturalness is reduced by past management activities and areas with visible roadbeds. Vegetation in the undeveloped area is not unique or unusual with a portion of the area being covered by grass and brush.

Scale of Analysis

The scale of this analysis includes all Federal land contained within the Patrick Vegetation Management project area (48,793 acres).

The measures used to compare between alternatives for undeveloped lands are:

- Intrinsic biophysical values (soils, water, fisheries, plants, wildlife)
- Intrinsic social values (recreation, apparent naturalness, remoteness, scenic quality, cultural resources)

No Direct/Indirect or Cumulative Effects

Wilderness and Inventoried Roadless Areas

There are no Wilderness or Inventoried Roadless Areas within the project area and no project activities are proposed in Wilderness or IRAs. The proposed project would have no direct, indirect or cumulative effects on designated Wilderness areas or IRAs; therefore, there would be no further discussion on designated wilderness or inventoried roadless areas in this report.

Potential Administratively Recommended Wilderness Areas

As described above, all of the BMFPR PARWAs are outside of the project area. Therefore, the proposed project would have no direct, indirect or cumulative effects on any BMFPR PARWAs.

Direct and Indirect Effects on Other Undeveloped Lands

Alternative 1

The entire undeveloped area would remain as described in the existing conditions of this document. There would be no direct or indirect effects on this area.

Alternatives 2 and 3

Both action alternatives are basically the same and involve the same activities of commercial and non-commercial thinning and prescribed burning. The major difference is that Alternative 3 has no thinning activities within Riparian Habitat Conservation Areas (RHCA).

Opportunities for Solitude

As described in the existing conditions, opportunities for solitude are limited within the identified area due to the proximity to roads. Proposed commercial and noncommercial thinning, and prescribed burning within the identified area would affect the remaining opportunities for solitude only in the short term.

Apparent Naturalness

In this area of the forest, fire is a natural, periodic occurrence and prescribed burning within this area would not affect its apparent naturalness. Commercial and noncommercial treatments of the undeveloped lands in the area would mostly consist of thinning from below, which is an intermediate treatment to reduce stand density. This would allow larger trees to dominate the landscape.

Cumulative Effects on Undeveloped Lands

Alternative 1

Under this alternative no actions would be authorized; therefore, it would not add anything to the effects of past, present, or reasonably foreseeable future actions. Based on the definition provided by the CEQ regulations, there would be no cumulative effects for this alternative.

Alternatives 2 and 3

The most noticeable impacts to opportunities for solitude and apparent naturalness are current existing use. Existing recreation use in the area ranges from dispersed camping and OHV activities to using roads to access the area for a variety of activities. Since the impact from the proposed activities under the action alternatives would be limited in scope and time, there would be no cumulative effects on recreation use in the project area.

Forest Plan Consistency

Activities proposed in the Patrick project area are consistent with the intent of the land allocation decisions made in the Forest Plan including wilderness and inventoried roadless areas.

Recreation and Visuals

Affected Environment

Recreation

Visitors to the Patrick Project area enjoy a variety of recreation activities. These include dispersed camping, hiking, backpacking, driving for pleasure, OHV riding, fishing, hunting, gathering forest products and motorized winter sports.

The primary issue of concern for recreation is impacts to users of Off-Highway Vehicle trail #1972 that passes through the northeast and southeast portion of the project area. In addition, Antlers Guard Station, a Forest Service recreation rental cabin, is within the project area. Both recreation sites, the cabin and the OHV trail, will need to be protected from impacts of the proposed activities. Dispersed camping occurs throughout the project area and dispersed camping areas will need to be protected also.

Recreation Opportunity Spectrum (ROS)

The Forest Service uses the Recreation Opportunity Spectrum (ROS) to classify and describe the range of recreation opportunities available based on the physical setting, social setting and managerial setting of an area. The recreational settings are described on a continuum ranging from Primitive to Urban (ROS Users Guide, USDA 1986)[3]. The project area falls within the Roaded Natural (45,023 acres) and Roaded Modified (3,729 acres) classes.

The LRMP states: "Provide a full range of recreation opportunities, except Urban, as described in the Recreation Opportunity Spectrum (ROS) and outlined in the National Recreation Strategy." (LRMP 4-38).

Direction for management of the Roaded Natural in Table 95 below. Roaded Modified is a subset of the Roaded Natural class, with the majority of the same management direction

Table 95. Direction for management of the Roaded Natural

	Environmental Modification	Recreational Experiences
Roaded Natural	Site modification moderate. Facilities about equal for protection of site and comfort of users. Contemporary/rustic design of improvements is usually based on use of native material. Inconspicuous vehicular traffic controls usually provided. Roads may be hard surfaced, and trails formalized. Development density about 3 family units per acre. Primary access may be over high standard roads. Interpretive services informal, but generally direct.	Forest environment is essentially natural. Important that a degree of solitude is combined with some opportunity to socialize with others. Controls and regimentation provided for safety and well-being of user are sufficiently obvious to afford a sense of security, but subtle enough to leave the taste of adventure.

Special Uses

There are currently two Special Use Authorizations issued within the Patrick Project area. One is for a power line and one is for a telephone line. The telephone line covers approximately 0.4 acre of pre-commercial thinning activities in the western portion of the project area. The power line covers approximately 72 acres of various treatment areas including pre-commercial thinning and prescription burning along Road 1055.

Visuals

The project area includes various visual quality objectives (VQOs). These include Modification, Maximum Modification, Partial Retention and Retention.

Table 96. Visual Quality Objectives across the Patrick Project

Visual Quality Objective	Number of Acres	% of total project area
Retention	2,652	5%
Partial Retention	28,390	58%
Modification	16,295	33%
Maximum Modification	1,417	3%

As Table 96 shows, the majority of the project area is in the VQO of Partial Retention. This means that management activities are visually subordinate to the characteristic visual landscape. The VQO of Modification allows management activities that may visually dominate the original characteristic visual landscape. Modification and Partial Retention represent over 90% of the project area. Retention allows management activities that are not visually evident and Maximum Modification allows vegetation and land form altering management activities that dominate the characteristic visual landscape in the foreground and middle ground, but which have the same visual characteristics as the surrounding area when see as background.

The landscape across this project area is varied. Slopes are covered with a mosaic of coniferous forests and grassy slopes. Western Larch provides fall color, amidst an understory of grasses and shrubs. Riparian areas support deciduous trees and shrubs that provide diverse fall color and textual diversity, as well as shade for recreation sites.

Since the proposed action, includes activities across every acre of the project area, the area roads provide varying degrees of visibility of these proposed activities. The majority of the project area falls within the VQO of Partial Retention, which means that people can perceive that areas of landscape have been slightly altered.

Direct and Indirect Effects

Alternative 1 – No Action

Under this alternative, existing recreation use would continue at the current levels. Dispersed camping spots would continue to be used and those within riparian areas would continue to impact those areas. Users of the Antlers Guard Station, OHV trail #1972 and dispersed recreationists would not be exposed to the results of management activities including smoke, noise and blackened terrain. Since trees would not be removed, opportunities for vistas from the guard station and OHV trail would be reduced as trees continue to grow.

The risk of severe wildfire would remain. This may result in indirect effects to recreation resources, potentially resulting in changes to the recreation setting or scenic quality of the project area. These impacts could include closures, lost recreation opportunities, and changes in access due to hazards such as snags, brush, and fallen trees.

Direct and Indirect Effects

Alternatives 2 and 3

The specific project activities with potential to impact recreation are common to both of the action alternatives.

During proposed management activities trucks and other equipment would be utilizing public travel routes. These additional vehicles have the potential to increase traffic congestion and negatively affect the driving experience of road users.

In the long-term, the project would improve the overall health of the forest and thereby improve recreation opportunities into the future. People familiar with the area, especially those who return each year (such as hunters) would be most aware of any limitations to recreation activities during project implementation. New or occasional visitors would be less aware of changes. Design features would reduce the short-term effects on recreation.

A short-term direct effect during project management activities would be temporary Forest Closures implemented to protect the public from safety hazards associated with tree removal and operation of mechanical equipment. These closures would reduce the public's opportunity to access areas of public land for dispersed recreation for periods ranging from one to six weeks. Advance signage and public outreach would notify as many people as practical of proposed closure periods ahead of time, allowing them to make alternate recreation access plans. Specific measures would include notification at least two weeks prior to start of activities. Notification would be posted on the WWNF's social media pages and website and signs posted on bulletin boards in the project area. OHV trail #1972 passes through the project area to the northeast and the southeast. In the northeast corner, the location of the trail is partially coincident to an identified Defensible Fuel Profile Zone (DFPZ). Where the trail co-exists with the location of the DFPZ, the trail bed would return to usable condition following any activity and would generally be consistent with the trail's pre-project appearance.

The vast majority of this project is in the VQO of Roaded Modified. The forest's LRMP states that for Roaded Modified, timber harvest is dominant, but blended into the surrounding terrain. It also states that prescriptions for harvest, slash cleanup, and other silvicultural practices will consider the environmental setting and recreational attractions. With the measures identified below in the visuals section, the project will meet the standards identified in the LRMP for Roaded Modified and Roaded Natural.

Hand Thinning/Non-Commercial Thinning

Direct effects to recreation from thinning activities may include noise from operation equipment, increased traffic and dust. The project area is distributed across the landscape. Because of this, impacts to visitors' opportunities for camping, hunting, hiking, driving for pleasure, sightseeing, OHV/OSV use, or forest products gathering are expected to be minimal. It is unlikely that a visitor who has been temporarily displaced would be unable to find another suitable dispersed recreation opportunity within a short distance.

Indirect effects to recreation could result from changes to the scenery following the thinning activities. Thinning could create favorable conditions for some recreation activities such as hunting or unfavorable conditions for other recreation activities such as dispersed camping and hiking.

Prescribed Burning

The direct impacts to recreation and quality of the recreation experience from prescribed burning activities, would be the sights and sounds of people and equipment, including chainsaws and vehicles, and smoke in the air. However, after Labor Day, forest visitor use is reduced. Hunters may be temporarily displaced by this impact but many alternative locations are available nearby. These impacts would mostly be in the short-term, while the activity is occurring.

Other short-term impacts would be smoke in the air, which will temporarily reduce air quality and visibility. In addition, some forest roads may be impacted by smoke and this could affect driving conditions and opportunities. Prescribed burning activities would create blackened areas on the landscape. These effects would be short term.

Visuals

Direct effects to visuals would be minimal, as the majority of the project area is under Partial Retention and Modification. Areas of Partial Retention should be areas where the management activities remain visually subordinate to the characteristic landscape, while areas of Modification should be areas where the landscape appears moderately altered.

Highway 7 runs through the project area in an east to west direction. Activities that occur along the highway need to meet the VQO of Retention which means that any harvest or burning activities need to leave the foreground (100 feet) unnoticeably altered.

Cumulative Effects (Alts 2 and 3)

The Project area has a long history of vegetation management projects. However, impacts from these previous activities do not have any residual effects on current recreation activities or scenic quality. Other than this project, there are no other on-going or future activities that will occur in the project area that will impact recreation or visuals.

Minerals

Existing Condition

The Patrick project area is on the westernmost portion of the mineralized area. According to the BLM's Legacy Rehost System LR2000, there are currently 295 claims within the project area. 172 are lode claims and 123 are placer claims. 26 claims have a Notice of Intent or a Plan of Operations pursuant to 36 CFR 228.4.

Resource Effects Measurement Indicators

There are no qualitative measurement indicators for mining. The only information that the Forest Service has is where active claims are located and the submitted PoOs or Notices of Intent (NOI). There are numerous claims across the forest and approximately 30% are inspected annually for compliance due to potential impacts associated with the level of work performed.

Since miners are not required to report recoveries to the Forest Service nor the ultimate disposition of their findings, it is not possible to estimate quantities of gold and other precious metals that are recovered on a yearly basis. Therefore, direct income and rare earth material volumes realized by mining activities is unknown.

Effects Analysis

Alternative 1

There would be no effects to mining operations under Alternative 1 because none of the Patrick proposed activities would occur.

Alternatives 2 and 3

Direct and Indirect Effects

The effects to mining operations from the proposed activities would generally be the same under Alternatives 2 and 3, but less acres would be impacted under Alternative 3 because no harvest or thinning activities would occur in the RHCAs. Direct effects to mining operations may include impact to surface resources such as a reduction in soil productivity and establishment of invasive species when logging operations occur. Safety conflicts may result when mining activities are concurrent with logging operations. Hauling conflicts could occur on roads used for mining access since mining is prevalent between June and October, coinciding with timber harvest work windows.

Previously reclaimed areas on the mining claims may also be impacted by logging operations, similarly to those described above. Miners under Plans of Operation will have procured a bond for reclamation and if the reclamation is incomplete, then the bond is utilized for agency administered reclamation. Reclaimed mining areas that are returned to general forest use and production utilizing best management practices may impact public perception regarding multiple use practices when subsequent logging impacts occur in restored mining areas.

Cumulative Effects

The surface resources may be dually affected by mining and logging in the same area. Soil productivity may be reduced, and invasive species can establish in mining areas because of ground disturbances. Logging equipment may potentially spread invasive species previously introduced by mining equipment or activities, however, practices to prevent the spread of invasive species during project activities will be followed during project implementation. These areas are likely less than 20 acres per claim on potentially 26 claims. Upon completion of the 26 operations with authorized Plans of Operations, the totality of potentially affected mining reclamation areas would be 520 acres where overlapping logging activities may occur.

Cultural Resources

Introduction

This section covers the existing condition and effects of implementation on cultural resources. Reports and analyses are in the Forest's cultural resource files.

Affected Environment

Prehistory

American Indian use in the project area included a seasonal round of hunting, fishing, and gathering. Deer, elk and other big game were hunted and continue to be a significant source of meat for tribal members today. Fishing took place in streams and rivers and continues to occur. Plants were, and are, gathered within the region by tribal members. Important vegetation of the Blue Mountain Province of the Columbian Basin physiographic area includes trees (ponderosa pine, grand fir, Douglas fir, and

western larch), grasses and shrubs (bluebunch wheatgrass, Idaho fescue, and bitterbrush), berries (strawberry, serviceberry, gooseberry, huckleberry, current, and chokecherry), and roots (camas, cous biscuitroot, bitterroot, wild carrot, and wild onion).

Prehistoric and historic American Indian cultural resource site types may include lithic scatters (chipped stone artifacts), resource utilization areas such as tool stone quarries and plant processing sites, seasonal camps such as small habitation areas or large villages, and special places. Special places may consist of sites and places that are valued for cultural, religious, or traditional importance (for example, traditional food locations such as berry areas, root gathering areas, medicinal plant grounds, and collection areas for materials for utilitarian and ceremonial craft production, as well as usual and customary hunting and fishing locations). Artifacts may include obsidian, chert, or basalt projectile points, knives, scrapers, burins, bifaces, utilized flakes, and debitage. Bone tools, stone cobble tools, mortars and pestles, net sinkers, beads, and metal objects such as those relating to firearms may also be included in artifact assemblages.

History

Trappers and Protestant and Catholic missionaries began to arrive in the area in the early 1800s. In 1855, treaties were formed with the Cayuse, Umatilla, Walla Walla, and Nez Perce Tribes. The Forest Service, through the Secretary of Agriculture, is vested with statutory authority and responsibility for managing resources of the National Forests. Commensurate with the authority and responsibility to manage is the obligation to consult, cooperate, and coordinate with Indian tribes in developing and planning management decisions regarding resources on NFS lands that may affect tribal rights. The Patrick project planning area is within the interest areas of the Nez Perce Tribe and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR).

Persons who traveled to the Willamette Valley often passed through northeastern Oregon on the Oregon Trail. Settlements were not established in the area until the 1860s, at the same time gold began to be discovered. Gold mining created the need for new and larger settlements, such as Baker City to the northeast of the project area, and John Day, to the southwest. Gold camps stimulated the economy through their demand for food, living supplies, and mining equipment. The need for food brought ranchers to the area. Once the railroad reached the region, the lumber market grew. By the 1880s, lumber began to be shipped to distant markets. The town of Whitney, in the project vicinity, was a lumber town that was established along the Sumpter Valley Railroad in the early 1900s. Government administration by the Forest Service began in the area and is evidenced by the presence of structures such Antlers Guard Station.

Historic cultural resources include remains and records of the past that are at least 50 years old and that may be diagnostic of historic groups such as American Indians, European-Americans, or Chinese people. Cultural materials or locations show occupation and resource utilization of the Plateau region of the interior northwest. Sites may include campsites, trash dumps, log cabins, building complexes, mines, ditches, and railroads, and are most often related to homesteading, timber harvest, or mining activities. Artifacts may include notched logs or cut lumber, tin cans, bottles and jars, ceramics, and metal items such as tools.

Tribal Interest

Elements of respective American Indian cultures, such as tribal welfare, land, and resources, were sometimes entrusted to the United States government as a result of treaties. Trust responsibilities resulting from treaties dictate, in part, that the United States government facilitates the execution of

treaty rights and traditional cultural practices of American Indians by working with them on a government-to- government basis in a manner that attempts a reasonable accommodation of their needs without compromising the legal positions of the respective tribes or the federal government. Specific treaty rights applicable to the land base managed by the Wallowa-Whitman National Forest are generally articulated in Article III of the 1855 Nez Perce Treaty:

"The exclusive right of taking fish in all the streams where running through or bordering said reservation is further secured to said Indians: as also the right of taking fish at all usual and accustomed places in common with citizens of the territory, and of erecting temporary buildings for curing, together with the privilege or hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land."

And as part of Article I of the 1855 Walla Walla, Cayuse, and Umatilla Treaty:

"Provided, also, That the exclusive right of taking fish in the streams running through and bordering said reservation is hereby secured to said Indians, and at all other usual and accustomed stations in common with citizens of the United states, and of erecting suitable buildings for curing the same; the privilege of hunting, gathering roots and berries and pasturing their stock on unclaimed lands in common with citizens, is also secured to them."

Effects Analysis

The Patrick cultural resources analysis area encompasses the entire project area, which is also the Area of Potential Effect.

Identification of Cultural Resources

As prescribed by Forest Service and other federal guidelines, a cultural resource inventory was conducted in the project area. A literature review was completed, and survey was conducted during the 2017 through 2019 field seasons by Forest Service archaeologists and Eastern Oregon University. The Forest's Survey Inventory Probability System was utilized to designate areas requiring coverage, and 20-meter transects were used. Survey covered approximately 12,000 acres, identified approximately 25 new sites, and monitored approximately 300 previously identified sites.

Direct, Indirect, and Cumulative Effects on Cultural Resources

Alternative 1 – No Action

The Patrick project area has had numerous activities take place over the years. These activities have included timber harvest, road construction, mining, grazing, and recreation. Wildfire and prescribed fire have also occurred. Foreseeable future management practices and activities would likely include the same types of actions.

During survey for the Patrick project, a number of newly located cultural sites were located in the project area and many sites were revisited. Many of the historic sites that were located and revisited were found to be in a state of decay. This decay is from natural causes.

Overall, there would be no change from the current condition. Sites would continue to gradually deteriorate over time, subject primarily to natural forces (i.e. weather conditions, unexpected wildfire, etc.). Activities such as grazing, and recreating would continue to occur.

Under this alternative, no treatment activities would be undertaken; therefore, there would be no direct, indirect, or cumulative effects to cultural resources.

Alternative 2 – Proposed Action

Cumulative effects of the Vegetation management activities have the potential to damage or destroy cultural resource sites directly by heavy machinery, falling trees, road building, fuels treatments, etc., or indirectly as a result of discovery through increased access to sites, which in turn could lead to damage, destruction, or loss through looting. However, vegetation management activities can have a beneficial effect on cultural resource sites with regard to a decrease in potential for uncontrolled wildfire. Uncontrolled wildfire would completely destroy many of the historic cultural resource sites that exist in the project area. A reduction in fuels through vegetation management would mitigate this potential occurrence.

For the Patrick project, all unevaluated and eligible cultural resource sites other than historic linear resources would be avoided by ground disturbing activities with a 10-meter buffer zone. Ground disturbing activities for the project include such activities as mechanical timber harvest, new temporary road construction, mechanical fuels reduction, and fire line construction for prescribed fire. Limited activities may occur on historic linear resources such as ditches and railroads, and some lithic scatters may be burned over with low-intensity fast-moving prescribed fire.

The programmatic memorandums of agreement between the Oregon State Historic Preservation Office and the United States Forest Service regarding the management of historic water transportation ditches and historic railroads on the Wallowa-Whitman National Forest are used as guidelines for protection of eligible or unevaluated ditches and railroads.

The Management Strategy for Treatment of Lithic Scatter Sites by the USDA Forest Service Pacific Northwest Region provides guidance to avoid adversely affecting lithic scatter sites, including during prescribed fire activities.

Project Design Features to protect cultural resources are listed in Appendix B. Incorporation of these design features would minimize or eliminate potential adverse impacts to cultural resources. The intent is to protect cultural resources and to comply with the National Historic Preservation Act.

Cumulative effects of the proposed project and reasonably foreseeable future management practices would likely be beneficial to the protection of historic properties in that the Forest's cultural resource program is and would be involved in providing input to line officers regarding practices that allow for site protection. There have likely been some effects to cultural resource sites as a result of past management practices, particularly from activities completed prior to establishment of cultural resource protection laws, before sites were routinely avoided or otherwise protected. The greatest culmination of past, present, and future activities is potentially more access in areas which may not have seen much recent use. Greater access can potentially lead to effects on historic properties. However, with appropriate protection or mitigation, any potential negative effects can be reduced or eliminated. It is expected that the cumulative effects of the Patrick project would most likely to be beneficial to historic properties through enhanced documentation and protection of historic properties.

Determination

The Wallowa-Whitman National Forest zone archaeologist has determined that the Patrick project is considered an "undertaking" pursuant to the definition provided in section 301(7) of the National Historic Preservation Act. This undertaking will have a No Historic

Properties Adversely Affected determination pursuant to 36 CFR 800 and Stipulation III(B)5 of the 2004 Forest Service/Oregon SHPO Programmatic Agreement.

A report containing the findings of the cultural resource survey for the Patrick project will be prepared and submitted to the Oregon State Historic Preservation Office and interested Tribes for review and comment.

Forest Plan Consistency

Alternatives would be consistent with the Wallowa-Whitman Land and Resource Management Plan as all cultural resource standards and guidelines would be met (USDA Forest Plan 1990).

Required and Additional Disclosures

This section discloses the effects of the alternatives on the human environment as specified by law, regulation, policy, or Executive Order.

Cultural Resources

No impacts to any known cultural resource site would result from implementation of any of the action alternatives. Appropriate protection and avoidance measures have been designed and applied to the known sites existing within the project area in conjunction with the project Archaeologist.

Tribal Treaty Rights

Treaties provide that Native Americans will continue to have the right to erect suitable buildings for fish curing, privileges of hunting, gathering roots and berries, and pasturing stock on unclaimed lands. Indian treaty rights and privileges were considered throughout this analysis and maintained through appropriate design and layout features, especially related to First Food resources such as fish, wildlife, and riparian areas.

Many plants that can be found in eastern Oregon may have cultural significance, and some of the plants may be present in the Patrick Project area. The following plants which may be of cultural significance may be found in environments similar to that of the Patrick Project: Grouse whortleberry, Blue huckleberry, Russet buffaloberry, Bulrush, Blue elderberry, Scarlet elderberry, Geyer’s willow, Willow, Gooseberry/Currant, Alderleaf buckthorn, Yampah, Bolander’s yampah, Bitter cherry, Common chokecherry, Lodgepole pine, Mock orange, Gray’s biscuitroot, Fernleaf biscuitroot, Cous biscuitroot, Bitterroot, Ocean spray, Strawberry, Hawthorne, Lanceleaf springbeauty, Horsehair lichen, Balsamroot, Big sagebrush, and Saskatoon serviceberry. (It should be noted that no official survey was conducted by WWNF botanists for presence/absence of these plants in the project area). Redband trout are known to be present in the project area, as are deer and elk. First Foods are those individual resources, reserved in their Tribal treaties, to which Tribal members retained rights. These rights, such as hunting, fishing, and gathering roots and berries, have been acknowledged by the United States Supreme Court. The Tribes mission is to protect, restore, and enhance the First Foods (including water, salmon, deer, cous, and huckleberry) for the perpetual cultural, economic, and sovereign benefit of the Tribe. They measure the success of resource management by the availability and utilization of these resources. The sustainability of these resources is considered by them the minimum ecological condition necessary to meet the trust responsibility of the United States.

This project has shared in the federal government’s overall trust responsibility to Indian tribes where treaty or other legally defined rights apply to National Forest System lands. Consultation has

incorporated opportunities for tribal comments and contributions to the proposed action. (See EA p. 12). All alternatives are relatively equal in their treatment of treaty rights and are expected to maintain treaty rights and opportunities into the future.

Biological Diversity

All existing native and desirable introduced species and communities are maintained with all alternatives. Erosion control measures (seeding) would use native species when possible (EA, Alternatives section).

Biological diversity is not expected to be affected.

Research Natural Areas, Experimental Forests, and Wilderness

There are no research natural areas, experimental forests, or Wilderness areas within or immediately adjacent to the Patrick project area. There are no known significant cumulative effects from the project and other projects implemented or planned on areas separated from the affected area of the project beyond those evaluated in Chapter IV of the FEIS of the Forest Plan. The physical and biological effects are limited to this analysis area. No actions are proposed which are considered precedent setting.

The only potential impacts on Wilderness areas from this project are from potential smoke incursion as discussed under Fire and Fuels section of this EA; however, any potential for smoke incursion from prescribed fire between July 4 and Labor Day would be restricted. Refer to the Lands with Wilderness Characteristics effects analysis in this chapter for a discussion of potential impacts to areas meeting wilderness criteria as defined by FSH 1909.12 Chapter 71.

Probable Adverse Environmental Effects that Cannot Be Avoided

Some impacts caused by implementation of management activities proposed in this analysis that cannot be avoided may be considered adverse according to individual interpretations. Stumps and disturbed areas are not a pleasing sight to some people, visually or environmentally. Truck traffic would compete with public traffic on commonly used roads. Traffic and removal activities would also create dust and noise.

Smoke from prescribed burning, fuels reduction, and slash disposal is an irritant and an unpleasant sight to some people. Recreation users may find changes to the areas they have visited in the past, either through changes in vegetation, reduced or increased access.

Irreversible and Irretrievable Commitment of Resources

Irreversible resource commitments are actions that either deplete a non-renewable resource or disturb another resource to the point that it cannot be renewed within 100 years. There are no known significant irreversible resource commitments or irretrievable loss of timber production, wildlife habitats, soil production, or water quality from actions initiated under any of the alternatives. No heritage sites will be negatively affected.

Impacts to soil and water are controlled by management practices and mitigation measures and would not represent an irreversible resource commitment. For all practical purposes, rock is a non-renewable resource. Use of rock as surfacing represents an irretrievable commitment of a resource,

although due to quantities of supply, it is not a significant commitment. Existing roads constitute a more-or-less permanent commitment of a portion of land to a purpose other than timber production.

Some non-designated old growth may be affected under the action alternatives; however, the affect is generally considered a positive one and there will be no net loss of old growth. In addition, some loss of snag habitat would occur under all action alternatives. It is not known whether this is an irretrievable or irreversible action at this time. It is also not known what impact this type of change may have on unidentified nest sites of management indicator species.

Energy Requirements of Alternatives

The need for less energy-efficient and more expensive harvest or fuel reduction techniques is often due to the need to mitigate visual concerns, soil damage or adverse effects on watershed and other resources that would occur if more energy-efficient means, such as tractor yarding systems were employed. In this analysis, a combination of yarding systems and road development scenarios were developed in order to evaluate the tradeoffs of implementing various options.

Prime Farmlands, Range Land, Forest Land

Actions taken under any of the alternatives would have no impact on farmland, rangeland, or forestland inside or outside the National Forest. There are no prime farmlands affected by the proposal. Wetlands and floodplains associated with streams and springs would be protected using mitigation guidelines previously identified. No designated Wild and Scenic rivers would be affected by this project proposal.

Wetlands and Floodplains

Executive Order 11190 requires the Forest Service to “avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands”. The Patrick Project is consistent with this EO because it does not propose to destroy or modify any wetlands. Executive Order (EO) 11988 requires the Forest Service to “avoid to the extent possible the long- and short-term adverse impacts associated with the occupation or modification of floodplains. The Patrick Project is consistent with this EO because it does not propose to occupy or modify any floodplain.

Civil Rights, Women, Minorities, Environmental Justice

There are no known direct or adverse effects on women, minority groups, or civil rights of individuals or groups. Action alternatives are governed by sale or service contracts, which contain nondiscrimination requirements to prevent adverse impacts to these groups. The no action alternative may have some short- term adverse impacts on the local community by not providing timber sale receipts. To the greatest extent possible all populations have been provided the opportunity to comment before decisions are rendered on proposals and activities affecting human health or the environment. The proposals within this EA would not have a direct or indirect negative effect on minority or low-income populations (Presidential Exec. Order No.12898 on Environmental Justice).

Agencies or Persons Consulted

The Forest Service consulted the following individuals, Federal, State, tribal, and local agencies during the development of this EA:

Individuals

John George

Francis M. Preston

Organizations

American forest Resource Council

Blue Mountain Biodiversity Project

Oregon Wild

Greater Hells Canyon Council

Powder Basin Watershed Council

Burnt River Irrigation District

Agencies

Oregon Department of Fish and Wildlife

Baker County Board of Commissioners

Tribes

Confederated Tribes of the Warm Springs Indian Reservation

Confederated Tribes of the Umatilla Indian Reservation

Nez Perce Tribe

Preparers

The following agency personnel participated in the preparation of the Environmental Assessment. All personnel are either employees of the Wallowa-Whitman National Forest (WWNF) or other Forests.

Current Interdisciplinary Team Members:

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